APPENDIX I
Exhibit 3

VARIABLES IN RURAL PLANT LOCATION: A CASE STUDY OF SEALY, TEXAS

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NOTICE

PREFACE

This is the twenty-first in a series of research memos describing activities and findings as part of the work accomplished under the research project entitled Transportation to Fullfil Human Needs in the Rural/Urban Environment." The project is divided into five topics; this memorandum is a description of part of the on-going research conducted under the topic, "The Influence on the Rural Environment of Inter-Urban Transportation Systems."

This represents the first phase of an effort to define the most important factors determining individual location in rural areas, especially those factors related to transportation. Based on a review of location theory and a case study of four industries in one rural community, this study lays the foundation for an expanded effort to examine locational factors on a regional basis.

ACKNOWLEDGEMENTS

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INTRODUCTION

It has been the general tendency in the last few decades for small rural towns in the United States to experience a falling population rate and, in many areas, an absolute decline in population, while large and intermediate cities have been successful in attracting industry and displaced rural "migrants." While this is generally true, there have been exceptions. The goals of this study are to examine several industries which chose to locate their plants in one rural town and, within the framework of general location theory, to study those factors which made the rural town an expedient choice of plant location.

Of particular importance is the role that transportation has played and can play in the encouragement of industrial location in rural areas. The enormous investment in transportation facilities, such as the Interstate Highway System, has been in part justified by benefits to small communities. An understanding of the actual influence transportation has exerted on plant location is needed in order not only to clarify the question of how beneficial past investment has been, but also to help determine future priorities in transportation planning.

This memorandum reports on a first step in a general study undertaken to examine plant location factors within a regional context. The case study itself is intended to serve in the formulation of a hypothesis for more general testing.

The case study is divided into three sections. The first section describes relevant location theory dealing with the manufacturing sector and plant location and reviews some previous case study approaches to evaluating plant location in rural areas. The second section will give a general background of Sealy, Texas, the site of the case study.

The third section will be comprised of particular studies of four industries which located in Sealy in 1960 and 1970. Each of these industries will be studied in light of the following factors:

(1) Location of raw materials

(2) Labor supply, wages, skills

(3) Sites available

(4) Tax structure

(5) Transportation facilities, transportation costs

(6) Market (time, distance)

(7) Services (water, power . . .)

(8) Other amenities (housing, etc.)

(9) Capital

Furthermore, an attempt was made to contact each industry in order to determine other (personal) factors involved in site location. To this end a survey was developed and sent to the industries in the case study community (see Appendix for example of the survey).[1]

[1]The survey is based on a combination of two design approaches. The first was developed by Melvin Greenhut in his study of manufacturing concerns (see Plant Location in Theory and Practice, Chapel Hill: University of North Carolina Press, 1956) and the second was developed by Sarah C. Orr and J. B. Cullingworth (see Regional and Urban Studies, Beverly Hills, California: Sage Publications, 1969).

SECTION I

A REVIEW OF SOME FACTORS OF INDUSTRIAL LOCATION

The investigation of economic activity in a spatial context has produced seemingly as many models as individual economic activities themselves. Despite the variety of approaches, they all tend to espouse the theoretical framework of traditional economic theory and, until recently, build upon the first approaches presented by J. Von Thünen and Alfred Weber.[1] The goal herein is is not to present the body of location theory, but rather to define and explain some of the factors which are common to traditional models and are incorporated in this report in analyzing locations of the case study plants.

One factor of particular importance in examining the location advantages of various sites is the effect of agglomeration. Agglomeration effects are those forces which reduce costs of production and/or increase market outlets due to proximity to other industries and/or the market. These advantages accrue to a given industry when, for example, it locates near an auxiliary industry from which it purchases a service. The sharing of that service among many industries tends to reduce its cost.

There are institutional agglomerative advantages as well. The availability of capital in urban centers, tax adjustments and low interest rates are inducements of an agglomeration. Greenhut suggests that "these agglomerating advantages are the governing factors in location whenever transportation and labor differentials at alternative sites are relatively slight."[2] Hansen criticizes traditional location theory for not illuminating sufficiently the extent of the impact of agglomeration:

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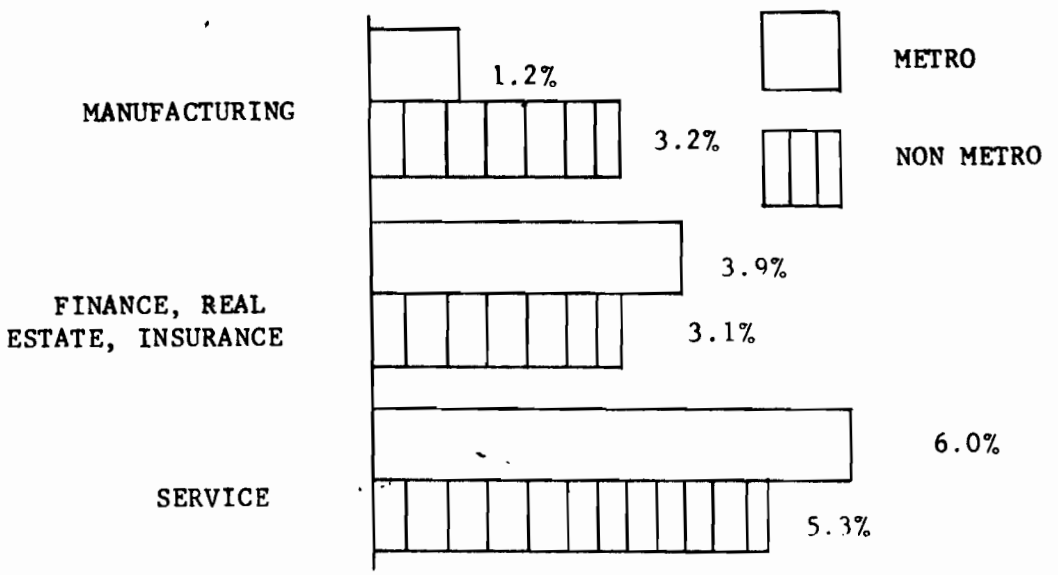
[1] See Peter Geoffrey Hall,ed., Van Thünen's Isolated State (Oxford, New York: Pergamon Press, 1966); and Alfred Weber, Theory of the Location of Industries (Chicago, Illinois: The University of Chicago Press, 1929). For an overview of their impact on location theory see Peter Dicken and Peter E. Lloyd, Location in Space: A Theoretical Approach to Economic Geography (New York, New York: Harper and Row, 1972).

[2] Melvin L. Greenhut, Plant Location in Theory and in Practice (Chapel Hill, University of North Carolina Press, 1956), p. 11.

It should be emphasized that the advantages of larger urban areas cannot be simply explained by the traditional economic base approach because it really never came to grips with the dynamics of the process by which an area amasses overhead capital and by which it acquires new export bases. Similarly, classical location theory, including central place theory, relied too heavily on static analyses . . .[3]

However, this appears to be only one side of a complicated coin, for not all industries are found in large agglomerations. Variability in labor costs and resource location are two "deglomerative" factors, and recent data suggest that urban agglomerations are, in essence, attracting industry at a rate that is slowing relative to rural areas. Rural and partly rural counties, with only a tenth of the manufacturing jobs in 1960, accounted for about a fifth of the gain in manufacturing workers in the 1960-70 decade (see Figure 1 below).[4]

FIGURE 1. EMPLOYMENT GAINS FOR SOME INDUSTRY GROUPS 60-70



[3]Niles M. Hansen, The Future of Nonmetropolitan America (Lexington, Massachusetts: Lexington Books, 1973).

[4]The Economic and Social Condition of Rural America in the 1970's, prepared by the U. S. Department of Agriculture for the Committee on Government Operations (U. S. Senate), 1971, p. 55. For S.I.C. breakdowns, see 1970 Census Supplementary Report, Industry of Employed Persons for the U. S., 1970.

The trend to decentralization from the central city may have its roots in a combination of 2 hypotheses as stated by Orr:

> " . . . first, that changes in communications, in the methods of costs of transport, and in production technology have freed plants from the necessity to take advantage of central locations. Consequently, alternative locations may become suitable for production but markedly less expensive in terms of initial capital investment for site preparation, land costs or rent, and perhaps recurring overhead costs such as local taxes and insurance."
>
> "Another explanation is that manufacturers wishing to redevelop would still prefer to take advantage of centrality benefits but find that the costs of redevelopment there are greater than in the urban fringe . . ."[5]

The effects may impact certain industrial typologies more rapidly than others. Industry size, dependence upon materials, labor, etc., may dictate a loosening of locational constraints. A further question is the extent to which constraints are loosened--are purely rural areas becoming a more attractive location for industry vis a vis the suburbs? Despite aggregative data which show a tendency for the decentralization of industry from the central city, there has been little analysis of industrial types most sensitive to locational shifts.[6] Of special interest in this study are (1) whether the location preferences of industry are fairly static and predictive as regards the industries in the case study and (2) to what extent transportation in particular has influenced location preferences vis a vis urban and rural choices.

The factors to be studied are generally derived from Greenhut's analysis of certain industrial plants in Alabama.[7]

Greenhut classifies two general theoretical approaches in location theory and uses a synthesis of factors of the two in his evaluation. The first approach is that of "least-cost" location, which has attempted to

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[5] See Sarah C. Orr and J. B. Cullingworth, Regional and Urban Studies (Beverly Hills, California: Sage Publications, 1969). p. 250.

[6] For preliminary view of plant size and characteristics see P. S. Florence, Economics and Sociology of Industry, 1969.

[7] Greenhut, op. cit.

evaluate industrial location in terms of the rational choice of the locator to minimize the costs of transportation, labor, production, etc., while generally assuming a homogeneous market. This approach was advanced by Launhardt and popularized by Weber in the early 1900's and is incorporated in most studies of industrial location even now. The least-cost approach, while a valuable starting point, has been criticized as a model based on its unreal assumptions about the importance of optimum production, market variability and transportation costs.

The second general theoretical approach to location noted by Greenhut (also described by Ian Hamilton) is that of locational interdependence which has emphasized the size, shape and variability of the market as an influence on location. This approach includes consideration of pricing policies, differential transportation rates, distribution of consumers, etc., as critical criteria in establishing a market area within which each concern is essentially a "spatial monopolist."[8] The importance of the market-demand approach is that it essentially expands the number of considerations which dictate a maximum profit location (not simply costs). Other approaches have tried to define location problems within the context of production theory (see Leon Moses, Urban Economics), as allocation problems (see Dorfman, Linear Programming for Economic Analysis), or as subjects of gaming techniques (see Chorley and Haggart, Models in Economic Geography).

Greenhut suggests a synthesis of some of the factors of both approaches in his survey of industries in Alabama which fall into three broad categories: demand factors, cost factors, and personal factors. The factors utilized in this report are outlined below.[9]

TABLE 1. Factors for Analysis of Plant Location Choice

Demand	Cost	Personal (by survey)
1. Demand curve for product	1. Tax on land	1. Contacts
2. Size of market	2. Availability of capital	2. Other preferences
3. Proximity to market	3. Power availability	
	4. Transportation costs, facilities	
	5. Labor	

[8] Ibid., p. 74.

[9] Ibid., pp. 279-280.

SECTION II

THE CASE STUDY COMMUNITY

Sealy, the site of the case study, is a small town approximately 50 miles from Houston, Texas, and has a current population of about 3000. It is considered here as a rural town, even though the U. S. Census of 1970 has given up that classification;[1] its place in the hierarchy of the region, as mapped by Huff and DeAre, scores the sphere of interaction between Sealy and Houston as tertiary (the 3rd of 4 decreasing levels).[2]

Sealy and Austin County have grown fairly rapidly in the last decade. The recent growth of Austin County in general is reflected by the fact that of all housing in the county in 1973, between 15% - 29.9% was built between 1960 and 1970.[3] In terms of population, Sealy grew by about 16% between 1960 and 1970.[4] This growth is fairly rapid compared to many Nonmetropolitan Incorporated Areas (NMI's) in Texas in general. Although between 1950 and 1970 NMI's declined from 18% to 16% of Texas' total population, their absolute population has increased by over 400,000.[5] Those NMI's closer to urban centers have shown a greater potential for growth due to " . . . an economic link to that center . . . as a place of residence . . . or its attractiveness to activities away from the larger center . . ."[6] There are indications that Sealy has benefitted from its proximity to Houston in the three categories above.

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[1]According to the 1970 U.S. Census the rural population lives in towns of fewer than 2500 inhabitants; over 2500, they are considered urban population.

[2]See David L. Huff and Diana R. DeAre, Principal Interaction Fields of Texas Metropolitan Centers, Bureau of Business Research, University of Texas, 1974.

[3]Texas Business Review, January 1973, pp. 17.

[4]Texas Industrial Commission, Site Selection Report Number 3, Sealy, 1973.

[5]Diane DeAre and Dudley L. Poston, Jr., "Growth of Nonmetropolitan Incorporated Places in Texas 1960-1970," Texas Business Review, January 1973, pp. 17.

[6]Ibid, pp 18.

In addition, Sealy has been impacted by the construction of a major highway. The town is located on Interstate 10, which was completed in 1968. The planning and construction of the highway paralleled the development of a community interest in attracting industry to the town, which hitherto had been an agricultural service-oriented town with three small manufacturing concerns.[7] In September of 1956 the Sealy Chamber of Commerce conducted a survey of the town to gather information on the available sites for the possible location of new industry.[8] In 1957 a credit association was formed by retail merchants to provide assistance to beginning or expanding businesses, and the first booklet touting the advantages of Sealy as a choice industrial location and a nice-place-to-raise-the-kids was published. During this period, however, no industries were sufficiently impressed to locate in Sealy. With the completion of the highway, there came about a proliferation of organizations interested in influencing industries to locate in Sealy, including the Sealy Development Corporation, the Sealy Industrial Foundation and the Sealy Investment Club. The Chamber of Commerce continued to be active in the period following completion of the section of I-10 to Houston in 1968. In 1970, for example, a further survey was undertaken of the extant labor force and data were submitted to the Texas Industrial Commission (to become a part of the intra-site program). In addition, the town's business clubs set about operating a continuing program to beautify Sealy. However, as noted by Hunter, the community development efforts of the various social-economic groups had a minimal effect on attracting the industries which decided to locate in Sealy and "an overwhelming majority of Sealy's new industries settled there without any direct assistance from the community."[9]

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[7] See Directory of Texas Manufacturers (Bureau of Business Research, University of Texas at Austin, Austin, Texas, 1971), p. 320.

[8] Graham C. Hunter, Rural Communities and Inter-urban Transportation Systems: A Study of The Stages of Interaction, (Master's Thesis) U. T., 1974, pp. 41. Much of the history of Sealy is gleaned from this report.

[9] Ibid, pp. 88.

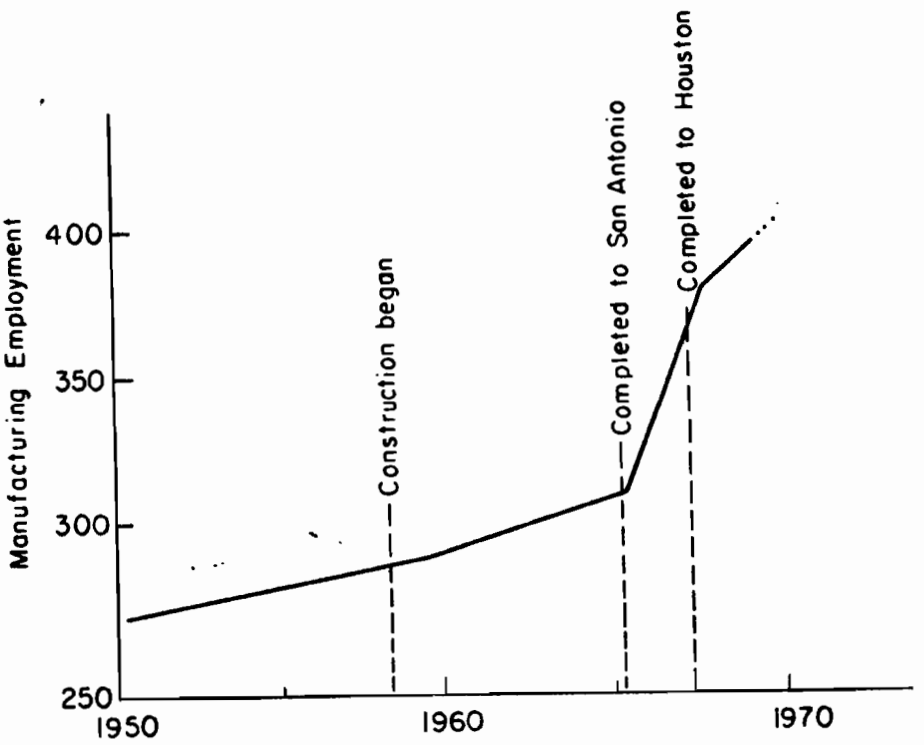
Just prior to and after the completion of I-10 the following industries located or expanded significantly their operations in Sealy:

TABLE 2. Industries Locating in Sealy Since 1966

Industry	Year	New/Moved Plant
Hollow Metal Specialties Corp.	1966	Moved from Houston
Schindler Brothers Steel	1967	New
Herlon Industries	1969	New
Imperial Farms	1969	New
Atlas Steel Culvert	1969	Moved from Conroe
Rendrang Steel Barge	1973	New

Figure 2 shows the growth of Sealy in terms of basic employment in relation to the construction of the Interstate 10:

FIGURE 2.



[10]These figures are averages of the employment figures given in the Texas Directory of Manufacturers (Sealy), 1974. The figures are probably slightly too high, but do reflect shifts.

Sealy's rural character nevertheless has remained pretty much intact--much of its retail commerce is predominantly agriculture-service oriented, and it remains a chief cattle market for the region. This rural character is obviously being impacted by the arrival of new industries and the increased mobility of Sealy residents with more rapid access to Houston. For example, several suburban sub-divisions have been built, attracting those who work in Houston but prefer the small town environment as a place to live. In addition to an increase in the number of commuter residents, there has also been an influx of industrial workers and managers in connection with the new industry. The city government of Sealy is presently concerned with the changing character of the town, and, in response to the problems generated by growth, the citizens and the government are attempting to develop a new master plan for the city.

SECTION III
RESULTS

Four industries were chosen for study and each was surveyed to determine the extent to which personal contacts and preferences influenced the choice of Sealy as a location. The four industries are analyzed in this section in light of the selected factors outlined in Section I. Although ideal data on each factor in many cases are impossible to obtain, the data sources used were felt to be indicative on the whole. These data include:

1. Demand - National Investment Trends in New Plants, Income[1] and Market; Regional Growth of Linked Industry
2. Land and Tax - Land Value Comparisons, Site Size, County Taxes, City Taxes
3. Labor - Size, Median Income, Skills
4. Capital - Bank Deposits
5. Power - Resources, Rates
6. Transportation - Type per Industry, Structure in Area, Costs
7. Personal Preferences

The industries are listed below showing size, number of employees, and general range of their product:

TABLE 3. CASE STUDY INDUSTRIES[2]

Industry	SIC Code[a]	No. Employees	Market Range
A	34	200	Regional
B	34	32	State
C	36	8	National
D	20	6	Local

[a] Since some information is confidential, only the general categories from the Standard Industrial Classification (SIC) Code are used to identify the case study industries.

[1] See Lloyd and Dicken, Location in Space: A Theoretical Approach, op. cit. p. 110.

[2] See Texas Directory of Manufacturers, 1974.

Demand

One of the industries chosen, D, serves only the local market. As such, it is assumed that the growth of Sealy created a demand threshold for its product that made the plant location a profitable one. The primary value of the data from this industry lies in location factors other than those treated under "demand."

Industry A is a subsidiary of a Houston based corporation, and its plant at Sealy processes steel bars from scrap that are used in reinforcing concrete. Industry B produces steel door frames, rods, etc. As such both are classified under the general SIC Code (34) of fabricated metal products. Industry C produces one product also under the general SIC Classification (34) and electrical machinery classified (36). Like 80% of all U. S. industries, most of these goods are used in turn by other industries in processing a final product which makes a market potential analysis based on population difficult at best. The pressure of growing demand might be gleaned from national figures reflecting tremendous growth in the fabricated metals industries and electrical machinery industries between 1960 and 1970 (see Table 4).

TABLE 4
Expenditures for New Plant[3]
And Equipment (millions)

	1960	1965	1970
Fabricated Metal Products	483	805	1,287
Electrical Machinery	616	1,047	1,520

TABLE 5.
National Income by Industrial Origin[4]
(billions)

	1960	1965	1970
Fabricated Metal Products	8.1	11.5	14.6
Electrical Machinery	10.5	14.9	20.2

[3] See Statistical Abstract of the U. S., U. S. Department of Commerce, Bureau of the Census, July 1973, Table 1192, p. 703.

[4] Ibid., p. 325, Table 527.

The growth, and particularly the increasing investments in new plants may suggest increased competition in the 60's for land and sites close to market areas that would minimize transportation costs. However, an interesting fact is that, of the persons employed in fabricated metal industries in 1970, almost 50% worked in plants in areas classified as "not urbanized" with the largest percentage of those in locations wholly outside metropolitan areas.[5] Since corresponding data are lacking from 1960, one can only conjecture as to national shifts in the last decade.

In part, the spatial variations of demand might be reflected in the growth of manufacturing industries as a whole in the country due to the forward and back linkages of the industries. Growth in the U. S., as reflected in employment in manufacturing sectors, shows the South Atlantic and West South Central regions (Texas is located in the latter) as the largest gainers between 1965 and 1970 (see below).

TABLE 6. Employees on Manufacturing Payrolls, by Region: (Thousands)[6]

	1960	1965	1970
New England	1451.7	1459.6	1457.8
Middle Atlantic	4126.9	4163.4	4147.0
East North Central	4495.2	4894.1	5032.1
West North Central	1001.4	1084.9	1226.2
South Atlantic	2040.1	2348.8	2698.4
East South Central	844.1	1022.7	1223.2
*West South Central	820.4	969.2	1218.2
Mountain	263.7	290.9	364.8
Pacific	1709.7	1827.2	2003.9

In terms of sub-state demand, linkages through manufacturing sectors would suggest two strong focal points influencing location, Houston and Dallas. The growth of employment--particularly in the case of fabricated metals--underscores Houston's dominance. (See Tables 7 and 8.)

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[5] 1970 Census of Population Supplementary Report, "Industry of Employed Persons for the U. S: 1970".

[6] Handbook of Labor Statistics 1973, U. S. Department of Labor, Bureau of Labor Statistics, 1973, pp. 112-113.

TABLE 7. Employment in Manufacturing (Thousands)[7]

	1965	1970
Amarillo	4.6	7.1
Austin	6.3	11.8
Beaumont-Port Arthur	33.8	36.5
Corpus Christi	10.2	11.4
Dallas	121.6	158.2
Houston	118.3	147.5
Lubbock	6.6	7.2
San Antonio	26.4	35.0

TABLE 8. Employment in Fabricated Metals (Thousands)[8]

	1965	1970
Texas	39.3	54.6
Beaumont-Port Arthur	2.5	3.0
Dallas	7.6	9.5
Houston	15.5	20.7

Strong back linkages are an important influence dictating location according to the preliminary study of the survey. In the case of Industry A, for example, 60% of the raw materials used in processing comes from Houston. Forward linkages are particularly strong as regards the construction industry since most of the products are used in building. A look at the construction industry again shows Houston and Dallas by far as the largest gainers in employment between 1965 and 1970.[9]

Land Costs

A selective look at some sale prices of various parcels sold or offered for industrial use of land between 1960 and 1973 in Sealy reveals the rapid rise in values attributable in part to the impact of the Interstate Highway.

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[7] Employment and Earnings States and Areas 1939-1972, U. S. Department of Labor, Bureau of Labor Statistics, Bulletin 1370-10, p. 622.

[8] Ibid.,pp. 628-633.

[9] Ibid.,pp. 628-633.

TABLE 9. Land Value of Certain Vacant Sites Sold for Industrial Development[10]

Site	Acres	Year	Land Value[a] ($)	$ Per/Acre
1	23.34	1964	18,000	771.20
2	46.65	1966	31,500	675.24
3	50.3	1970	59,500	1182.90
4	33.3	1972	70,000	2102.10
5	105.5	1973	321,600[b]	3048.34

[a]Figures obtained from insurance policies issued on land value.

[b]This site is the only one on which development has not yet taken place.

For industries locating in the area, the initial capital outlay for land may seem considerable. However, when one considers comparable sites in Houston, there is little doubt of the advantage of the Sealy location. Houston realtors, specializing in industrial properties, informed us that comparable lots in the Houston area, when obtainable at all, would have a cost 6 to 8 times greater than that in Sealy.

In the case of Industry A, a fairly large tract of land was purchased. Although not usually considered in the category of land intensive industries, metal fabricating plants may in fact find the need for land a constraint on location. The size of the lot may be considered close to minimum when consideration is given to truck access, storage, and processing. Thus, in terms of both cost and size of available lots, Sealy would seem more attractive than corresponding urban sites.

These generalizations are in part supported by survey data. Alternate sites considered by Industry A included other rural towns in the area, and

[10]The sites listed in Table 9 are all relatively large tracts of land and exhibit similar characteristics (i.e., access to highway, and rail, topography, distance from CBD, etc.). For a more detailed discussion of land values in Sealy, see Lidvard Skorpa, et al., Land Value Modelling in Rural Communities: A Case Study, Council for Advanced Transportation Studies, University of Texas at Austin, Research Report No. 3 (Publication pending).

"inexpensive land for location and expansion" was a factor rated as fairly important by comparison with most others. Industries B and C are both smaller concerns, and hence less land intensive. The surveys indicated that land costs, though fairly important, were less significant than other factors, in particular labor costs and the area's reputation for "good" labor-management relations. On the other hand, Industry D is land intensive, and its executives rated land cost as among the most important reasons for choice of location.

Tax Structure

For tax sensitive industries, such as land intensive industries or those which must locate on more costly land to acquire access to CBD or transportation facilities, property tax may be a consideration in the location decision.

Data on taxes are somewhat misleading but are presented in a comparative sense in any case. They are misleading due to (1) exceptions or reductions which may be included as an enticement to industry and (2) differences in assessing procedures in different cities (there are no standardized methods in Texas as there are in California). A comparison of county taxes does reveal a relatively favorable position of Austin County in comparison to other rural counties and Harris, a predominantly urban county.

A look at the per capita tax of some counties shows an inverse relationship between per capita tax and distance from Houston. The lowest per capita taxes are to be found in the most rural counties. Once outside the city of Houston, the lowest levels of assessed value are generally to be found in the towns farthest from Houston, the nearest major SMSA. (See Tables 10 and 11, p. 17. The counties or cities, as the case may be, are arranged in order of increasing distance from Harris County or the city of Houston.) Although Houston does have a lower taxed percentage of assessed value, it is assumed that the values themselves are much higher than in rural towns.

TABLE 10. Comparison of Selected County Tax Rates[11]

County	Property Tax $ (per capita)	
Harris (Houston)	121	(The city of Houston's per capita tax is an additional $53)
Fort Bend	110	
Wharton	129	
Waller	100	
Austin (Sealy)	66	
Washington	55	
Colorado	97	
Lavaca	40	
Fayette	41	

TABLE 11. Taxed Level of Assessed Value[12]

Houston	37.1%	(1972)
La Porte	76%	(1972)
Angleton	50%	(1971)
Sealy	40.4%	(1971)
Bellville	33.3%	(1972)
Columbus	30%	(1970)
Crockett	33.3%	(1972)

[11] County and City Data Book 1972, U. S. Department of Commerce, Bureau of the Census, March 1973, pp. 440-484.

[12] Texas Municipal Reports, Municipal Advisory Council of Texas, Austin (for various years).

It should be noted that in the urban to rural arrangement, the most significant tax gap among counties within a 75 mile radius of Houston, is between Harris and Austin Counties. Whereas the difference between Austin and Harris County is in excess of $50 (not including city tax), the difference between Austin County and other rural counties is less than half of that figure. When consideration is given to the tax structure in Austin County vs. other rural counties, the relative advantage in tax reduction diminishes with distance from Houston. In the more distant counties, other costs related to the reduced accessibility to Houston will probably rise, suggesting some point of equilibrium between accessibility and any benefits gained from the tax advantage.

In the absence of hard comparative data throughout the state, the only reasonable conclusion to be drawn is that the tax structure was probably a marginal consideration in the decision to locate in the study area rather than an urban area.

Labor

The metal industry is highly labor intensive, and one would expect the labor market to be an important influence on its location. Since it requires only a small number of skilled workers, the critical factor is the cost of labor, although certain minimum skills may be needed. Preliminary data from the survey suggest that a perceived notion of experienced workers in the Sealy area was of importance in location choice as regards the metal fabricating products. As for Industry C (SIC code 36), there are two important considerations of the labor market--cost and skill or, perhaps, skill potential (which is a difficult variable at best to evaluate). For this industry, the survey indicates that high consideration was given to "low labor costs" and "area's reputation for good labor management relations."

In terms of labor costs, a comparison of skill and wage levels once again indicates Austin County has a reasonable advantage especially in craftsmen:

TABLE 12. Median Incomes 1969[13]

County	Professional-Managerial	Craftsmen	Operatives
Austin	7,990	5972	5213
Brazoria	11,364	9558	8631
Colorado	8,107	5920	5161
Harris	11,645	8192	6788
Waller	9,049	6606	5105
Walker	8,036	5267	3500
Wharton	8,250	6053	5272
Washington	8,294	5436	4639
Lavaca	6,789	4635	4160
Fayette	7,110	4023	3890

Perhaps some insight as to skill potentials may also be gleaned from the education levels achieved in various rural towns in the region as presented in the 1970 census.

TABLE 13. Comparison of Selected Education Levels in Study Region[13]

Town	Median School Years	% Completed High School
Sealy	9.9	38.5
Karnes City	8.4	27.4
Bastrop	9.3	30.2
Columbus	9.5	30.8
Cotulla	6.3	21.2
Giddings	8.8	24.6

Industry D is in some ways the most interesting in terms of labor as a location factor. High-rankings on the survey were given to all categories under labor except "availability of skilled labor." Since the industry does not require highly skilled labor, this was to be expected, but what seemed of extreme importance were the qualitative factors "high productivity of local labor" and "area's reputation for good management-labor relations." "Low labor rates" was also given the highest ranking score.

[13] 1970 Census of the U. S., Department of Commerce, Bureau of the Census, Table 122.

Capital

Preliminary data indicate that availability of rural capital was not a determining factor in the location decisions of the major industries which chose to locate in Sealy. However, some of the smaller and later arriving concerns have made use of local loans, and Industries C and D rated "local financial assistance" as an important factor. For comparison, and as an indicator of economic health in general, deposit totals for various surrounding counties are shown below:

TABLE 14. Total Deposits for Various Counties (millions)[14]

County	Bank Deposits (June 1970)	Savings and Loan (December 1970)
Austin	18.2	----
Colorado	13.9	34.1
Fort Bend	11.6	47.6
Fayette	19.2	----
Lavaca	2.7	----
Waller	3.7	----
Washington	25.8	18.0
Wharton	16.6	21.0

As is to be expected, capital availability seems to be a significant factor predominantly in those cases where small firms (not a subsidiary) have chosen to locate in the area.

Power

The metals industry is a power intensive industry due to the input of fuels and electricity necessitated by furnaces in the melting and shading process. Data from the survey indicate a high importance given to the availability of fuels and electric power in the choice of plant location in all cases. While a comparison of utilities rates throughout the region is not available, and should be a part of a complete analysis, a rough estimation of rates was obtained for some cities in Texas.

[14] County and City Data Book 1972, op. cit. pp. 440-484. These data show time deposits by individuals, partnerships, and corporations.

TABLE 15. General Rates Per KWH over 12,000 KWH[15]

Amarillo (S. W. Public Service Co.)	.80
Lubbock (S. W. Public Service Co.)	.92
New Braunfels (New Braunfels Utilities)	.80
Austin (LCRA)	.90
Houston (Houston Lighting and Power)	.78
Sealy (Houston Lighting and Power)	.78
Conroe (Gulf States Utilities)	.68
Dallas (Dallas Power and Light)	.90

These rates do not reflect total cost due to both energy charge and demand charge nor do they take into account minimum payments. They are a very rough estimation, but they tend to bear out the power-cost sensitivity reflected in the preliminary survey data. Not shown, and also important in rate analysis, is whether the utility company is owned by the city, a public organization or a private concern. The importance is that often cities may offer utility rebates to induce industries to locate there. Unfortunately, accurate and complete data are not available at this time.

Fuels, while scarce in many parts of the country as a whole, are abundant in the East Texas Region near Houston. The region lies in a railroad commission district which is classified as an "energy surplus" district due to the natural gas and oil extracted, processed and exported from the area.[16]

Transportation

Specific transportation data of a comparative nature which might reveal spatial variations and inducements on a regional and state level are not available at this time; however, there are general implications which can be drawn from the preliminary survey data. There are three interesting factors of transportation cost which impact location in rural vs. urban areas:

[15]Estimations are based on general published rates of varying scale from The National Electric Rate Book, Federal Power Commission, Washington D. C., 1973.

[16]Robert M. Lockwood, "Energy Consumption in Texas," Texas Business Review, Bureau of Business Research, University of Texas, August 1973, p. 179.

(1) The historical decrease in transportation costs due to technology, etc.

(2) The administrative structuring of rates (I.C.C. and The Texas Railroad Commission)

(3) The increased cost of congestion

I-10 is an example of the impact of technology in reducing transportation costs in the long run. Some of the effects as outlined in a report done for the Texas Division of Planning Coordination of the Governor's Office include:[17]

(1) Reduction of time (maximum utilization of vehicles, wages)

(2) Savings in fuel costs

(3) Savings in equipment costs (lower hp. vehicles for example)

(4) Savings through safety (lower insurance rates)

The overall impact is to free plants from market and resource locations and especially to reduce the cost of congestion--which was rated on all surveys extremely high as a consideration for location in a rural area.

It has been argued that the administrative structuring of rates has generally been prejudicial to rural locations in Texas.[18] The effect has been to favor long hauls, which in a sense has discouraged intermediate rural areas from being utilized, and has also encouraged full load hauls, thus inducing smaller load producers to locate near the market and penalizing small lot shippers situated in non-metropolitan areas.[19]

Despite these deterrents, the three case study plants (A, B, C) which are sensitive to transportation costs for both resource and market did locate in rural areas, and, in the case of Industry A, executives considered sites even

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[17] J. Edwin Becht, Rural Transportation Problems and Rural Development in the State of Texas, University of Texas of the Permian Basin, 1973, p. C-14.

[18] Ibid. pp. C-15 - C-20.

[19] Ibid. p. C-23.

farther from their major market and resources. Significantly, other sites considered were also on I-10 and had rail connections. All four plants rely most heavily on motor truck transport, both for materials used in processing and for moving the final product. However, rail was in at least one case (Industry A) one of the three most highly rated factors in location.

The survey of the one plant with only a local supply and market, and thus the one least dependent upon interurban modes of transportation, provided an interesting answer to the question, "What effect has the development of I-10 had on your firm?" The answer was "increased labor costs"; the reason given was that higher salaries had to be paid local labor because I-10 had increased the access to other job markets.

Personal Factors

In two industries (B and D), personal contacts with a local resident were listed as important. For larger industries, Industry A, for example, this was not the case. The most important factor that could be called "personal" which received a rating of "very important" on the surveys was "Attractiveness of local environment for transferred executives." Since Sealy offers a variety of housing and has access to several types of outdoor recreation, the qualitative aspect of the rural environment cannot be overlooked.

Preliminary Conclusions

Previous studies have emphasized different factors as being of the greatest importance. The availability of land which is both relatively inexpensive and of sufficient size to meet the requirements of the locator was found to be the most important determinant in Bone's study of Route 128 near Boston.[20] Next in importance were labor supply and them some notion of "accessibility." Breese concluded that transportation was of pri-

[20] A. J. Bone and Martin Wohl, "Massachusetts Route 128 Impact Study," Highway Research Board Bulletin 227 (January 1959), pp. 21-49.

mary importance in a strictly comparative study of Burlington County, New Jersey, while taxes, labor, etc., were marginal influences.[21] Kiley's survey rates availability of a "good highway" as the most important determinant--moreover, his study included a larger number rural-based industries than the other two which involved mostly developed areas.[22]

The variations in the results in our own study suggest that differences in the size of the operation and the nature of the product need to be accounted for when generalizations are made about the relative importance of different factors. For the largest concern, the combination of energy resources, rail, and highway was the important determinant. For the smaller companies, labor costs and labor relations seemed to be more important than other factors, and, in the case of the one land intensive industry (D), a combination of labor costs and land costs was a determinant.

The relative rankings on the survey instrument do not, however, serve as a perfect measure of the role played by transportation in influencing plant location. Even though access to transportation facilities ranked relatively low on the surveys from smaller companies, it may be the case that the availability and reasonable cost of transportation were necessary, though not sufficient, conditions of choice in all cases. "Freedom from congestion" was given the highest ranking on all surveys, indicating that this transportation-related factor is of greater significance than is usually considered to be the case. At any rate, further research should incorporate more accurate ways of evaluating "accessibility" as a location factor.

Generally, the locational criteria in the study may be related to industrial typology as well. Though to differing degrees, all but one were labor intensive, and each was subject to minimum lot-size constraints. In terms of demand, the plants with extra-local markets were in fast growing industries with forward linkages to construction or to construction-oriented industry.

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[21] Gerald Breese, Industrial Site Selection, the Bureau of Urban Research, Princeton University, 1954.

[22] Edward Kiley, "Highways as a Factor in Industrial Location," Highway Research Record, Number 75 (1964), pp. 48-52.

In the process of this study, the difficulty of making a comparative locational analysis on a limited geographic area became apparent. Data, in many cases, were not available in any form. The study has, however, illuminated critical factors which, when incorporated in a regional impact model, may provide a more quantified overview of manufacturing growth in a rural area. Work is currently underway in developing such a model, and this effort will be reported on in a subsequent document.

APPENDIX

STRICTLY CONFIDENTIAL

Questionnaire

Description of Company

Name of Company _____

Year the Plant was Established in Sealy _____

Approximate Weekly Payroll _____

Is your Company a Branch of, or a Subsidiary of, an Older Company?
(check one) Yes _____ No _____

A. If yes, what is the name of the company of which you are a branch or subsidiary? _____

B. What is the relationship? _____

C. Where is the parent company located? _____

The Product

Briefly describe your product, and the raw materials needed for this product.

Who are the principal users of this product: Please specify. (check one)
The general consumer_____ Industrial users_____ Others_____

If other manufacturers use your product, what are the principal final products?

Previous Location

(a) When did you start production at Sealy? _____

(b) What were your principal products at that date?

(c) What factors made you pick Sealy as a suitable location?

(d) What were the main economic advantages of this location?

(e) What were the main economic disadvantages of this location?

(f) Prior to your relocation, what type of factory did you occupy? (e.g. one story, tenement, standard, etc.)

Choice of New Location

Which sites did you consider for relocation? (please name)

The Location Process

Who makes the decisions on plant location for your company? (check one or more) Company executives_____ Outside consultants_____
Others (please specify)_____

If company executives influenced the location decision, what were the official positions held by these executives?

Workers

How are the numbers of your present labor force divided among the following categories?

	Male	Female
Administrative staff		
Technical staff		
Clerical		
Skilled operators		
Semi-skilled		
Unskilled		
Apprentices		

Costs and Production

What were your annual costs of production in dollars and percent of total cost under the following headings in the last financial or calendar year?

Item	Average Annual Cost($)	Percent(%) of Total Cost
Labour Wages		
Raw materials		
Semi-finished manufactured goods		
Utilities (gas, water, electricity, fuel)		
Transport		
Rates		
Rent		
Depreciation		
All other (please specify)		
TOTAL		

Transport

How are your transport costs spread amongst the following types of transport?

Transport Method	Percentage	
	Raw Materials	Finished Products
Road		
Rail		
Air		
Water		

Materials/Markets

What percentage, by value, of raw materials and semi-finished manufactured goods come from

Area	%
Local	
Houston	
Texas	
U.S.	
Other	

What percentage, by value, of your finished products go to

Area	%
Local	
Houston	
Texas	
U.S.	
Other	

Please rank on a scale of 1 to 7 the relative importance of the following factors on your decision to locate in Sealy (1 is most important, 7 least) Circle the appropriate number.

Factors	Ranking Very Important						Unimportant
Availability of skilled labour	1	2	3	4	5	6	7
semi-skilled labour	1	2	3	4	5	6	7
unskilled labour	1	2	3	4	5	6	7
Low labor rates	1	2	3	4	5	6	7
High productivity of local labour	1	2	3	4	5	6	7
Area's reputation for good management-labor relations	1	2	3	4	5	6	7
Access to rail	1	2	3	4	5	6	7
canals or river	1	2	3	4	5	6	7
port(s)	1	2	3	4	5	6	7
major roads	1	2	3	4	5	6	7
airport(s)	1	2	3	4	5	6	7
Availability of transport services for goods	1	2	3	4	5	6	7
Freedom from traffic congestion	1	2	3	4	5	6	7
Proximity to linked producers	1	2	3	4	5	6	7
sub-contractors	1	2	3	4	5	6	7
central city services	1	2	3	4	5	6	7
suppliers	1	2	3	4	5	6	7
major markets	1	2	3	4	5	6	7
Suitable factory available	1	2	3	4	5	6	7
Low factory rents	1	2	3	4	5	6	7
Fully serviced site	1	2	3	4	5	6	7
Inexpensive land for location and expansion	1	2	3	4	5	6	7
Community co-operation over housing, roads planning permission, etc.	1	2	3	4	5	6	7
Local co-operation with financial assistance (grants, loans, subsidized rents, rate reductions, etc.)	1	2	3	4	5	6	7
Attractiveness of local environment for transferred workers/executives	1	2	3	4	5	6	7
Local technical education facilities	1	2	3	4	5	6	7
Personal preferences (please specify)	1	2	3	4	5	6	7

The Effect of Comprehensive Development

What effect has the development of H10 had on your firm?

What do you most like/dislike about your new location?

Like Dislike

Name and Title of person completing this form: