Economic Impacts Of Expressways In San Antonio

A Study of the Effects of a 3.7-Mile Expressway Near Downtown San Antonio, Texas, on Land Values and Land Use

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CONTENTS

ECONOMIC IMPACTS OF EXPRESSWAYS IN SAN ANTONIO

INTRODUCTION AND SUMMARY

How should the costs of highway improvements be allocated? This question cannot be divorced from the consideration: What are the benefits and who receives them? The Congress of the United States reached this conclusion in its deliberations of of the Highway Revenue Act of 1956. The concern of the Congress is revealed in the Act itself in Section 210, which authorizes and directs that information should be developed regarding the benefits of federal-aid highways to users as well as nonusers.

The intent of Congress was that findings from the investigations should be used to aid in the determination of future allocations of highway costs. The first purpose of the San Antonio study is to contribute to the body of information required by the Congress. This study and others like it, however, may serve a variety of other important purposes.

The 41,000-mile System of Interstate and Defense Highways is the most ambitious road program ever to be undertaken. Scheduled for completion in 1971, the system had an original estimated cost of $23.2 billion. After two years, it was found that the program would far exceed the anticipated cost and probably would require more time than was originally allotted. A report given during the second session of the 85th Congress increased the total estimated cost to nearly $40 billion.

Obstacles to construction have arisen in many forms but none has been more important than problems associated with rights-of-way acquisition. In some states, obtainment of land has proved to be the principal limiting step in program accomplishment. Information on the economic impacts of road improvements may contribute importantly to solutions of right of way problems. In the field of public relations for example, factual data and actual experience can dispell unwarranted fears of landowners and, on the other hand, serve to aid in the anticipation and evaluation of real damages. The unknown nature of expressway effects has tended to delay negotiations for property. Right of way appraisers also stand to gain from economic impacts information. Their sharpened appraisals may lead to decreased costs and time requirements of acquisition and, at the same time, protect the interest of properties. Similarly, the displacement of conjecture with well-documented economic data should tend to decrease condemnation and speed the procedure when it does occur.

Some problems of right of way procurement stand to be alleviated through more careful consideration of exact location and design. Again, case histories of road effects on land values and uses should not be ignored. The choice between alternative locations and design characteristics, with otherwise equivalent conditions given, should not be made without attention to land-use patterns and land damage and enhancement potentials.

Economic impacts information also has tremendous utility in city planning. To be effective, planning must anticipate change and, in turn, knowledge of the probable influence of a new expressway system will increase the accuracy of prediction. Correlation of urban renewal and rehabilitation projects with expressway systems have been initiated by interested agencies. Here, too, is a valuable application for information dealing with the reaction of particular property classes to the forces accompanying expressways.

The San Antonio expressways chosen for study are U. S. 81 East and U. S. 87 North which are located near the central business district. These sections aggregate 3.7 miles in

Looking North—This U. S. 87 expressway section winds to the northwest. In the right foreground is its junction with the U. S. 81 expressway.

length and converge in such a manner that they may be considered "an expressway."

The principal reason that these sections were selected for investigation was that continuous frontage or service roads were not incorporated in their design. This is in contrast to Houston's Gulf Freeway and Dallas' Central Expressway which have continuous frontage roads. (The effects of these facilities have beeen studied previously and the publications are listed in the Bibliography.)

The San Antonio Expressway study was begun on a limited scale in June, 1957, with the collection of information from which the scope and methods of the inquiry were developed. The approach to determine the magnitude of expressway impacts on land values was to compare real estate prices in study areas and in presumably nonaffected control areas. Comparisons were made for periods before and after the expressway was constructed and net differences in changes of prices in study and control areas were taken as expressway effects. The "before" period for the comparative analysis was 1941-45 and the "after" period was 1952-56. The recording of sales and tax data, used in some of the measurements of land price changes, was started in August, 1957, and 1559 bona fide transfers were obtained.

The influence or study area delineated for investigation was two blocks or about 700 feet wide on either side of the expressway, except that an additional two blocks of properties along major thoroughfares also were studied. Five control areas were selected as representative of the study area in proximity to downtown San

Antonio, land use, zoning, age of development and other characteristics. In all stages of the research project, advice of persons familiar with San Antonio's land market and development history was sought and respected.

To supplement land values analyses, 202 interviews were conducted with residents and business operators in the study areas. This survey also proved useful in determining land use information and, of course, yielded interesting attitudes regarding the new facility. Field observations, maps, photographs and a variety of background data further were used to analyze land use effects and to establish the environment in which the road improvement was made.

It should be emphasized that this study deals with the economic impact of the expressway sections over a short period of time. The analyses of land value effects covers a period from 1946, when the road improvements became general knowledge, to 1954 which is the midyear of the 1952-56 "after" period. Observations on land use changes and interviews of persons in the study area were conducted in 1958. While this extended the period of influence studied, it still must be considered that only the earliest impact of the expressway sections is covered in this study. Perhaps somewhat different results might be obtained after the passage of additional time.

The following is a summary of the findings:

Looking South—In the foreground is a portion of the U. S. 81 expressway. To the right is its intersection with the U. S. 87 expressway section. In the center is the San Antonio Central Business District. Stretching south is the common route of U. S. 81 and U. S. 87.

The over-all net influence of the expressway sections was gauged at 129 to 133 percent by the principal method of measurements in terms of 1941-45 land prices. Other indexes of net influence yielded similar results.

One-family dwellings comprised the only class of property that showed evidence of expressway damages. The disbenefits were quite small, however, and were not indicated for properties abutting the expressway. (No group of properties in study areas experienced absolute losses in price from 1941-45 to 1952-56. Negative influences resulted when the study area properties gained less in value than did their comparative control areas.)

The greatest benefits accrued to land located on frontage roads. The net influence for such properties ranged from 377 to 392 percent, in terms of 1941-45 prices. Other abutting properties, not served by frontage roads but otherwise touching the expressway right of way, experienced net increases in value of about 300 percent. The same magnitude of benefits was found for land in nonresidential uses and unimproved land throughout the study area.

Land located on major thoroughfares in the vicinity of the expressway showed price influences of about 100 percent. Apartments as a group were also enhanced about 100 percent, location disregarded.

Land use changes along the expressway were far from spectacular; yet, some notable influences were evident. A large motel under construction in 1958 was one direct effect. Some twelve other new commercial buildings were attributable primarily to the expressway, and an equal number of expansions and renovations were observed.

The most numerous changes were related to roadside advertising, as a large proportion of abutting properties had billboards. Within uses, improvements such as slum clearance, better drainage, lighting and access to other sections of the city were attributed to the expressway.

In 1958, there remained a real potential or further land use change, especially along frontage roads. However, the fact that the best sites already are improved, usually with dwellings, will make succession of uses expensive and will slow its rate.

Fourteen of the 51 businessmen interviewed reported that the expressway had increased business volumes. Ten, on the other hand, felt that the facility had hurt their business. The remaining 27 said that there were no effects on business.

Forty-one percent of 82 resident-owners of dwellings contacted believed that their properties had beneitted from the expressway. Travel advantages and area improvement were most frequently given as reasons.

Fourteen percent of the resident-owners claimed damages from the expressway. They identified noise, vibrations and one-way streets among their supporting reasons. Forty-five percent of the owners of dwellings stated that values had neither increased nor declined because of the expressway's presence.

SOME CHARACTERISTICS OF SAN ANTONIO

San Antonio, county seat of Bexar County, Texas, was founded in 1712. It is one of the most colorful and distinctive cities in the United States. The atmosphere of the rugged Southwest is tempered by the romantic charm of old Mexico. Tourists view the distinctive architecture of many buildings and the well-preserved old Spanish missions, of which the Alamo is most famous historically. Tourist trade exceeded $40,000,000 in 1957. The new interstate highway system should act as a stimulant for additional visitors to enjoy the famous zoological gardens, scenic beauty, historic shrines and mild climate of the area.

The city has gained fame as the home of five large miiltary establishments and their quarter-billion annual payroll contributes materially to the city's economy. In addition, agriculture, oil, industry and banking are important. The value of manufactured goods amounted to over $111,000,000 in 1957. Its recognition as a medical and hospital center is increasing and the city has become a mecca for retired military personnel.

San Antonio is served by nine major highway routes of which four are among the interregional highway system, four state maintained farm roads and fourteen major county roads. Railway facilities are furnished by the Missouri Pacific, Southern Pacific and the T. & N. O. In addition there are 135 motor carriers and six airlines. San Antonio is, however, one of the few major cities in the U. S. without water transportation.

Population Growth

The population of Bexar County was 338,176 in 1940 and 500,560 in 1950, at which time 89.8 percent was urban, 7.7 percent rural nonfarm, and 2.5 percent rural farm. Anglo-Americans comprised 54.7 percent of the total population, Latin-Americans 38.8 percent, and 6.5 percent were Negroes. The population estimate for Bexar County was 710,451 in 1957 and the motor vehicle registration was 245,255. (TEXAS ALMANAC, 1958-59. See Bibliography.)

San Antonio ranked 25th in population among United States cities in 1950 and third among Texas cities. Its population was estimated at 559,547 as of May 31, 1958.

The following table reflects the steady growth of San Antonio in population and in total area (Unpublished data, Department of City Planning, San Antonio):

Year	Population (City)	City Area Square Miles
1940	257,208	40.16
1945	325,827	64.81
1950	408,442	72.36
1955	522,009	154.36
1956	531,308	154.53
1957	550,739	160.11
1958 (May 31)	559,547	160.11

Retail Sales

Additional indexes, such as total retail sales and valuation of building permits, also reflect San Antonio's growth. Each of these indices reveals some effects of the current recession.

Total retail sales have been as follows (SALES MANAGEMENT MAGAZINE, May issues, 1950-57):

Year	Total Retail Sales Estimates (In Thousands)
1950	$447,592
1955	631,713
1956	612,352
1957	624,495

The valuations of building permits for San Antonio have climbed since 1950 as is shown in the following series (Unpublished data, Office of Building Permits, San Antonio):

Year	Valuations of Building Permits
1950	$57,061,839
1955	59,449,190
1956	60,549,672
1957	51,377,915

Per Capita Income

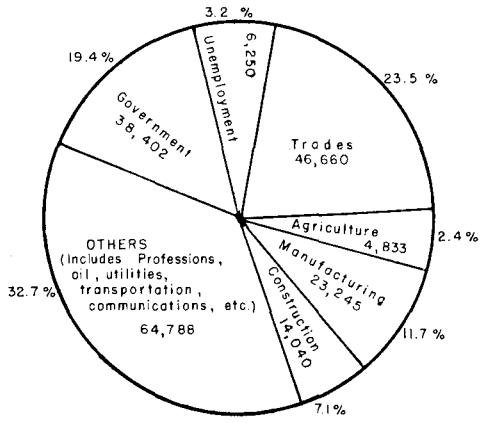
Although San Antonio is noted for its historic assets, scenic beauty and civic pride, in 1950 its median family income ranked 49th among the fifty largest U. S. cities. (Reported by ACTION, Inc. See Bibliography.) The per capita effective buying income for Bexar County continued to lag considerably behind that for Harris County (Houston), Dallas (Dallas) and Tarrant County (Ft. Worth) in 1955 according to the SAN ANTONIO NEWS, November 25, 1956.

The seven-year drouth hit San Antonio harder in farm-ranch income loss than the other metropolitan areas in the state and largely accounted for San Antonio's lag in consumer buying power.

Some of the city planning officials have attributed the low per capita income to a population growth that is outrunning industrial development. Data on the San Antonio labor market released by the Texas Employment Commission for September 1956 tends to strengthen the assumption.

The information from the Employment Commission indicates that the major weakness in San Antonio's labor market is in manufacturing

employment. The editor of the SAN ANTONIO NEWS recently commented on this deficiency as follows: "In half of nearly a thousand American cities with populations of 10,000 or more, industry accounts for 50 to



SAN ANTONIO LABOR MARKET

80 percent of employment. In only three cities over 50,000 does manufacturing employment provide less than 10 percent of total employment. In San Antonio the figure is only 11.7 percent.

"Of the six largest metropolitan areas in Texas, San Antonio ranks next to last in manufacturing employment and last in factory payrolls. As a result, though unemployment is below the state average, underemployment is high for lack of higher-paying industrial job opportunities. Basic industry is that which produces goods for export to other areas, thus bringing added buying power to the local market. The normal ratio of basic-industry employment to total population is 1 to 7; the San Antonio ratio is 1 to 16" (SAN ANTONIO NEWS, November 25, 1956).

Housing

Fifty-six percent of all dwelling units in San Antonio were owner-occupied in 1950; however, the median value of one-dwelling unit owner-occupied structures amounted to only $6,530. San Antonio ranked at the bottom among the fifty largest U. S. cities in this respect for the same year according to a report from ACTION, Inc.

There have been some attempts to counter the city's urban decay. The San Antonio Public Housing Authority has cleared 332 acres of slums in the development of 11 public housing projects since 1938. Also, San Antonio has given increased emphasis to city planning and zoning in recent years and now bids to make considerable use of urban renewal and rehabilitation in civic improvement.

Future Growth

San Antonio's Department of City Planning has projected the city's 1970 population to be 980,000. The economic progress of San Antonio, however, is heavily dependent upon the development of its rather large trade area.

A SALES MANAGEMENT MAGAZINE analysis indicates that the city had a 49-county retail trade territory of nearly 2,000,000 population in 1956 with an effective buying income of over two and one-third billion dollars annually. San Antonio's primary wholesale area comprised 91 counties and about 2,500,000 population. This area's effective buying income was reported at more than three billion dollars. The secondary wholesale area was delineated as 150 counties having over 4,000,000 people and five and one-half billion dollars in effective income (SALES MANAGEMENT MAGAZINE, May, 1956).

The economy of the trade area has been based primarily on farm and ranch enterprise in the past. Although this source of income is still important, it has been surpassed by incomes from minerals, with oil and gas predominating.

San Antonio has had one phenomenal period in its history which probably is not matched by any other major city of the nation. For a period of ninety years, from 1850 to 1940, the area within the city's corporate limits did not change. In 1940, population growth, associated to a large degree with military activities, began to push effectively against the city's boundaries. At about the same

time, San Antonio's citizens became interested in land use planning.

A zoning ordinance to regulate land use was adopted in 1938 but was not closely and constructively administered until the early 1950's. A long-intended and thorough revision of the zoning laws was underway in 1958. The initial interest of the city in land use control has developed into a matter of deep concern. The population of the metropolitan area more than doubled from 1943 to 1958 and the city area quadrupled from 1940 to 1958. The task of the city planners is to devise plans and methods for redeveloping older blighted areas while keeping constant attention on future growth and land use.

CHARACTERISTICS OF THE SAN ANTONIO EXPRESSWAY

The 3.7 mile length of the San Antonio Expressway System selected for study is similar in shape to the letter "Y." The right wing extends east (U. S. 81 E) for 1.6 miles to Broadway Avenue and the left wing extends north (U. S. 87 N) for 2.1 miles to Fredericksburg Road. The two

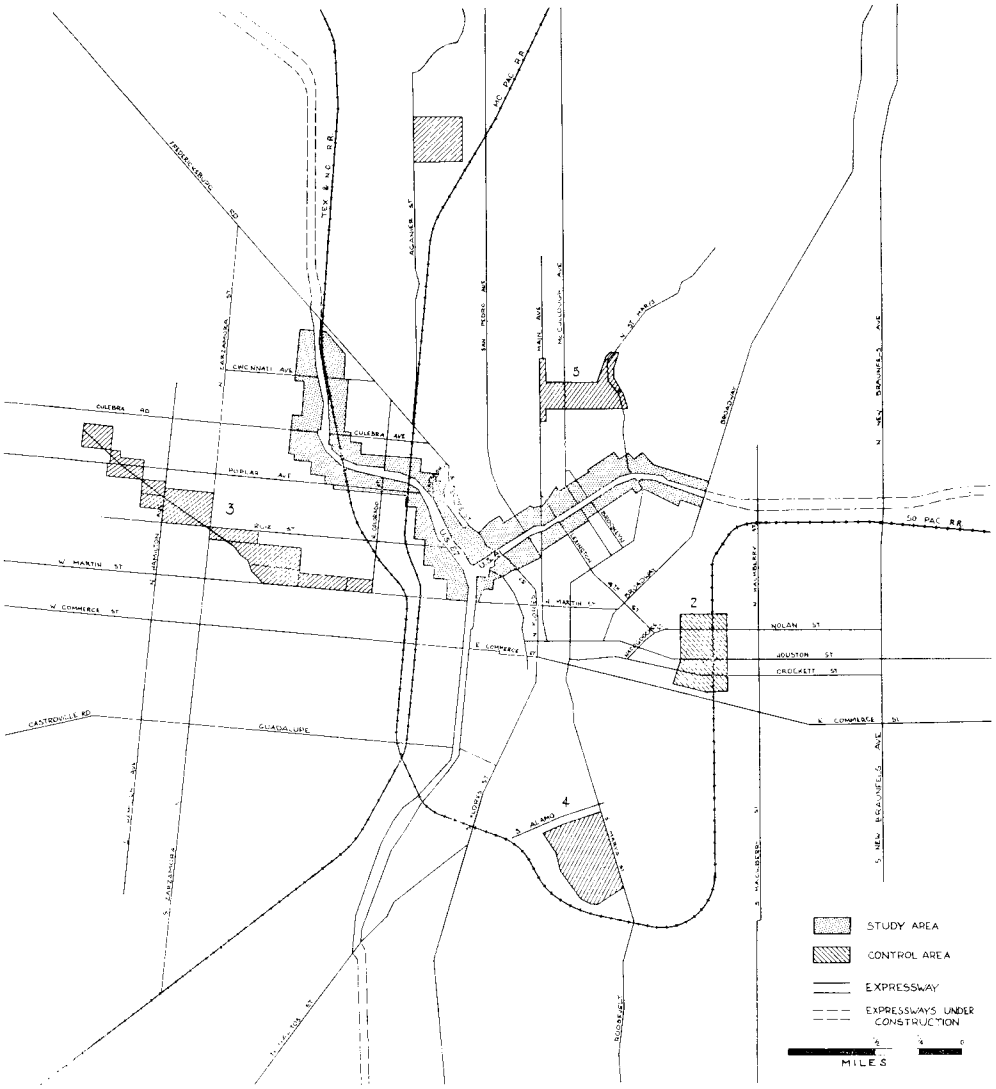


Figure 1. Locations of San Antonio study areas, U. S. 87 and U. S. 81 Expressways and control areas.

study sections merge at the south and rest on a base at Martin Street near the Central Business District. Beyond Martin Street to the south, where the study area is terminated, traffic is carried on a newly-opened expressway section of U. S. 81 to Nogalitos Street.

U. S. 81 is the main route south to Laredo, Texas, and carries Austin, Dallas and Ft. Worth traffic north. U. S. 87 has its beginning at Port Lavaca, Texas, and stretches north through San Antonio to Fredericksburg, San Angelo, Lubbock and Amarillo. The U. S. 87 expressway was begun in June, 1947, and was opened to traffic in the latter part of 1950. Construction of the U. S. 81 section was started in early 1952 and was completed in November, 1954.

The sections studied were the first portions of the San Antonio Expressway System to be completed in the urban area. Previous to their construction there was considerable local opposition to plans for financing the purchase of expressway rights of way. The sale of bonds was delayed for approximately one year and the financing eventually provided was barely sufficient to acquire minimum rights of way. Consequently, the right of way in the study area is extremely narrow, being only slightly over 100 feet at some points. (See Figure 2.) Thirty percent of the 3.7 mile facility has a right of way width of 200 feet or less. Most of the narrow right of way is on U. S. 81 E.

Design

Along most of their length, the expressway sections have four free traffic lanes separated in pairs by a median. One short stretch has six free lanes. Acceleration lanes are provided at most entrance ramps and allowance for declaration is charac-

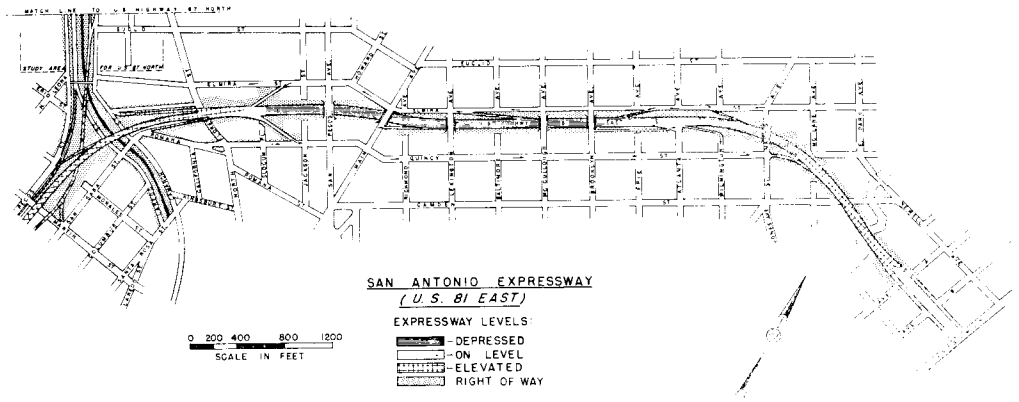


Figure 2. U. S. 81 East Expressway showing the design, levels of construction and right-of-way purchased.

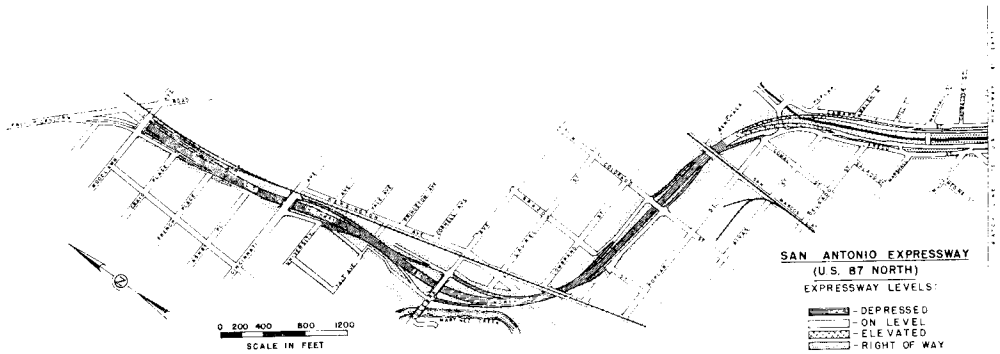


Figure 3. U. S. 87 North Expressway showing the design, levels of construction and right-of-way purchased.

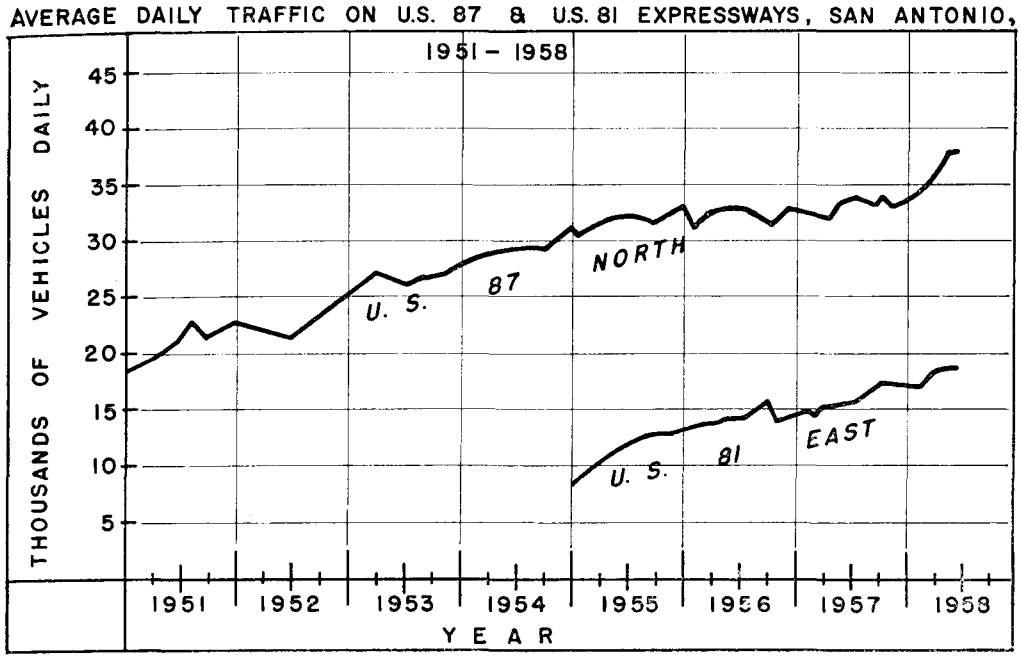


Figure 4.

teristic of most exit ramps. There are no grade crossings in the study area. Overhead crossways for pedestrians were constructed at three locations.

Frontage roads are limited to 28 blocks or 32 percent of the abutting property. Included in this measurement are properties abutting access ramps. Generally, frontage roads were old city streets paralleling the expressway. In other areas, parallel city streets fulfill some of the functions of frontage roads but are separated from the expressway by strips of improved land one-half block or more in depth. (See Figures 2 and 3.)

The expressway sections were constructed through rolling terrain. The facility has only 18 percent of its length approximately on the same level with adjacent property Forty-seven percent of the expressway is depressed to some degree and the remaining 35 percent is elevated.

A factor of design was the exclusion of short trips on the expressway. Short trips complicate and hinder longer movements and at the same time may well be made more economically via the regular street system. However, the necessary distribution of entrance and exit ramps to protect the expressway from short trips made access from many adjacent properties rather difficult. Thus the expressway sections cannot be considered superior for land service for nearby land. In view of this expressway characteristic, the enhancements experienced in the study area have added significance.

The expressway sections studied are located near the Central Business District. Calculations of probable time and distance savings that would result from travel via the expressway to the Central Business District were made. It was indicated that from most points in the study areas little could be gained by using the expressway for this purpose. It was obvious, however, that the expressway furnished significant convenience to other parts of the urban area.

Average Daily Traffic

Together, the expressway sections in the study area carried an average daily traffic of about 57,000 vehicles

in early 1958. The pattern of traffic volume on the north and east portions of the expressway is given in the following table. It may be noted that the average daily traffic (derived from Texas Highway Department records) has more than doubled since each section of the facility has been completed.

Date	Average Daily Traffic (Vehicles)
(U. S. 87 N.)	
January 1951	18,868
May 1958	37,240
(U. S. 81 E.)	
January 1955	8,589
May 1958	19,176

INFLUENCE OF THE EXPRESSWAY ON LAND VALUES

Prices of property in study and control areas were obtained for 1941-45 and 1952-56 these being the "before" and "after" periods. A large number of measurements of influence of the expressway were made from these data. Each measurement was based upon the assumption that differences in changes in study and control areas were primarily attributable to the expressway.

Two general methods of data manipulation were used. Under Method I actual sales data were averaged for each property type by using total prices paid divided by total area that sold. Obviously, the treatment yielded an average price per unit area (square foot) for property including its improvements. Thus, final measures of influence obtained from Method I data included the influence of the expressway upon improvements as well as upon land.

It was desirable for at least two reasons to obtain measurements of influence for which changes in the value of improvements had been removed or controlled. One reason was constituted in the principle that enhancement or damage to property values finally accrues to land. This led to the conclusion that expressway effects on property values should be measured in terms of land values only. Whether or not this principle is followed, the second reason was that the imperfection of the real estate market should be controlled if real estate prices are to be used to reflect changes in real estate values. To illustrate: if proportionately more unimproved land sells in one period than in another, the change in price is as much a measure of changes in the type of property that sold in each period as it is of the difference in the value of real estate in each period.

One method of removing the value of improvements from real estate prices is to subtract from such prices the tax value of improvements (at the time of sale) multiplied by a construction cost factor. This method was used in the San Antonio study and was designated Method II. The construction cost factor was applied to tax valuations to obtain the value of improvements in dollars equivalent to those stated in real estate prices.

There are in turn several indexes of the expressway's influence that may be derived from Method I and Method II prices. An absolute dollar influence may be shown under each method; this measure being the algebraic difference between price changes in study and control areas. The absolute influence may then be stated as a percentage of study area prices during either the "before" or "after" periods. This procedure yields Index (1) as it is called in this report. Another measure of influence, designated Index (2), is the algebraic difference between percentage changes in study and control areas. Index (1) and Index (2) give identical results if prices during the base period were the same in both study and control areas. Since this equality of prices seldom occurred, both measures are used in this report.

As has been suggested, percentage influence may be calculated in terms of prices in either the "before" or "after" periods in study areas. For most measures made in the San Antonio study, the 1941-45 or "before" period was presented in Appendix Tables 22, 23 and 24 was adjusted for changes in the value of the dollar

Over-all Influence of the Expressway on Real Estate Prices

Table 1 presents a variety of measures of the net influence of the expressway throughout the study areas. The first row of data represents the most direct indexes of influence. This series of measurements was obtained by comparing study and control area prices as they occurred; that is, unadjusted for differences in the types of properties that sold in study and control areas and in the "before" and "after" periods.

As indicated by Method I, the influence of the expressway averaged $.312 per square foot or 62 to 77 percent in terms of 1941-45 prices. Stated according to another standard, the net benefit under Method I computations was 16 to 24 percent of 1952-56 study area prices.

Method II indexes which are considered the principal and "best" measurements of the study, show a somewhat higher influence of the expressway. The absolute benefit was $ .354 per square foot and the percentage influences, base 1941-45, were 129 percent under Index (1) and 133 percent under Index (2). The close similarity of Index (1) and Index (2) indicates that the 1941-45 prices of land in the study and control areas, with the value of improvements removed, were very nearly the same. The difference was equal to $ .016 per square foot. (See Appendix Table B 1.) As a proportion of 1952-56 study area prices, the influence of the expressway on the value of land only was computed as 43 percent under Index (1) and 26 percent under Index (2).

The additional measurements of expressway influence, shown in Table 1, were obtained to study the effects of differences in the distribution of sales in study and control areas. Adjustments were made to correct for differences in the distribution of sales in land use classes, zoning districts and types of location. The various treatments yielded somewhat varying answers, but the influences as derived were all positive, all significantly greater than zero. The additional measurements, therefore, support the validity of the previous ones.

Abutting and Non-Abutting Property

Location in relation to an expressway should be expected to have considerable bearing on how the value of property is affected by the traffic

TABLE 1—OVER-ALL INFLUENCE OF THE EXPRESSWAY ON REAL ESTATE PRICES IN STUDY AREAS UNADJUSTED AND ADJUSTED FOR DIFFERENCES IN DISTRIBUTION OF SALES IN STUDY AND CONTROL AREAS[1]

Basis of Adjustment	METHOD I					METHOD II				
	Absolute Influence Per Square Foot	Percent Influence on Basis of 1941-45 Prices in Study Areas		Percent Influence on Basis of 1952-56 Prices in Study Areas		Absolute Influence Per Square Foot	Percent Influence on Basis of 1941-45 Prices in Study Areas		Percent Influence on Basis of 1952-56 Prices in Study Areas	
		Index (1)	Index (2)	Index (1)	Index (2)		Index (1)	Index (2)	Index (1)	Index (2)
Unadjusted for Distribution of Sales	$0.312	62%	77%	24%	16%	$0.354	129%	133%	43%	26%
Land Uses, Distribution of Sales among	0.528	105	127	40	35	0.385	140	169	47	36
Zoning Classes, Distribution of Sales among	0.326	65	84	25	18	0.313	114	127	38	25
Type-of-Street Locations, Distribution of Sales among	0.326	65	80	25	16	0.322	117	122	39	23

[1]Method I is based on actual sales data; that is, data that are not adjusted for value of improvements on property that sold.

Method II removes from actual prices the value of improvements, which value was calculated by multiplying the tax appraisal of improvements by construction cost factors.

Index (1) is the absolute influence (study area change minus control area change) divided by average prices in study areas. To prepare this table, both the 1941-45 and 1952-56 average prices in study areas were used as bases. In the remainder of the report, the 1941-45 average price in study areas is used as the base.

Index (2) is the difference between percentage in study and control areas. Again, both 1941-45 and 1952-56 bases were used in preparing this table. The remainder of the report uses the 1941-45 base.

It should be noted that if control area and study area prices were the same in the base period, Index (1) and Index (2) would yield identical results. This point is discussed further in the text of this report.

See Table 12 in appendix for additional details.

EXPRESSWAY INFLUENCE ON LAND VALUES
(1941-45 TO 1952-56)
OVERALL EFFECT IN STUDY AREA BY VARIOUS MEASUREMENTS
UNADJUSTED AND ADJUSTED FOR DISTRIBUTION OF SALES

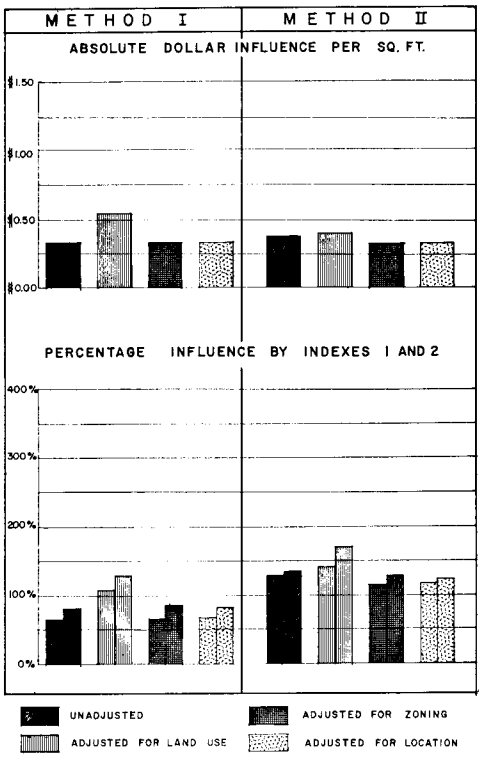


Figure 5.

facility. Ordinarily, the best land service furnished by an expressway accrues to properties located along frontage roads or otherwise having direct access and good visibility from the facility It is also true of course, that objectionable features of an expressway, like noise and fumes, may have the greatest impact on properties nearest the facility.

Along the San Antonio expressway, enhancements far outweighed damages for fronting properties as a group. Net benefits to such lands were appreciable according to measurements reported in Table 2. The influence on real estate prices as reckoned under Method I was $ .950 per square foot or 251 to 300 percent of 1941-45 study area prices. The expressway's influence on the value of land only (Method II) averaged $ .890 per square foot, and the percentage influence as shown by both indexes approached 400 percent.

Properties touching, although not fronting, the expressway were benefited from 181 to 231 percent according to Method I and 264 to 299 percent under Method II (Table 2). This favorable influence of the facility was through several mediums. Access to other parts of San Antonio undoubtedly was improved for many of the properties. Other sources of value enhancement were better drainage and lighting. The consideration of these factors by property owners is discussed later in the report.

Non-abutting properties were divided into two classes, land located on main thoroughfares and that located on minor streets. Referring again to Table 2, it may be seen that properties along main streets experienced important benefits from the expressway; 64 to 71 percent under Method I calculations, and 115 to 127 percent by Method II. Although not all main thoroughfares had ready access to the facility, in general, their convenience to other parts of the city was greatly enhanced. Also, of course, properties not abutting the expressway but located along main thoroughfares were somewhat immune to damages that might be associated with proximity. Another important factor was that main thoroughfares had access to areas on the opposite side of the expressway via overpasses and underpasses. The fact that certain land uses aggregate along main thoroughfares was another factor that affected the expressway's impacts.

Land along minor streets in the expressway area received very mild influences from the facility (Table 2). Method I computations yielded a very small absolute disbenefit of $ .009 per square foot or two percent. Index (2) under Method I, however, measured a positive benefit of 13 percent. Corrected for improvements under Method II, price differentials in study and control areas indicated a moderate expressway benefit for

properties along minor streets. The enhancement was calculated as $ .077 per square foot or 30 to 33 percent of 1941-45 study area prices.

The failure of properties with minor street locations to reap higher benefits might well have been expected. Such properties, while improved in relative nearness to other parts of the city, have immediate access problems via narrow minor streets, some of which the expressway blocked for through traffic. Other barriers to price appreciation were the residential uses and zoning which have a relationship to minor street locations. Some of the owners along minor streets reported that the expressway aided in slum clearance and area drainage factors which help to explain the enhancements that occurred.

Land Uses and Land Values

Measurements of impacts of the expressway on prices of land classified as to use show that one-family dwellings as a group received few if any favorable benefits. In fact, some evidence of expressway damage to land in this use is revealed by Method I indexes. The fact that Method II results fail to confirm detrimental effects of the expressway introduces an element of doubt in this regard. Supporting the negative influence are the reports by some owners of dwellings that the expressway decreased the value of their holdings. Properties on dead-end streets, near elevated expressway sections and in lots disfigured by right-of-way acquisition, apparently were leading candidates for disbenefits.

EXPRESSWAY INFLUENCE ON LAND VALUES
(1941-45 TO 1952-56)
BY DIFFERENT STREET LOCATIONS

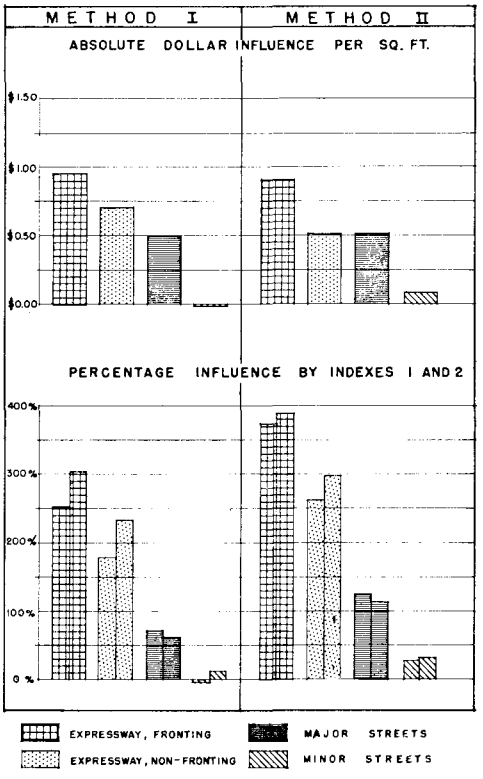


Figure 6.

Land used for apartments received significant value benefits from the expressway. The facility's influence fell in the ranges of 52 to 72 percent under Method I and 100 to 109 percent under Method II. As will later be reviewed, some apartment owners

TABLE 2 INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE WITH VARIOUS TYPE-OF-STREET LOCATIONS[1]

Location of Property	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Fronting	$0.950	251%	300%	$0.890	377%	392%
Expressway, Not Fronting	0.685	181	231	0.505	264	299
Expressway, Abutting[2]	0.773	205	254	0.627	296	321
Main Thoroughfare, Not At Expressway	0.492	71	64	0.504	127	115
Not Main Thorougfare, Not Expressway	– 0.009	– 2	13	0.077	30	33

[1]See tables 13 and 22 in appendix for additional details.
[2]"Abutting" classification includes locations fronting and otherwise touching the expressway right of way.

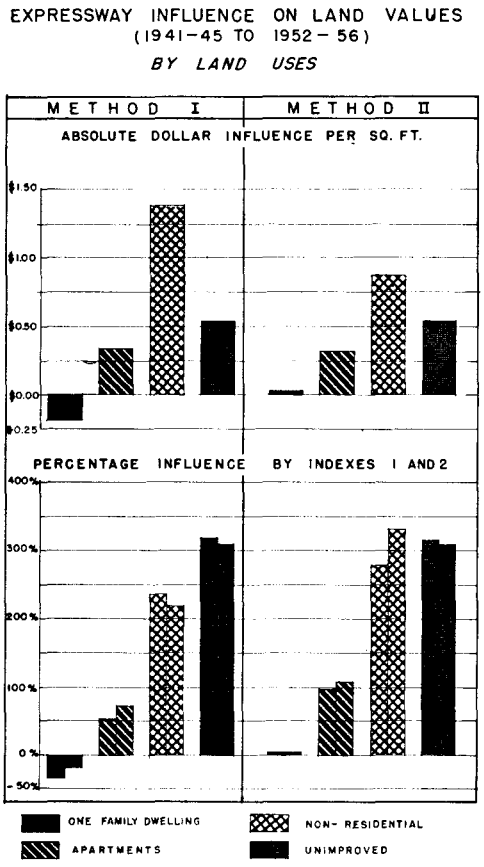


Figure 7.

denied favorable effects. Recession-associated vacancies in 1958 obviously influenced the thinking of apartment owners. As a whole, apartments near the expressway undoubtedly fared better than did apartments elsewhere not affected by such a facility. That apartments as a group were enhanced in value, while dwellings apparently were not, may have been due to a greater regard for accessibility among apartment dwellers. Such an appreciation of access would be reflected in better occupancy rates, higher rentals and thus in site values. This factor and factors of slum clearance and improved drainage for the area likely accounted for a major portion of the expressway's influence.

Land in non-residential uses and unimproved land registered very large benefits from the expressway. Land being used for retail, commercial or manufacturing purposes showed gains in value of more than 200 percent as computed by Method I and near 300 percent under Method II (Table 3). The location of non-residential land use near expressways is valued because of better accessibility, better opportunities for effective on-site advertising, and vehicular savings as well as other factors. Despite the positive influence of the expressway on land in non-residential uses, it should be mentioned that business operators were not unanimous in acclaiming the new facility. Some of the businessmen who denied expressway benefits were primarily dependent on rail for shipping and receiving. Their arguments are given fuller consideration in the discussion of attitudes and opinions in later sections.

Measurements of influences on unimproved properties were the same under Methods I and II, there being no improvements to remove. Such land had value increases of 310 to 317 percent assignable to the expressway. The absence of improvements precluded one possible element of damage, that of obsolescense of old uses and the attendant costs of shifting to more appropriate use. With

TABLE 3—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN VARIOUS USES[1]

Land Use	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
One-Family Dwelling	- $0.177	- 33%	- 18%	$0.006	2%	2%
Apartments	0.338	52	72	0.308	100	109
Nonresidential[2]	1.380	235	219	0.860	280	332
Unimproved	0.529	317	310	0.529	317	310

[1]See tables 14 and 23 in appendix for additional details.
[2]Local retail, commercial and manufacturing.

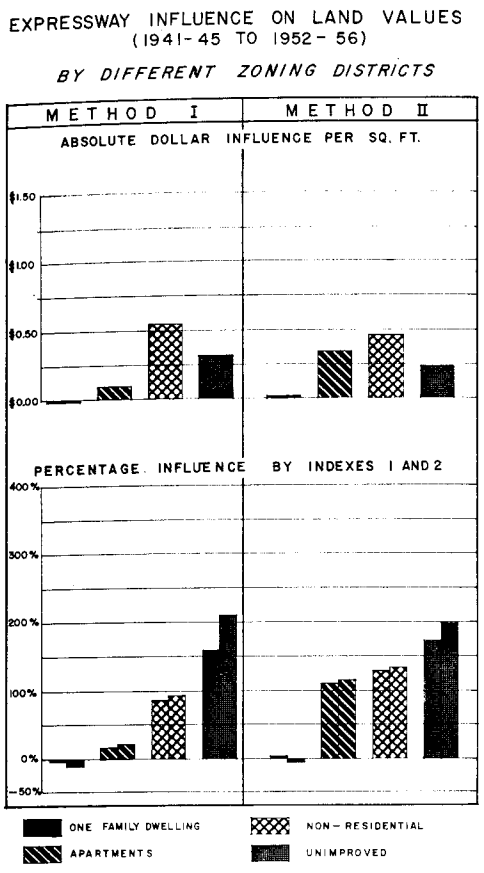


Figure 8.

favorable zoning, unimproved land stands ready for the highest and best use. If its access and other situs characteristics are improved, it may be expected to rise in value rather quickly.

Zoning

Land restricted to one-family dwellings under the San Antonio zoning ordinance was not enhanced in value by the expressway. In contrast, measurements indicate that such land sustained minor damages. Method I computations show value losses due to the expressway of $0.008 per square foot or two to ten percent, (Table 4). Influence as calculated under Method II was five percent negative according to Index (2) and two percent positive under Index (1). The negative influence measured was very small. In fact, there is room for contention that the indexes actually indicate the absence of expressway effects, positive or negative. Land in single-family dwellings and restricted to that use by zoning had a negligible opportunity to move to higher uses and thus greater value. Obviously then, the expressway had to improve such land in its existent use. While in various ways the San Antonio expressway did improve some land used and zoned for dwellings, its damages to other land may have outweighed benefits to a small degree. The occurrence of three negative measures out of four, the opinions of owners, and field observations are the evidence supporting this conclusion.

Land zoned for uses other than one-family dwellings had its value increased by the expressway according to all measures (Table 4). Manufacturing districts received the greatest enhancement, up to 208 percent. Since zoning districts, other than those restricted to dwellings, allow other uses, further discussion of expressway effects on properties classified as to use and zoning is given in the next section.

TABLE 4—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN VARIOUS ZONING DISTRICTS[1]

Zoning	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
One-Family Dwellings	- $0.008	- 2%	10%	$0.006	2%	- 5%
Apartments	0.098	16	21	0.330	109	113
Retail and Commercial	0.544	85	91	0.460	127	131
Manufacturing	0.318	158	208	0.234	172	199

[1]See tables 15 and 24 in appendix for additional details.

Land Uses and Zoning

One-family dwellings were found in all zoning districts in the study and control areas. None of the dwellings were new, nor were any of them expensive. The most valuable were old residences vintage 1890 and earlier, which long ago would have found their best use as apartments. A few of these homes approached a market value of $15,000 in 1956 prices. The average value of all dwellings was approximately $8,000 in 1956 in both study and control areas and the vast majority fell in a range of $5,000 to $10,000.

Tests were made to check the effects of the expressway on dwellings in residential versus non-residential zoning districts. In neither type of district did the expressway have resounding effects. Both zoning types showed some negative effects. Indexes obtained by Method II, however, showed small positive benefits (Table 5). The lack of influence in residential zoning districts might well be expected from previous discussions. Some was calculated through Method I for land in dwellings in nonresidential zoning areas. Again, however, Method II measured some enhancement. The conclusion is that there was little effect. The majority of such land was far from ripe for land use change even before the expressway was constructed. The new facility, in turn, was not strong enough in its impact to speed the ripening to a significant extent during the short period of its existence.

It should be emphasized that no group of properties in study areas experienced absolute losses in price from 1941-45 to 1952-56. The calculated negative influences resulted when study area properties gained less in value than did their comparative control areas. (See tables in the appendix.)

Additional comparisons of expressway influences on properties in various use and zoning classes are presented in Table 5. Most of these data, however, should be interpreted with caution for they were derived from a relatively small number of sales. (See Table 16.) Perhaps the most important observation concerning the measurements is that they were generally positive.

Residential Use and Type-of-Street Locations

Tables 6 through 10 were prepared in an effort to discover more precisely the incidence of expressway benefits and disbenefits among property types. To retain adequate numbers of sales for meaningful tabulations, certain combinations of property types were necessary. In Table 6, for example, one-family dwellings and apartments were combined to obtain residential land use, thus obscuring the behavior of each with respect to various type-of-street locations. More correctly stated, data were in-

TABLE 5 INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN VARIOUS USES AND ZONING DISTRICTS[1]

Land Use and Zoning	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
One-Family Dwellings						
Residential Zoning	– $0.091	– 15%	7%	$0.015	5%	7%
Nonresidential Zoning	0.185	– 39	– 24	0.022	7	8
Apartments						
Apartment Zoning	0.266	36	48	0.267	82	89
Nonresidential Zoning	0.232	42	33	0.168	40	– 41
Nonresidential Use and Zoning	1.561	295	276	0.860	310	332
Unimproved Land						
Residential Zoning	0.916	790	788	0.916	790	788
Nonresidential Zoning	0.292	159	173	0.292	159	173

[1]See Table 16 in appendix for additional detail.

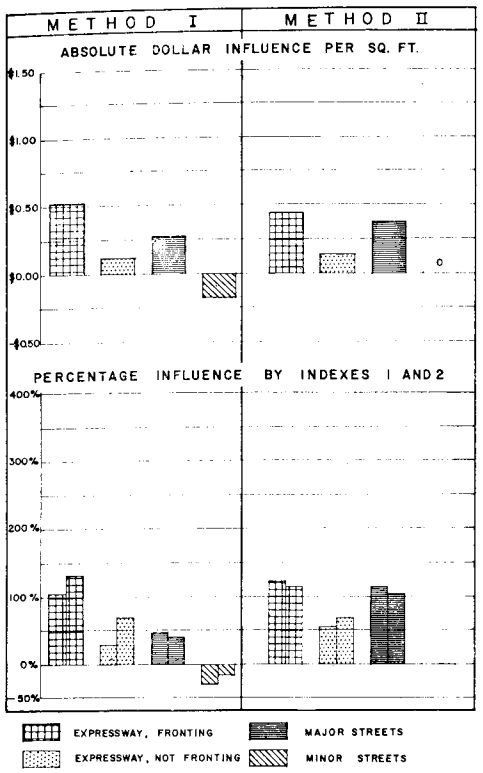


Figure 9.

sufficient to measure such specific classes of property; therefore the combinations actually resulted in the loss of only a minor amount of detail.

The most important finding reported in Table 6 is that the value of residential property was benefited significantly in all locations except along the minor streets (Not Main Thoroughfare, Not Expressway), Method I estimates revealed that fairly heavy negative influences were sustained by residential properties located on minor streets. Both dwellings and apartments showed losses by Method I indexes. Corrected for the value of improvements by Method II, indexes of expressway influence fail to confirm the negative effects. These latter indexes may be interpreted more accurately as indicating that the expressway had little impact on such properties.

It is suggested that the measurability of Method I is subject to question here. Residential property located on the expressway itself but having relatively poor access to the facility logically would have been more likely to experience disbenefits than residential property removed from the expressway. Method I indexes conflict with this assumption. Here, reference to Table 17 in the appendix is helpful. Corrected by Method II for differences in improvements of properties that sold, prices in the study and control areas were highly similar both in 1941-45 and 1952-56, the difference in each period being less than two cents The Method II price increase per square foot was the same for both areas, being $0.185.

Thus it is felt that Method I, at best, overestimates such expressway disbenefits as did occur and that Method II correctly shows that the value of land was not affected.

TABLE 6 -INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN RESIDENTIAL USE BY VARIOUS TYPE-OF-STREET LOCATIONS

Location of Residential Property	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Fronting	$0.524	103%	128%	$0.431	121%	112%
Expressway, Not Fronting	0.122	27	67	0.131	53	66
Expressway, Abutting[1]	0.317	67	100	0.282	97	100
Main Thoroughfare, Not at Expressway	0.274	46	39	0.369	113	102
Not Main Thoroughfare, Not Expressway	- 0.175	- 30	- 17	0.000	0	4

[1]See table 17 in appendix for additional details.

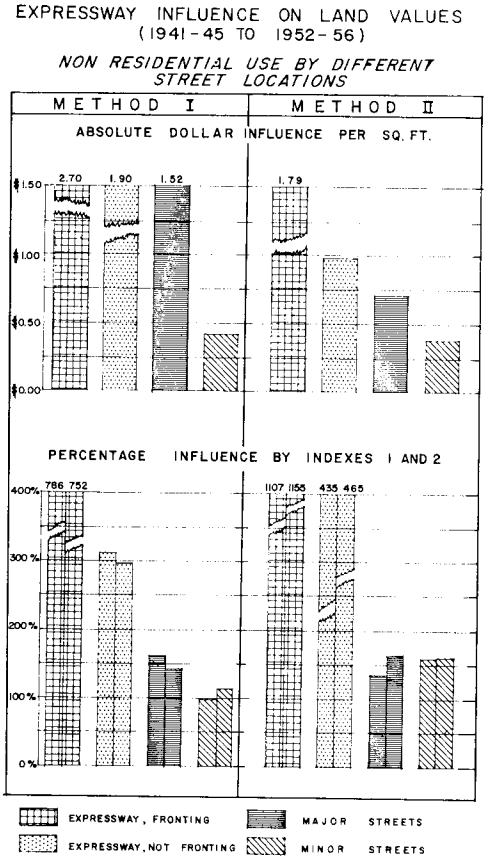


Figure 10.

Non-Residential Use and Type-of-Street Locations

Properties being used for local retail, commercial or manufacturing purposes were affected by the expressway in a marked pattern in each type-of-street location. Land in non-residential use and fronting the expressway received by far the greatest enhancement in value. Net influence ranged from 752 to 786 percent under Method I and 1105 to 1155 percent under Method II. (Table 7) Non-residential properties touching the expressway but not on frontage roads received the second greatest benefits.

Non-residential lands on main thoroughfares and along minor streets also were favorably influenced with the main thoroughfare locations experiencing slightly larger gains.

Despite a fairly small number of sales for each class of property, the measures in Table 7 appear to be significant. The pattern of influence is a logical one and is repeated in the series of measurements under both Methods I and II.

Unimproved Land and Type-of-Street Locations

A large number of sales of unimproved land would simplify the study of expressway effects on land values. Unfortunately, such sales are relatively scarce in older urban areas. The influence areas in San Antonio experienced only 24 such sales in 1952-56. In spite of this small number, calculations were made to check the expressway's influence on unimproved land abutting the expressway, on main thoroughfares and on minor streets.

The influence of 662 to 710 percent on abutting unimproved land (Table 8) was not surprising since the measures are in harmony with

TABLE 7—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN NONRESIDENTIAL USE BY VARIOUS TYPE-OF-STREET LOCATIONS[1]

Location of Nonresidential Property	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Fronting	$2.704	786%	752%	$1.793	1107%	1155%
Expressway, Not Fronting	1.902	311	296	0.978	435	465
Expressway, Abutting	2.161	487	463	1.144	615	655
Main Thoroughfare, Not at Expressway	1.525	161	143	0.700	135	163
Not Main Thoroughfare, Not Expressway	0.406	99	112	0.370	159	161

[1]See table 18 in appendix for additional details.

TABLE 8—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE, UNIMPROVED LAND BY TYPE-OF-STREET LOCATION[1]

Location of Unimproved Land	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Abutting	$0.629	662%	710%
Main Thoroughfare, Not at Expressway	0.301	51	- 16
Not Main Thoroughfare, Not Expressway	0.116	74	68

[1]Since Method II is the value of land with improvements removed, Method I and Method II data in this table would be the same. See Table 19 in appendix for further detail.

previous findings relating to abutting land. Unimproved land in the remainder of the study areas also was benefitted by the expressway. The measures of influence on this land were somewhat inconsistent, however.

The negative nature of Index (2) regarding effects upon unimproved land along main thoroughfares may be at best explained by referring to Table 19. The control data evidently was not comparable to study area data in the 1941-45 period. Note, however, that prices in study areas were much higher in the last period than control area prices and that the absolute gain in prices in study areas was almost triple the increase in control areas. Thus, Index (1), is indicated as the more accurate measurement of the expressway's impact upon unimproved land located on major thoroughfares.

Residential Zoning and Type-of-Street Location

Table 9 shows the measurements of expressway influences on properties with various locations within

EXPRESSWAY INFLUENCE ON LAND VALUES (1941-45 TO 1952-56)

UNIMPROVED LAND BY DIFFERENT STREET LOCATIONS

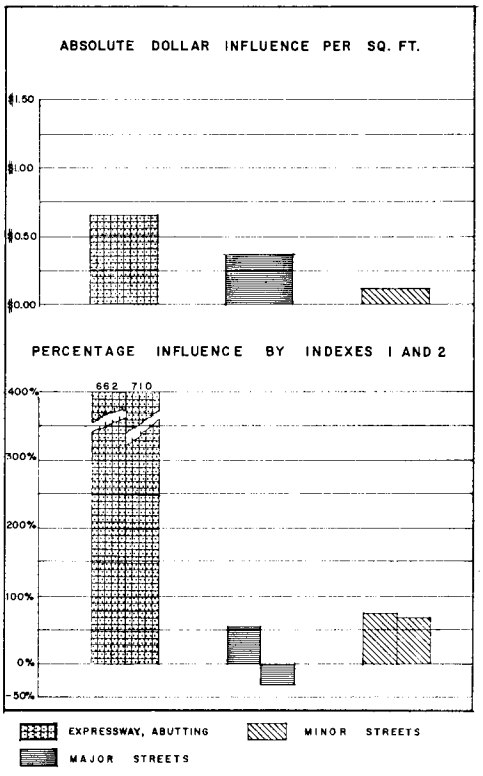


Figure 11.

residential zoning districts. The pattern of effects was quite similar to that shown for land classified by use and location in Table 6.

Land fronting the expressway received the greatest benefits in spite of its being confined through zoning, at the time at least, to residential use. This land experienced net in-

TABLE 9—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN RESIDENTIAL ZONING DISTRISTS BY TYPE-OF-STREET LOCATION[1]

Location of Property in Residential Zoning	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Fronting	$0.608	97%	87%	$0.713	157%	129%
Expressway, Not Fronting	0.015	3	23	0.167	78	96
Expressway, Abutting	0.408	79	69	0.455	157	153
Main Thoroughfare, Not at Expressway	0.103	19	- 61	0.382	129	82
Not Main Toroughfare, Not Expressway	- 0.014	- 2	- 2	0.049	18	22

[1]See Table 20 in appendix for additional detail.

TABLE 10—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN NONRESIDENTIAL ZONING DISTRICTS BY TYPE-OF-STREET LOCATION[1]

Location of Property in Nonresidential Zoning	METHOD I Actual Sales Data Influence of Expressway on Real Estate Prices			METHOD II Improvements Removed Influence of Expressway on Land Prices		
	Absolute Influence Per Square Foot	Index (1)	Index (2)	Absolute Influence Per Square Foot	Index (1)	Index (2)
Expressway, Fronting	$1.559	339%	396%	$0.864	424%	472%
Expressway, Not Fronting	1.047	301	356	0.619	336	397
Expressway, Abutting	1.077	313	369	0.677	349	403
Main Thoroughfare, Not at Expressway	0.698	92	94	0.554	122	120
Not Main Thoroughfare, Not Expressway	– 0.086	– 20	– 12	0.102	40	39

[1]See Table 21 in appendix for additional detail.

fluences on value of 87 to 97 percent under Method I and 129 to 157 percent according to Method II.

Properties zoned residential and touching but not fronting the expressway also registered positive effects, up to 96 percent by Method II calculations. Thus the facility's impact on the value of abutting residential property as a group may be considered favorable.

A somewhat poor comparative control accounts for the conflicting Method I indexes of benefits to prop-

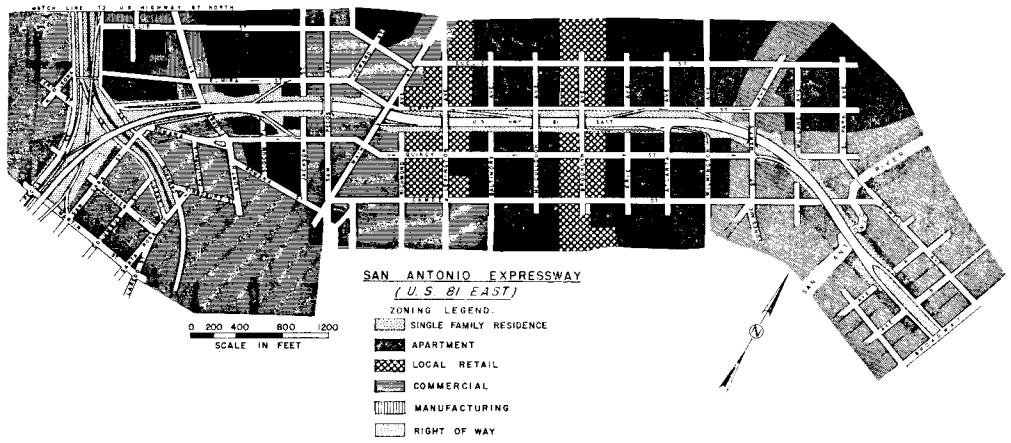


Figure 12. U. S. 81 East Expressway showing different zoning districts within the study area.

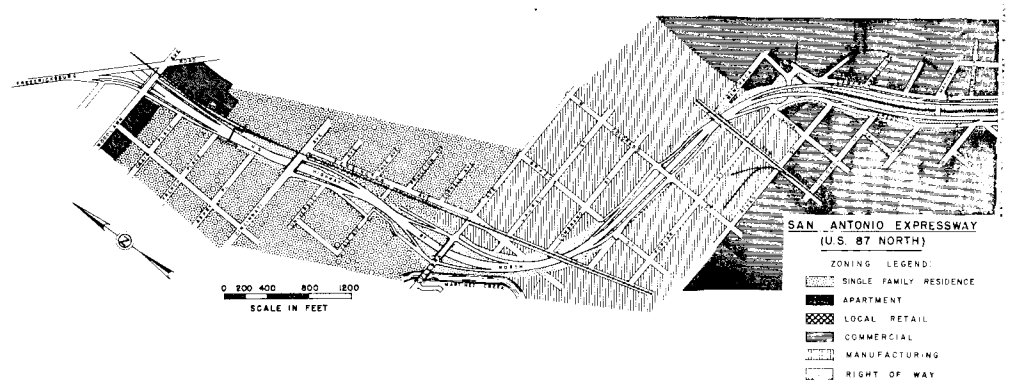


Figure 13. U. S. 87 North Expressway showing different zoning districts within the study area.

erty on main thoroughfares. Method II, however, presents strong evidence that such land was enhanced in value.

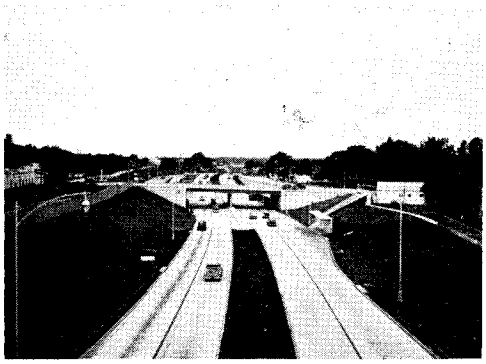
Very small measures of disbenefits to residential zoning areas along minor streets resulted from Method I computations. Again, however, Method II indexes reversed such findings with some strength. (See Table 20 for further evidence in this regard.)

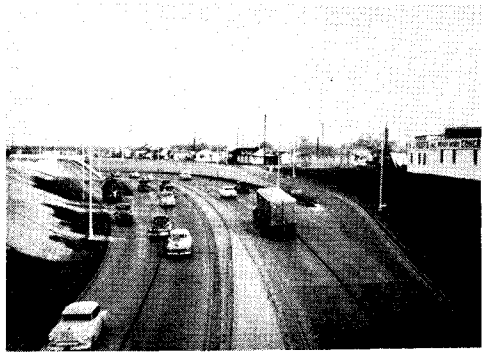
Non-Residential Zoning and Type-of-Street Locations

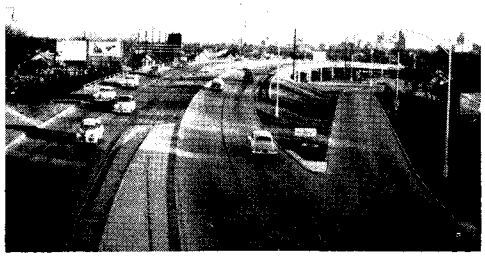
One of the principal influences that an expressway may have is that of changing the highest and best use of land. The other possible expressway benefit is the enhancement of land in its present use. Land in non-residential zoning districts is susceptible to both of these effects. It is very likely, however, that the incidence of such effects will be highly dependent upon the location of land in relation to the expressway. Table 10 provides at least a partial test for this hypothesis.

Land located on the expressway's frontage roads and access ramps registered substantial benefits. Indexes derived under Method I show a 339 to 396 percent net influence, and the estimates under Method II are 424 and 472 percent. Land otherwise abutting the expressway also experienced large gains, in fact only slightly smaller influences than fronting land.

Measurements of influence upon land values along main thoroughfares again show significant expressway benefits. The pattern was broken, however, by non-residential zoning districts along minor streets. Method I indexes indicate disbenefits for this latter type of property. Under Method II, land values are shown to have been enhanced, the measures of influence by the latter method being somewhat greater than the disbenefits registered by Method I.



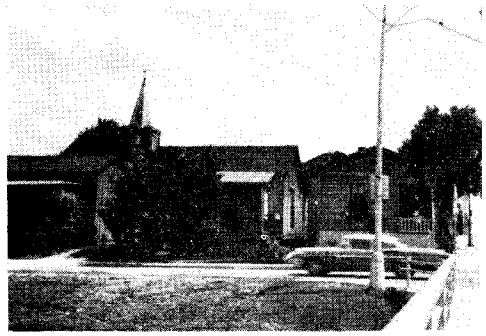


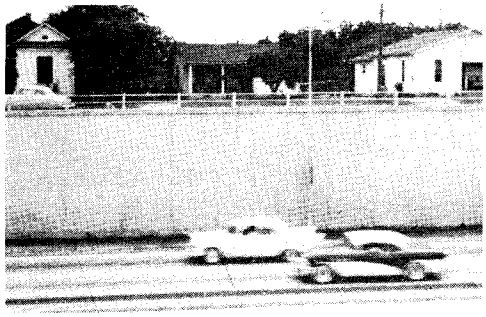


About 68 percent of the length of the expressway does not have frontage roads.

INFLUENCE OF THE EXPRESSWAY ON LAND USES

A change in land use is economically feasible when a new use will yield a greater return to land than the net revenue to land and improvements under the old use. For land generally, the process leading to justified land use change is a slow one. Indeed, for most properties, the deterioration or exhaustion of improvements over a long period of time is perhaps the principal factor that decreases net revenues to a point where



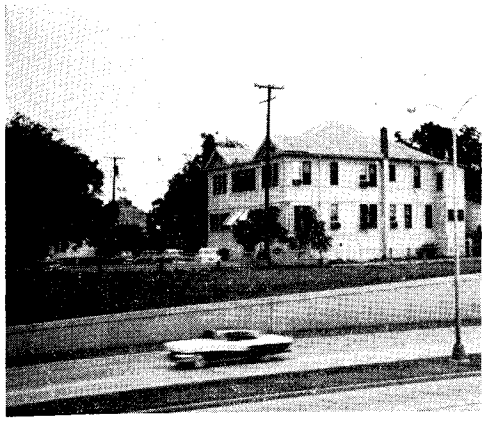


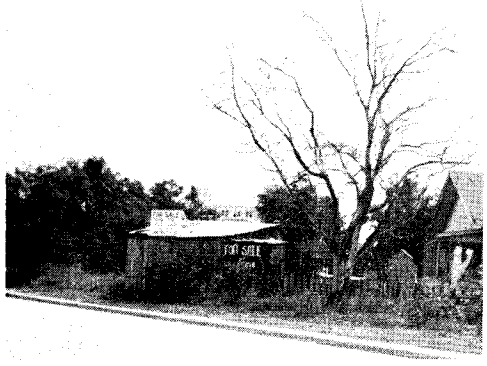
Residential properties in the study area range from shacks to large homes converted to apartments.

a new use or a rehabilitation of the old use indicated. Another manner in which land may ripen for a change in use is through the rise of its site or location value. In this latter instance, although net revenue is constant or decreasing very slowly, a sufficient increase in the site rent possible under a new use would make a change in use immediately feasible. Of the several factors which tend to enhance location and site rent, perhaps improvements in road service are capable of the greatest and most abrupt impact. The urban expressway is a road improvement of the highest type and thus expectedly should be of tremendous influence on land use patterns.

The analyses of the effects of the San Antonio expressway on land values indicated that this road improvement had a salutary influence on site values. At the same time, it was found that changes in land use had not kept apace with the enhancement of locations. This lag of land use is a natural one, for time is required to institute new uses of land. The highest use must be sought. The land must find its way into the ownership of the person who will use it. Plans must be drawn and perhaps credit arranged. More than this, other obstacles to change must be met. Small tracts may need to be consolidated. Zoning restrictions may have to be reconciled with the indicated best use. Land clearing and construction requires more time. Another consideration is that each successive land use change bids to alter the highest and best use of other properties in the area, necessitating restudy of their situations.

It should be remembered too that land prices should reflect potential land uses that may not be economically justified until some future period of time. In the meanwhile, maintenance of the land in its existing use will yield the greatest net returns. On the other hand, the best use of some land may not be changed by the improvement in its location. Rather, it may be enhanced simply





Before new land use can be accomplished in some areas along the expressway, old improvements must be removed.

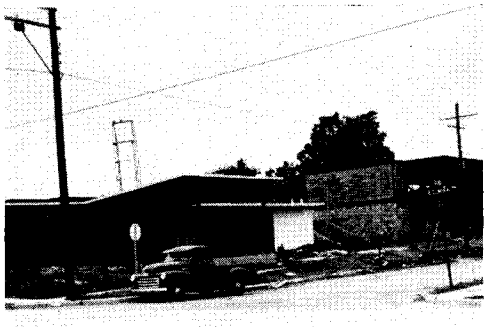
in its existing use with potentials for changes in use too weak to be valued.

This review of the general economic framework has a special significance as regards the impact of the San Antonio expressway sections on land uses. The U. S. 81 and U. S. 87 expressways which were the subject of study traversed an older part of the city. The study encompassed old established housing, retail and commercial buildings and two manufacturing areas. There was little unimproved land and practically no new homes or business structures existed. Aged persons and Latin-Americans comprised a large proportion of the occupants of dwelling units. Deterioration of housing was common in the area of old and large homes near the central business district that had been converted to apartments. Dilapidated residences of low value were predominant in the San Pedro Creek vicinity (see Figure 2). Rotted porch floorings and screens, decayed steps and sills, battered roofs and weathered paint were not unusual Approximately 40 percent of the housing units in the study area were substandard and some of these were definitely slum housing. Other dwellings were fair to good in appearance. There were very few expensive homes, those with the highest market value being large dwellings valued perhaps at $15,000 or slightly more in 1958.

One of the manufacturing districts existed before the zoning ordinance of 1938, having a vintage in the 1920's and earlier. It is located in the north angle of the U. S. 81 and U. S. 87 intersection. The other manufacturing area was built-up mostly after 1940 and is zoned for light manufacturing. It is larger than the older district, being about 200 acres, is served by two railroads and was split by the U. S. 87 expressway. Both of the manufacturing districts have an interspersal of other uses, including old dwellings, duplexes and retail and commercial. Manufacturing includes textiles, steel frabrication, concrete products, and light products such as candles and foodstuffs.

This was the nature of the study area before the construction of the

Professional office building.



Motor hotel.

Future bank location.

Service station.

Land use changes in study area.

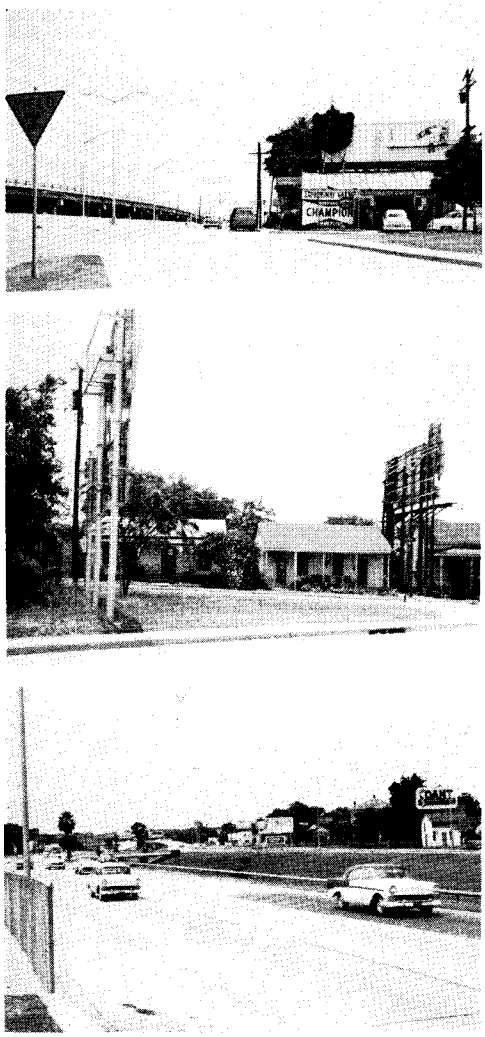
expressway. In June 1958, there was some evidence of land use change but generally conditions were much the same. This section, therefore, deals fully as much with changes that may be anticipated as with actual changes that have occurred.

New Construction

Only a small number of new improvements was constructed in the study area after expressway construction was begun. Also, in 1958, there had been very little assembly of small tracts into larger holdings to accomodate new uses. Conversation with various owners, however, revealed some enthusiasm concerning future construction of commercial facilities.

Twelve new structures for business were attributable, to some extent at least, to the presence of the expressway. About an equal number of expansions of old business facilities occurred after construction of the expressway became a certainty. The most important improvements from the standpoint of investment were a new bank building and a new motel, both being erected in 1958. Each of these structures displaced residences. The motel certainly would not have been located at its present site if the expressway had not been constructed. It was situated on perhaps the best site created for such a use, being between Atlanta and Erie streets on the north frontage road (Elmira Street) of U. S. 81 East (see Figure 2). It is likely that other residences adjacent to the motel site may be rapidly superceded by similar commercial uses.

The bank building was being erected on North Main Street near the expressway. The location of this new improvement was undoubtedly enhanced by the facility. Other land use changes partially due to the expressway included a multi-unit building accomodating several small commercial businesses. This is a one-story structure located on abutting land. In two locations, residences had been removed to expand private parking facilities. Only one service station apparently was induced to locate near the expressway but several attractive sites for this use were created. The more attractive existing businesses were located on major thoroughfares crossing the expressway sections. Some of these streets



Outdoor advertising in study area.

are: North St. Mary's, North Main, San Pedro, North Flores, Colorado, and Culebra.

It is believed that a great deal more land use change would have occurred if there had been more unimproved land in the study area. A change in land use is greatly simplified when land is vacant. In this case, the new use does not face the obstacle of paying for the removal of old improvements in addition to equalling the net revenue they may yield. Instead, the new use has only to return a payment to land, this return being greater than that from an alternative new use. Thus, given an improved and an unimproved tract with similar location characteristics, the unimproved tract logically would be the first to come into a new use.

Outdoor Advertising

The most comprehensive land use effect attributable to the expressway was in the nature of outdoor advertising on abutting properties. Except where strictly prohibited by law, many of the abutting properties accomodated one or more commercial signs. Some of the advertisements, of course, were concerned with the business on the site. A far greater number were off-site advertisements. All types of signs were represented, from the 24-inch sheet posters to electric spectaculars. Some of these structures were sandwiched among dwellings, as is shown in illustrations in this report.

Effects within Uses

Another influence of the expressway had to do with the enhancement of land within uses. This effect came into play in several ways. Most often mentioned by residents and business operators were better drainage of the area, better lighting, better access and slum clearance. Also credited to the expressway were certain vehicular and time savings which eventually, of course, are recognized and capitalized in site values. The occupancy of vacant buildings and some changes in types of tenants also may be traceable to the expressway's influence.

Potential for Land Use Change

The potential for the re-use of land in areas adjacent to the expressway obviously was far below that revealed in studies of Dallas' Central Expressway and Houston's Gulf Freeway (see Bibliography). Yet, the road improvement has established a very real potential for supersession in land use. The highest and best use of many parcels of land has been changed. An early realization of new uses logically may be expected for many properties even where the city's zoning is inconsistent with change. When land incomes promise to be

larger in new uses than net revenues are in the old, and this ripeness for use change is recognized by entrepreneurs, the succession of use will occur. In most areas, zoning likely will fail to be a deterrent for two reasons: Basically, most adjacent properties will stand to incur little if any damage from such new uses as motels, office buildings and service stations. Secondly, the existing mixture of uses and the lack of neighborhood solidarity in proximate areas suggest that opposition to changes in zoning would be nil and probably ineffectual.

The narrow San Antonio River runs beneath the U. S. 81 section of the expressway and across the study area between St. Mary's street and Broadway. The river is subject to flash-flooding and this threat is an influence for several blocks. The area has commercial zoning and the predominant land use in 1958 was commercial with some local retail stores. There has been no new construction in the study area near the river since the completion of the expressway but the facility improved the situs of this area. Further improvement in flood drainage control will make the area highly attractive for warehouses, wholesale services and other similar uses.

Some properties located near the expressway and on main thoroughfares were ripened for change perhaps as much as fronting lands. A primary difference, however, was that a larger proportion of properties on main thoroughfares already were in retail and commercial uses than were properties on frontage roads.

Properties abutting the expressway but not on frontage roads were given potential for change in use to the extent that the secondary street system provides, or easily may be improved to provide, good road service.

Two railroads cross the U. S. 87 section of the expressway. These are the Missouri Pacific (at San Marcos Street) and the Texas and New Orleans. The latter runs parallel to the expressway from Culebra to Fredericksburg Road. As heretofore mentioned, the railroads serve the light manufacturing district also served by the expressway. At the time of the study, only one new building had been added, it being the commercial structure previously described. In this and the older manufacturing area, improvement of the secondary street system is needed for realization of the potential introduced by the expressway.

Generally, locations on minor streets were not ripened for higher uses. Nor are they likely to experience such changes in the absence of comprehensive urban renewal or rehabilitation programs. In this latter regard, the expressway may serve an extremely worthwhile function.

Urban renewal is most practical for areas that are delineated by insulator or buffer zones. The U. S. 81

TABLE 11—STUDY AREA (U. S. 87 NORTH AND U. S. 81 EAST) AND CONTROL AREA PRICES PER SQUARE FOOT

	No. of Sales		METHOD I				METHOD II			
			Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Study Area										
U. S. 87 North	396	157	$0.371	$0.916	$0.545	147%	$0.196	$0.517	$0.312	164%
U. S. 81 East	257	121	0.756	1.826	1.070	142	0.427	1.202	0.775	181
Control Area										
Control 1	91	66	0.737	1.369	0.632	86	0.326	0.482	0.156	48
Control 2	41	26	0.540	0.746	0.206	38	0.313	0.391	0.078	25
Control 3	125	67	0.282	0.632	0.350	124	0.149	0.330	0.181	121
Control 4	114	56	0.620	1.363	0.743	120	0.330	0.647	0.317	96
Control 5	33	9	1.117	1.300	0.183	16	0.508	0.626	0.118	23

and U. S. 87 expressways may serve very well as barriers to protect renewed or rehabilitated areas from creeping blight from nearby untreated areas. The expressway sections offer this function in several places. Particular situations so served by the facilities are the areas in the north and southeast angles created at the intersections of the two sections (see Figure 2).

In summary, land use change along the San Antonio expressway sections has been somewhat slow. The failure of land use to realize more of the potential indicated by the rise in land values is primarily attributable to the following factors:

1. The economic recession of 1957-58, which was felt less in San Antonio than in many major cities but deterred construction.
2. The small proportion of unimproved land in the study area and the high costs of assembling and clearing improved property for reuse.
3. The scarcity of frontage roads which among other effects furnish direct improved street service to nearby land.
4. The expressway system beyond the study area was not complete which fact complicated the task of deciding the proper use of particular properties.
5. Business enterprise may have been slow to recognize the benefits of the expressway even though the land market reflected that buyers and sellers were cognizant of such benefits. This lag also probably was associated with the incomplete condition of the expressway system.
6. The land market may have overvalued expressway enhancements making land prices a barrier to some use changes.
7. Other obstacles such as zoning when added to the above-named factors comprised a complex of deterrents to make land use adjustments unusually slow.

OPINIONS AND ATTITUDES OF RESIDENTS AND BUSINESSMEN

In the summer of 1958, a survey was conducted of the opinions and attitudes of business operators and residents along the expressway. This step was taken for several reasons. Analyses of sales did not reveal the experiences of specific individual owners. Instead, the results were intended to show how various groups of properties had fared. Interviews, on the other hand, furnished the opportunity to ascertain the feelings of individuals regarding the expressway. This information would have additional utility in supplementing and explaining relationships previously revealed in the study of sales data. Owners of real estate, obviously, were a very real part of the real estate market as they acted as interpreters of market factors, including the expressway. An additional reason for the survey was to allow persons whose area was the subject of study, and later of report, to have a voice in the findings.

The findings of this portion of the San Antonio study are in general agreement with those of the statistical phase of the study. Information obtained by interview, however, may be flavored strongly with personal bias. It should be regarded as opinion, some of which may be uninformed and unfounded. It should be borne in mind, also, that the survey was conducted four years after the midpoint of the 1952-56 or "after" period of property sales. A change in the general economic tempo during the intervening period had become a factor influencing opinions and attitudes of respondents.

Both businessmen and dwellers demonstrated interest and cooperation in the study. Some residents contacted, however, could not be successfully interviewed because of language difficulties. In a few instances, children of Latin-American families served as interpreters. Business and family units were sampled with regard to types and location along the expressway. Interviews were conducted at depressed, elevated, and on-

grade sections; along frontage roads, at main thoroughfares, and along minor streets. Spokesmen for 51 businesses and 151 occupants of dwellings and apartments were interviewed. The sample represented approximately 10 percent of the total number of business and family units that were located in the area, being about half of the businesses and about eight percent of residential properties.

Business Establishments

The study sample included 51 business establishments. Interviews were conducted with 33 owners and 18 lessees of business firms classified as follows:

	Number of Establishments	Percent
Retail Trade	16	31
Services	13	26
Contracting	7	14
Manufacturing	6	12
Wholesale Trade	5	10
Transportation and Communication	2	4
Finance, Insurance and Real Estate	2	4

Almost two-thirds of the businesses (63 percent) were located in the study area previous to the construction of the expressway. Over two-thirds (68 percent) of the establishments that moved into the area after construction of the facility came from other locations in San Antonio and the remainder comprised newly-established business. Thirty percent of the business establishments fronted the expressway; most others were located on main thoroughfares.

The use of the expressway by the firms in the sample varied considerably. A few of the manufacturing establishments along railway facilities and some businesses located on old established thoroughfares made little or no use of the expressway. Some establishments located on frontage roads were quite dependent upon the facility both for operational purposes (shipping and receiving) and customer trade.

Broadly described the manner of expressway usage by the 51 business establishments was reported as follows:

	Number of Establishments	Percent
Use Expressway for Operations and Customer Trade	17	33
Use Expressway for Operations Only	15	29
Use Expressway for Customer Trade Only	8	16
Do Not Use for Operations or Customer Trade	11	22

Only three respondents among the 19 business establishments that were newly situated in the area attributed their choice of location to the expressway. The other 16 stated that the expressway did not influence their decision to locate in the study area. Instead, they cited the following as deciding factors: Vacant building; purchased property from parents; needed larger building; land available and relatively cheap; inherited property; near railway facilities; cheap rent; no competitors near; close to other business interests; wanted to get out of downtown area.

Personnel at 20 of the 33 owner-establishments stated that their property had increased in value following the construction of the expressway. None of the 20 felt that the expressway was totally responsible for the increase, and several stated that the facility was a minor contributing factor. The owners of business establishments estimated an average increase of 26 percent in property value. Nine owners felt that the expressway had no effect on property values and four stated that the facility caused a decline in property values. Five of the nine businesses were located on minor streets and four were located on main thoroughfares in instances where owners stated that property values were not affected. The nine "nonaffected" firms were equally divided among retail, manufacturing and service establishments. Three of the four business owners claiming declines in property values were located on one-way streets and were engaged in food serving. The principal reason for damages was that the expressway had isolated the businesses from some of their customers.

The majority of the firms, 53 percent, indicated that business volume had neither increased nor declined as a result of the expressway. Fourteen (28 percent) of the 51 business operators reported that their business had increased an average of 21 percent. All fourteen hedged, however, by stating that the increase was not necessarily due to the expressway. Trends of an expanding economy and population also were cited as important factors.

Ten business operators (20 percent) stated that business volumes had declined an average of 27 percent since the expressway construction. They did not attribute the business decline completely to the expressway but stated that the recession was an aggravating factor. Thus, together with the expressway, economic conditions were both blamed and blessed, according to the frame of reference of respondents.

The 78 advantages and 63 disadvantages of the expressway mentioned by the 51 businessmen were as follows:

ADVANTAGES

	Number of Responses
Save Time and Money on Deliveries	33
Convenient for Customers and Employees	17
Valuable Advertising	6
Identifies Location	6
More Customers	5
Cleared Slums	5
Improved Parking	2
Miscellaneous (superior state maintenance, improved drainage and lighting, etc.)	1
No Advantage Stated	5

DISADVANTAGES

	Number of Responses
One-Way Road Hurts Business	9
Potential Customers Don't Slow Down on Frontage Roads	8
Dead-End Streets Curtailed Business	7
Too Few Exits	6
Too Narrow for Present and Future	5
Restricted Parking	5
Need Blinker Lights at Intersection of Exit Ramps and Frontage Roads	3
Noise	3
Miscellaneous (too many elevations, curves and depressions, wrecks on expressway, no minimum speed)	15
No Disadvantage Stated	15

Apartments and One-Family Dwellings

There were 54 percent owners and 46 percent renters among the 151 residents that were interviewed in the study area. Almost two-thirds (64 percent) of the respondents were residents of one-family dwellings, and the remainder resided in structures of two or four apartments. Virtually all of the apartments and dwellings were frame structures. Forty-five percent of the units were located less than one block from the facility, the other 55 percent being from one to two blocks from the expressway.

Sixty-four percent of all families resided in the study area prior to the construction of the expressway. The long-time residents were, of course, most familiar with the changes that occurred following the construction of the facility. They gave the following typical phrases that reflect some of the changing values, appreciations, and memories: "We used to be afraid to walk alone at night, but the lights now make us feel safe, and it keeps prowlers away; a good breeze comes through now since they opened up the place; they came and got me when the water was in my house to the kitchen, but San Pedro doesn't flood since they fixed it up; the whole area is pretty since they cleaned out the old houses, trash and weeds; my husband can get to Kelly Air Base on emergency calls in no-time; I miss all my old friends that were moved out or cut off on the other side; I remember when it was almost impossible to get across town, but that's not so now." Twenty-eight of the residents interviewed did not own automobiles. These were among the older persons that mentioned the entertainment value provided by watching the cars pass along the expressway.

Forty-one percent of the owners gave the opinion that the construction of the facility contributed to an increase in value of properties. Forty-five percent stated that values had neither increased nor decreased. Fourteen percent of the owners stated that the following factors caused the value of housing properties to decline: one-way streets caused vacant apartments and rooms; dead-end streets were created; excess noise resulted; houses now vibrate on foundations; sidewalks were ruined; and lots were disfigured. Forty-six percent of the owner group stated that they would be willing to sell their property and

move out of the area; 54 percent said that they would not sell.

Only two (11 percent) of the 18 apartments owners that were interviewed reported that the expressway caused the value of their properties to decline The apartments of these two were located on minor streets a block or more from the expressway. However, five apartment owners likewise located on minor streets reported value increases while four reported neither increases nor decreases in property values.

About one-third of the 64 owners of one-family dwellings were of the opinion that their property values had been increased. Exactly half of the owners believed that property values were unaffected or expressed that they were uncertain about effects. Only nine dwelling owners, 14 percent, reported that the expressway had brought a decline in values.

Six of the nine owners reporting damages were located on minor streets. Of the 23 other owners of dwellings located on minor streets, 10 credited the expressway with benefiting their holdings while 13 said that values had neither been enhanced nor damaged. These opinions regarding expressway impacts on one-family dwellings on minor streets were in keeping with the findings of the sales data analyses. These indicated that the facility had had little influence (but possibly slight adverse effects) on such properties.

Three owners among those who claimed expressway disbenefits were located adjoining but not fronting the expressway. In disagreement with these owners, six owners of one-family dwellings with the same type of location held that their holdings had been enhanced in value. Ten stated that their ownerships had not been affected. None of the property fronting the expressway was damaged according to interviews. Again, opinions and findings from sales data were in harmony as the balance of evidence in each case indicated that, as a group, residential property fronting or otherwise touching the expressway was benefited.

Sixty percent of the owners of one-family and apartment houses stated that the expressway had improved the attractiveness of their residences by slum clearance, better drainage and improved roads, the latter being old city streets improved as a part of the expressway program. Forty percent of the owners felt that the expressway had no effect on the attractiveness of their property.

The 70 renters interviewed were, of course, not asked whether they would be willing to sell the property; nor were they questioned regarding the influence of the expressway on property values and attractiveness. This latter omission was made because the "turn-over" of renters was relatively high and many having lived in the area for less than a year. In contrast, persons in the owner category were often referred to as the "old-timers." Their stability of residence and ownership provided a more meaningful knowledge of local property values and the economic effects of the expressway on the area.

The answers to questions relative to the use or nonuse of the expressway were consolidated for owners and nonowners because it was found that experiences were similar for both groups. The 187 responses related to expressway use were as follows:

Use of the Facility	Number of Responses
Use to and from Work	62
Use for Social Visitation	29
No automobile Used (Some Travel by Bus)	28
Use Only to Cross Town	24
Use Only for Out-of-City Trips	15
Use for Shopping	10
Don't Use	19

Separate tabulations were necessary for owners' and renters' responses pertaining to the advantages and disadvantages of the expressway. It was anticipated that the owner group would express more interest in this question and that their opinions likely would be more concentrated on land value considerations. The respondents answered in the predicted pattern. The 81 owners gave far more advantages and disadvantages than did the 70 renters.

The responses of the groups differed comparatively little in regard to advantages of the facility for transportation purposes. The most popular advantages were: "saves time"; "more convenient"; and "safer driving." However, the great majority of owners were long-time residents and proved to be more conscious of property values than were renters. Consequently, they scored much higher in such items of advantage as: slum clearance, attractive lighting and security, cooler breeze and improved drainage.

The owner group also gave proportionately more disadvantages of the expressway than the renter group. The renter group had a much more favorable (or less unfavorable) impression of the expressway in that almost half, 34 out of 70, did not state disadvantages, while only 30 percent of the owners failed to give at least one disadvantage. A listing of the responses is as follows:

ADVANTAGES

	Number of Responses 81 Owners	70 Renters
Saves Travel Time and Automobile Expense	48	39
More Convenient	28	19
Slum Houses and Unwholesome Surroundings Removed	28	3
Lights are Attractive, Prevent Prowlers and Give Pedestrians Security	17	5
More Circulation of Breeze, Cooler	17	3
Relieves Traffic on Major Thoroughfares	11	4
Safer Driving	4	4
Improved Drainage	8	0
Made City Modern	6	0
More Visitation and Facility is Entertaining	4	1
Depressed Areas Reduce Traffic Noise	3	0
Wartime and Disaster Evacuation	2	0
No Advantage Stated	7	4
TOTALS	183	82

DISADVANTAGES

	81 Owners	70 Renters
Noise	22	11
Poor Traffic Control (No Minimum Speed, Inadequate Signs, Traffic Blocks)	23	9
Too Many Accidents	16	8
Poor Design (Narrow, Walls Obstruct View on Curves, Insufficient Frontage Roads, Sharp Ramps, Poor Drainage in Depressed Areas)	24	3
Difficult to Give Directions (Streets Cut, Too Few Exits)	6	1
Dead-End Streets	6	1
One-Way Streets	4	2
Traffic Congestion on Frontage Roads	4	2
Damaged Landscaping	5	0
Trucks Cause House Vibrations	1	2
No Disadvantage Stated	24	34
TOTALS	135	73

METHODS OF STUDY

The objectives used to guide the San Antonio expressway study were as follows: (1) to determine expressway effects on the value of adjacent lands; (2) to determine changes in land use attributable to the new facility; and (3) to determine the advantages and disadvantages for business and residence locations near the facility. Implicit in these objectives was the further aim to ascertain how various types of property were affected by the expressway.

The purpose for conducting the research in San Antonio was twofold. First, San Antonio was somewhat different from Dallas and Houston where expressway studies had been completed previously. The city had experienced a continuing growth in population for many years and yet was comparatively low in basic industry, in per capita income and in many elements associated with economic potential. A second reason for studying expressway effects in San Antonio involved expressway design. The city's completed expressway sections, unlike Dallas' Central Expressway and Houston's Gulf Freeway, did not have continuous frontage roads.

Determination of Influence Areas

Expressway sections of U. S. 81 and U. S. 87 having been chosen for study, the next consideration was to delineate the areas presumed to have been influenced by the new highway improvements. Aid in this task was solicited from realtors, officials in several city departments and personnel of the Texas Highway Department. To supplement and verify the information obtained, areas within three to four blocks of the expressways were inspected from automobile and on foot, and a number of interviews were conducted with residents and businessmen. The study area outlined was a band of properties generally two blocks in width on either side of the expressway sections, which totaled 3.7 miles in length. An additional group of properties beyond the two-block band was chosen for study, this group being properties

abutting major thoroughfares for a distance of four blocks from the expressway. These properties were added to the influence area in accord with suggestions (by persons who advised on the selection of the original influence area) that, in the absence of continuous frontage roads, expressway impacts might well extend more than two blocks along major thoroughfares.

The "Before" and "After" Approach

At this stage of the project, much deliberation had been given to techniques for accomplishing the study's objectives. The approach decided upon was to compare price histories of land near the expressway and of land in other parts of San Antonio. This, of course, constitutes the oft-used "before-and-after" approach with control areas to allow the determination of changes attributable to the expressway. Findings obtained in this manner would then be supplemented by information obtained by interviews and observations in the influence area.

Other approaches that might also have accomplished the objectives included multiple regression analysis in which simultaneous solutions would have been used to evaluate the expressway's influence with other influences held constant. The limitation of properly identifying and quantifying other variables and attributes appeared, however, to be insurmountable on a practicable basis. Control of a great many variables and attributes, on the other hand, could be accomplished more simply if truly comparable control areas could be found. To aid in this step, careful consideration of the characteristics of land in the study areas was required, of course.

Finally, five control areas were chosen, special attention being given to the following factors in study areas: (1) land use and types of development, (2) zoning, (3) nationality groups, (4) types of street, (5) distance to the central business district, and (6) other accessibility and transportation facilities. Again, aid in the selection of control areas was obtained from realtors, appraisers, persons in the city's tax and planning departments, and personnel in the Texas Highway Department's San Antonio offices. For almost every comparison made in this report, control areas appeared to be highly comparable to study (influence) areas. This ascertion is supported by prices in study and control areas as shown in Tables 12 through 21. In cases where faulty controls may have occurred due notation is given in the text.

The Time Periods Used

Although initial construction of the expressway sections was not started until June, 1947, planning for the improvement and right-of-way acquisition had begun a year earlier. Accordingly, the "before" period chosen for the study was 1941-45. The first section of 2.1 miles was opened for traffic in November, 1950; thus 1952-56 was designated as the "after" period. The periods each covered five years to assure an adequate number of sales. Another 1.6 miles of expressway was started in 1950 and completed in 1954. Since this section was closely associated with the initial section in purpose and function, it could best be studied in the same 1941-45 to 1952-56 framework rather than through altered time periods.

Calculations of the Expressway's Influence

There were a number of methods that might have been used to analyze sales data from study and control areas to obtain measurements of expressway influences. In the San Antonio study only two methods were calculated. These methods were designated Method I, which is actual sales prices, and Method II, the purpose of which was to remove the value of improvements from real estate prices. Under each of these methods, prices were reduced to a per-square-foot basis, averages being obtained by dividing total prices paid by the total area that sold.

Three measurements of net expressway influence were derived from the data of each method, these being an absolute dollar influence per square foot and two indexes showing influence in percentages. The absolute or dollar influence is equal to the algebraic difference between the dollar change in prices in study and control areas. Index (1) is the absolute or dollar influence of the expressway stated as a percentage of 1941-45 study area prices. This index assumes that, in the absence of the expressway's influence, prices of land in the study and control areas would have changed by the same dollar amount. Index (2) is the algebraic difference between percentage changes in prices and is based on the assumption that prices in study and control areas would have experienced the same percentage change if the expressway had not been constructed.

In cases where average selling prices in study and control areas were the same in the base period, the indexes yielded identical results. Since this degree of similarity of base period prices seldom prevailed, both measures were calculated for this report. The quality of one index versus the other is a matter of conjecture. For convenience of interpretations, the indexes may be considered as the limits of a range of influence.

Numerous variables and attributes of properties were studied even to the point of calculations. Except for three major factors, however, results were not generally worthy of detailed attention in this report. Inadequacy of data associated with other factors was generally due to the small numbers of sales in particular categories and to insufficient detail on the factors themselves.

The three property attributes on which attention was concentrated were land use, zoning and type-of-street location. One-family dwellings, apartments, retail and commercial, manufacturing and unimproved were the land-use categories selected for initial comparisons. In other analysis, combinations were made to yield residential, non-residential and unimproved as land-use types. Numbers of sales usually dictated the combining of similar land-use types. Except for unimproved land, of course, zoning classifications generally paralleled the land-use categories.

Type-of-street locations necessarily required special categorizing to recognize locations on the expressway. The types decided upon were defined as follows:

1. Expressway, Fronting — locations fronting on access ramps and roads which are contiguous with the expressway right-of-way.
2. Expressway, Not Fronting—locations touching the expressway right-of-way but not "fronting" by the previous definition.
3. Expressway, Abutting—all properties adjoining the expressway right-of-way including "fronting" and "touching" locations.
4. Main Thoroughfare, Not at Expressway—locations on main thoroughfares and not abutting the expressway. (Thirteen main thoroughfares were designated in study areas and 15 in control areas.)
5. Not Main Thoroughfare, Not Expressway—locations on minor streets not at main thoroughfares, nor the expressway.

Referring again to Method II, which corrected sales prices for the value of improvements, the following considerations are important. The accuracy of this scheme depends upon the quality of the tax data that was available and the degree to which the 20-city construction cost factors used represented cost movements in San Antonio. In regard to tax data, valuations for the city as a whole undoubtedly were poor in uniformity and comparability. This was especially true for land valuations. Valuations of improvements were of somewhat higher quality, the chief weakness of these being lags in the acknowledgment of depreciation and

obsolescence. Comparisons of valuations of improvements in study and control areas did not reveal, however, differences such as would constitute a bias for either area. In other words, study and control areas had been treated similarly tax-wise.

The construction cost factors employed in Method II were derived from Boeckh's 20-city average. A complete set of construction cost factors relative to San Antonio was not obtained. However, the 1941 and 1956 averages were obtained for San Antonio and indicated that through the full period of 1941-56 the city's trend in construction costs was very close to the 20-city series. The 20-city average increased by 138 percent from 1941 to 1956, comparable figures for San Antonio reflecting a 131 percent increase. The factors used in Method II are as follows:

Year	Construction Cost Factor	Year	Construction Cost Factor
1941	1.059	1952	2.264
1942	1.115	1953	2.328
1943	1.161	1954	2.337
1944	1.247	1955	2.411
1945	1.329	1956	2.527

Computations from the sales data obtained in the individual study and control areas are shown in Table II. Sales along U. S. 87 and U. S. 81 sections later were combined and all data were processed together as one study area. The five different control areas that were selected to represent various study area segments were also combined and subsequent calculations for control purposes disregarded geographic locations. As may be seen in Table II, values of property along U. S. 81 were higher than along U. S. 87 in both periods. These differences reflect actual conditions for, generally speaking, properties in the U. S. 81 area were of higher quality within use classes. It should be noted that the increases in values were highly comparable along both of the sections.

Attention is called to the difference between the volume of sales in the 1941-45 and 1952-56 periods. In both the study and control areas, more sales occurred in the "before" period than during the "after" period. The large number of sales in 1941-45 reflected the effects of World War II operations on military centers such as San Antonio. Additional detailed information on sales is presented in Tables 12 through 21.

Inflation

In the main body of this report, none of the dollar value figures are treated for inflation. The decision not to deflate sales prices was based primarily on two considerations. Most important, it was felt that the majority of readers and users of the information would prefer undeflated figures. The fact that inflation was a factor in control as well as study areas conditioned this judgment. Of course, it is true that if prices in both study and control areas had been deflated, smaller indexes of influence would have generally resulted. The second reason that prices were not corrected for inflation was to avoid the introduction of extra series of measurements. For readers who might wish to treat certain of the data for inflation, the best applicable figures for San Antonio likely are contained in the Consumer Price Index for Houston, Texas. Data from this index as reported by the U. S. Bureau of Labor Statistics indicates that a dollar in 1941-45 would purchase 1.66 times as much in consumer goods as it would have in 1952-56. Tables 22, 23, and 24 in the Appendix present measurements of influence adjusted for changes in dollar value during the study period.

Sources of Data

Study and control areas were outlined on city zoning maps as the beginning step in obtaining sales data. The city blocks encompassed by the boundaries of the areas were then listed. Lot numbers were also listed for some blocks to assure that no properties that had been taken in total by right-of-way or other public acquisition would be included for study.

The next step was to use county plat book sales records to ascertain

properties that had sold during the study periods. This source of data was discovered to be unreliable. After some laborious investigation, it was found that records maintained by the Stewart Title and Guaranty Company were not only accurate but relatively easy to use. Arrangements were made with this Company to use its files without charge.

Information obtained from the Company's records included identification of properties that sold, dates of sales and price data. Some information of exact dimensions of parcels also was obtained. Of considerable importance, the files also yielded code numbers which allowed the quick location of warranty deeds in county records. These public records were then used to verify and supplement data already recorded and to allow the culling of sales that obviously were not bona fide in reflecting real estate values.

City block maps were then used to obtain the area of properties that sold. Land use and zoning information was obtained from maps of the city's Department of Planning and Zoning. Aerial photos obtained from the Texas Highway Department also were helpful for these purposes.

Tax valuations for use in Method II were recorded from city tax records. The construction cost index also used in Method II was derived from E. H. Boeckh's construction cost factors (20-city average) as published in the 1957 STATISTICAL SUPPLEMENT TO THE SURVEY OF CURRENT BUSINESS (U. S. Department of Commerce).

Other sources of information have been duly noted with the discussions of findings from each source and in the Bibliography.

Opinion Survey

Much of the methodology used in the survey of residents and business operators is discussed in a previous section which reports the findings of the survey. Several additional comments, however, are in order here.

Enumerators who conducted the survey were professional members of the project team. They were instructed to select respondents in a manner to assure a representation of various property types. More exactly, the following factors were considered in determining property strata (1) land use, categories of which were one-family dwellings, apartments, retail businesses and other businesses; (2) type-of-street location, including properties fronting the expressway, those otherwise adjoining the facility and properties on major thoroughfares as well as minor streets; and (3) the elevation of abutting and other nearby property in relation to the expressway grade, types of which were designated as elevated, depressed and on-grade.

The very large number of strata, 48 for abutting properties, and the lack of prior knowledge of the population spelled difficulty in developing a systematic sampling procedure. A further complication was the desire to limit the total number of questionnaires to about 200 (approximately 10 percent of the number of properties in the study area), due to time considerations.

Finally, it was decided that about 50 percent of the businesses should be sampled. This was accomplished with careful consideration given to obtaining a representative cross-section with the above-named factors as guides. For residential properties, at least one interview but no more than three was conducted in each city block having land in this use. Even this instruction proved difficult, as in some blocks several calls were made before an interview was obtained. The obstacles were primarily the absence of adults and the language barrier with some Spanish-speaking residents. No more than one interview, of course, was conducted for any apartment building.

No attempt was made to contact absentee owners, nor were any recalls made. Despite the fact that interviews were obtained in the evenings, as well as during the day, a large

proportion of women respondents occurred among residents Checks for biases attributable to this factor revealed only that a relatively larger number of women were uncertain about expressway effects.

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APPENDIX OF SUPPLEMENTARY TABLES

TABLE 12—PRICES OF PROPERTY IN STUDY AND CONTROL AREAS (BASED ON ALL SALES) WITH PRICES IN CONTROL AREAS ADJUSTED ACCORDING TO DISTRIBUTION OF SALES IN STUDY AREAS BY ZONING DISTRICTS, BY LAND USES AND BY TYPE-OF-STREET LOCATION[1]

	METHOD I					METHOD II				
	Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56		Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	
	1941-45	1952-56		Base= 1941-45	Base= 1952-56	1941-45	1952-56		Base= 1941-45	Base= 1952-56
Study Area Prices[2]	$0.502	$1.327	$0.825	164%	62%	$0.275	$0.826	$0.551	200%	67%
Control Area Prices, Not Adjusted for Distribution of Sales in Study Areas[3]	0.588	1.101	0.513	87	46	0.291	0.488	0.197	67	41
Control Area Prices, Adjusted for Distribution of Sales among Land Uses in Study Areas	0.799	1.096	0.297	37	27	0.375	0.541	0.166	31	31
Control Area Prices, Adjusted for Distribution of Sales among Zoning Districts in Study Areas	0.625	1.124	0.499	80	44	0.328	0.566	0.238	73	42
Control Area Prices, Adjusted for Distribution of Sales among Type-of-Street Locations in Study Areas	0.591	1.090	0.499	84	46	0.295	0.524	0.229	78	44

[1]The adjustment of control area prices was accomplished by weighting the average price of a particular type of property in control areas by the area of such type property selling in study areas. For example, 41 percent of the land that sold in study areas in 1941-45 was being used for one-family dwellings; thus the price of such land that sold in 1941-45 in control areas was given a weight of .41 in computing the total average price in control areas.

[2]Based on 653 sales in 1941-45 and 278 sales in 1952-56.

[3]Control Areas had 404 sales in 1941-45 and 224 sales in 1952-56.

TABLE 13—PRICES OF PROPERTY WITH VARIOUS TYPE-OF-STREET LOCATIONS

Location of Property	Number of Sales		METHOD I				METHOD II			
			Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Expressway, Fronting										
Study Areas	64	19	$0.378	$1.841	$1.463	387%	$0.236	$1.323	$1.087	460%
Control Areas	404	224	0.587	1.100	0.513	87	0.291	0.488	0.197	68
Expressway, Not Fronting										
Study Areas	68	31	0.377	1.575	1.198	318	0.191	0.893	0.702	367
Control Areas	404	224	0.587	1.100	0.513	87	0.291	0.488	0.197	68
Expressway, Fronting and Not Fronting										
Study Areas	132	50	0.377	1.663	1.286	341	0.212	1.036	0.824	389
Control Areas	404	224	0.587	1.100	0.513	87	0.291	0.488	0.197	68
Main Thoroughfare, Not at Expressway										
Study Areas	145	68	0.694	1.619	0.925	133	0.397	1.185	0.788	198
Control Areas	73	37	0.629	1.062	0.433	69	0.344	0.628	0.284	83
Not Main Toroughfare, Not Expressway										
Study Areas	376	160	0.492	1.016	0.524	106	0.260	0.518	0.258	99
Control Areas	331	187	0.576	1.109	0.533	93	0.276	0.457	0.181	66

TABLE 14—PRICES OF PROPERTY IN VARIOUS USES

Land Use	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
One-Family Dwellings										
Study Areas	347	125	$0.532	$0.896	$0.364	68%	$0.295	$0.468	$0.173	59%
Control Areas	267	160	0.624	1.165	0.541	86	0.296	0.463	0.167	57
Apartments										
Study Areas	130	63	0.644	1.551	0.907	141	0.307	0.844	0.537	175
Control Areas	41	27	0.823	1.392	0.569	69	0.346	0.575	0.229	66
Nonresidential[1]										
Study Areas	114	66	0.589	1.813	1.224	208	0.277	1.241	0.964	348
Control Areas	18	12	1.366	1.210	- 0.156	- 11	0.659	0.763	0.104	16
Unimproved										
Study Areas	62	24	0.167	0.821	0.654	393	0.167	0.821	0.654	393
Control Areas	78	25	0.151	0.276	0.125	83	0.151	0.276	0.125	83

[1]Local retail, commercial and manufacturing.

TABLE 15—PRICES OF PROPERTY IN VARIOUS ZONING DISTRICTS

	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
One-Family Dwellings										
Study Areas	132	58	$0.528	$1.040	$0.512	97%	$0.253	$0.434	$0.181	72%
Control Areas	191	126	0.486	1.006	0.520	107	0.228	0.403	0.175	77
Apartments										
Study Areas	122	62	0.633	1.373	0.740	117	0.304	0.873	0.569	187
Control Areas	127	54	0.669	1.311	0.642	96	0.322	0.561	0.239	74
Local Retail and Commercial										
Study Areas	298	112	0.637	1.797	1.160	182	0.362	1.182	0.820	227
Control Areas	68	27	0.674	1.290	0.616	91	0.374	0.734	0.360	96
Manufacturing										
Study Areas	101	46	0.201	0.667	0.466	232	0.136	0.433	0.297	218
Control Areas	18	17	0.612	0.760	0.148	24	0.324	0.387	0.063	19

TABLE 16—PRICES OF PROPERTY IN VARIOUS USES AND ZONING CLASSES

Use and Zoning	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
One-Family Dwellings										
Residential Zoning										
Study Areas	165	71	$0.588	$1.053	$0.465	95%	$0.283	$0.471	$0.188	66%
Control Areas	228	136	0.633	1.189	0.556	88	0.293	0.466	0.173	59
Nonresidential Zoning										
Study Areas	182	54	0.480	0.732	0.252	52	0.305	0.466	0.161	53
Control Areas	39	24	0.574	1.011	0.437	76	0.310	0.449	0.139	45
Apartments										
Apartment Zoning										
Study Areas	67	39	0.732	1.535	0.803	110	0.325	0.801	0.476	146
Control Areas	36	22	0.872	1.409	0.537	62	0.368	0.577	0.209	57
Nonresidential Zoning										
Study Areas	63	24	0.554	1.582	1.028	186	0.421	0.943	0.522	124
Control Areas	5	5	0.520	1.316	0.796	153	0.215	0.569	0.354	165
Nonresidential Use and Zoning										
Study Areas	114	66	0.530	1.935	1.405	265	0.277	1.241	0.964	348
Control Areas	18	12	1.366	1.210	- 0.156	- 11	0.659	0.763	0.104	16
Unimproved Land										
Residential Zoning										
Study Areas	22	10	0.116	1.171	1.055	909	0.116	1.171	1.055	909
Control Areas	54	22	0.115	0.254	0.139	121	0.115	0.254	0.139	121
Nonresidential										
Study Areas	40	14	0.184	0.608	0.424	230	0.184	0.608	0.424	230
Control Areas	24	3	0.233	0.365	0.132	57	0.233	0.365	0.132	57

TABLE 17—PRICES OF PROPERTY IN RESIDENTIAL USE (ONE-FAMILY DWELLINGS AND APARTMENTS) BY TYPE-OF-STREET LOCATION

Location of Property	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Expressway, Fronting										
Study Areas	34	14	$0.510	$1.584	$1.074	211%	$0.356	$0.968	$0.612	172%
Control Areas	308	187	0.658	1.208	0.550	83	0.304	0.485	0.181	60
Expressway, Not Fronting										
Study Areas	48	15	0.449	1.121	0.672	150	0.248	0.560	0.312	126
Control Areas	308	187	0.658	1.208	0.550	83	0.304	0.485	0.181	60
Expressway, Fronting And Not Fronting										
Study Areas	82	29	0.474	1.341	0.867	183	0.290	0.753	0.463	160
Control Areas	308	187	0.658	1.208	0.550	83	0.304	0.485	0.181	60
Main Thoroughfare, Not At Expressway										
Study Areas	101	36	0.591	1.336	0.745	126	0.326	0.827	0.501	154
Control Areas	40	28	0.539	1.010	0.471	87	0.288	0.437	0.149	52
Not Main Thoroughfare, Not Expressway										
Study Areas	294	123	0.588	0.979	0.391	66	0.290	0.475	0.185	64
Control Areas	268	159	0.679	1.245	0.566	83	0.308	0.493	0.185	60

TABLE 18—PRICES OF PROPERTY IN NONRESIDENTIAL USE (LOCAL RETAIL COMMERCIAL AND MANUFACTURING) BY TYPE-OF-STREET LOCATION

Location of Property	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Expressway, Fronting										
Study Areas	21	4	$0.344	$2.892	$2.548	741%	$0.162	$2.059	$1.897	1171%
Control Areas	18	12	1.366	1.210	- 0.156	- 11	0.659	0.763	0.104	16
Expressway, Not Fronting										
Study Areas	10	11	0.612	2.358	1.746	285	0.225	1.307	1.082	481
Control Areas	18	12	1.366	1.210	0.156	11	0.659	0.763	0.104	16
Expressway, Fronting And Not Fronting										
Study Areas	31	15	0.444	2.449	2.005	452	0.186	1.434	1.248	671
Control Areas	18	12	1.366	1.210	- 0.156	- 11	0.659	0.763	0.104	16
Main Thoroughfare, Not At Expressway										
Study Areas	34	24	0.048	2.110	1.162	123	0.517	1.578	1.061	205
Control Areas	13	5	1.803	1.440	- 0.363	- 20	0.858	1.219	0.361	42
Not Main Thoroughfare, Not Expressway										
Study Areas	49	27	0.410	1.359	0.949	231	0.233	0.704	0.471	202
Control Areas	5	7	0.456	0.999	0.543	119	0.244	0.345	0.101	41

TABLE 19—PRICES OF UNIMPROVED LAND BY TYPE-OF-STREET LOCATION

Location of Property	Number of Sales		Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56		
Expressway, Abutting[1]						
Study Areas	19	6	$0.095	$0.849	$0.754	793%
Control Areas	78	25	0.151	0.276	0.125	83
Main Thoroughfare, Not at Expressway						
Study Areas	10	8	0.595	1.049	0.454	76
Control Areas	20	4	0.167	0.320	0.153	92
Not Main Toroughfare, Not Expressway						
Study Areas	33	10	0.156	0.398	0.242	156
Control Areas	58	21	0.144	0.270	0.126	88

[1]"Abutting" classification includes location fronting and otherwise touching Expressway right of way.

TABLE 20—PRICES OF PROPERTY ZONED RESIDENTIAL (ONE-FAMILY DWELLINGS AND APARTMENTS) BY TYPE-OF-STREET LOCATION

Locaation of Property[1]	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Expressway, Fronting										
Study Areas	11	5	$0.627	$1.782	$1.155	184%	$0.454	$1.356	$0.902	199%
Control Areas	318	180	0.565	1.112	0.547	97	0.269	0.458	0.189	70
Expressway, Not Fronting										
Study Areas	23	12	0.467	1.029	0.562	120	0.214	0.570	0.356	166
Control Areas	318	180	0.565	1.112	0.547	97	0.269	0.458	0.189	70
Expressway, Fronting And Not Fronting										
Study Areas	34	17	0.517	1.376	0.859	166	0.289	0.933	0.644	223
Control Areas	318	180	0.565	1.112	0.547	97	0.269	0.458	0.189	70
Main Thoroughfare, Not At Expressway										
Study Areas	56	24	0.576	1.393	0.817	142	0.296	0.910	0.614	207
Control Areas	25	15	0.351	1.065	0.714	203	0.186	0.418	0.232	125
Not Main Thoroughfare, Not Expressway										
Study Areas	164	79	0.594	1.103	0.509	86	0.266	0.497	0.231	87
Control Areas	293	165	0.593	1.116	0.523	88	0.280	0.462	0.182	65

[1]For study area properties located on Expressway, all sales in residential zoning districts in control areas are used for control.

TABLE 21 PRICES OF PROPERTY ZONED NONRESIDENTIAL (LOCAL RETAIL, COMMERCIAL AND MANUFACTURING) BY TYPE-OF-STREET LOCATION

Location of Property	Number of Sales		METHOD I Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56	METHOD II Price Per Square Foot		Increase Per Square Foot 1941-45 to 1952-56	Percent Increase 1941-45 to 1952-56
	1941-45	1952-56	1941-45	1952-56			1941-45	1952-56		
Expressway, Fronting										
Study Areas	53	14	$0.341	$1.900	$1.559	457%	$0.204	$1.291	$1.087	533%
Control Areas	86	44	0.660	1.063	0.403	61	0.363	0.586	0.223	61
Expressway, Not Fronting										
Study Areas	45	19	0.348	1.798	1.450	417	0.184	1.026	0.842	458
Control Areas	86	44	0.660	1.063	0.403	61	0.363	0.586	0.223	61
Expressway, Fronting And Not Fronting										
Study Areas	98	33	0.344	1.824	1.480	430	0.194	1.094	0.900	464
Control Areas	86	44	0.660	1.063	0.403	61	0.363	0.586	0.223	61
Main Thoroughfare, Not At Expressway										
Study Areas	89	44	0.761	1.705	0.944	124	0.455	1.291	0.836	184
Control Areas	48	22	0.814	1.060	0.246	30	0.448	0.730	0.282	64
Not Main Thoroughfare, Not Expressway										
Study Areas	212	81	0.435	0.957	0.522	120	0.256	0.532	0.276	108
Control Areas	38	22	0.459	1.067	0.608	132	0.252	0.426	0.174	69

TABLE 22—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE WITH VARIOUS TYPE-OF-STREET LOCATIONS

DATA ADJUSTED FOR CHANGE IN VALUE OF THE DOLLAR[1]

Location of Property	METHOD I Influence Per Square Foot	Index (1)	Index (2)	METHOD II Influence Per Square Foot	Index (1)	Index (2)
All Locations	$0.187	37%	46%	$0.212	77%	80%
Expressway, Fronting	0.570	151	180	0.534	226	235
Expressway, Not Fronting	0.411	109	139	0.303	158	179
Expressway, Abutting	0.464	125	152	0.376	177	193
Main Thoroughfare, Not At Expressway	0.295	43	38	0.302	76	69
Not Main Thoroughfare, Not Expressway	– 0.005	– 1	8	0.046	18	20

[1]The factor used to adjust data for change in the value of the dollar was derived from the Consumer Price Index for Houston, Texas.

TABLE 23—INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN VARIOUS USES
DATA ADJUSTED FOR CHANGE IN VALUE OF THE DOLLAR

Land Use	METHOD I			METHOD II		
	Influence Per Square Foot	Index (1)	Index (2)	Influence Per Square Foot	Index (1)	Index (2)
One-Family Dwelling	– $0.106	– 20%	– 11%	$0.004	1%	1%
Apartments	0.263	31	43	0.185	60	65
Nonresidential	0.828	141	131	0.516	168	199
Unimproved	0.317	190	186	0.317	190	186

TABLE 24 INFLUENCE OF THE EXPRESSWAY ON PRICES OF REAL ESTATE IN VARIOUS ZONING DISTRICTS

DATA ADJUSTED FOR CHANGE IN VALUE OF THE DOLLAR

Zoning	METHOD I			METHOD II		
	Influence Per Square Foot	Index (1)	Index (2)	Influence Per Square Foot	Index (1)	Index (2)
One-Family Dwellings	– $0.005	– 1%	– 6%	$0.004	1%	3%
Apartments	0.059	10	13	0.198	65	68
Retail and Commercial	0.326	51	55	0.276	76	79
Manufacturing	0.191	95	125	0.140	103	119

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*No. 2. A Comprehensive Study of Factors Influencing the Load Carrying Capacities of Drilled and Cast-in-place Concrete Piles. Part One. Lawrence A. DuBose. July 1956.

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