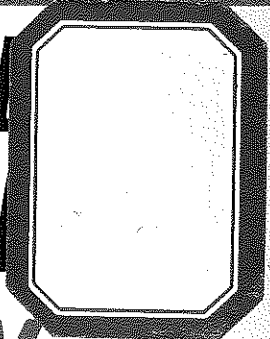


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PART OF A JOINT RESEARCH PROGRAM

ECONOMIC AND SOCIAL EFFECTS OF HIGHWAY IMPROVEMENTS



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. . . . A Summary

MICHIGAN STATE UNIVERSITY / HIGHWAY TRAFFIC SAFETY CENTER
AND MICHIGAN STATE HIGHWAY DEPARTMENT

WITH PARTICIPATION OF

U. S. DEPARTMENT OF COMMERCE, BUREAU OF PUBLIC ROADS

EAST LANSING, MICHIGAN

1961

44

ECONOMIC AND SOCIAL EFFECTS OF HIGHWAY IMPROVEMENTS

A Summary

REPORTS OF A SERIES OF RESEARCH STUDIES

by

MICHIGAN STATE UNIVERSITY/HIGHWAY TRAFFIC SAFETY CENTER AND FIVE UNIVERSITY DEPARTMENTS

and

MICHIGAN STATE HIGHWAY DEPARTMENT

with participation of

U. S. DEPARTMENT OF COMMERCE, BUREAU OF PUBLIC ROADS

SUMMARIZED BY E. CLARK ROWLEY

Highway Traffic Safety Center

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Acknowledgements

The studies comprising the joint research project on "The Economic and Social Effects of Highway Improvements," which are reported in summary in this book, were designed and conducted by faculty and staff members of five departments of Michigan State University working under the coordinating direction of the Highway Traffic Safety Center. While these men performed or supervised the work of research and interpretation and are responsible for the findings, many other individuals and organizations made essential contributions which are acknowledged in detail in the individual technical research reports, but which should be given general recognition here.

Basic information regarding highways, traffic flow and other matters was willingly supplied, often on short notice, by personnel in several division offices at the Lansing headquarters of the Michigan State Highway Department, which was a sponsor of the research project. Various departments at Michigan State University,

*"The Impact of Highways on Land Uses and Property Values, A Review of Current Studies," by A. E. Warner, Associate Professor of Business Administration, Highway Traffic Safety Center, and Department of Business Administration, Michigan State University, 1958.

other than those directly engaged in the studies, have supplied information and advice. Notably, an earlier review of current studies of the economic effects of highway improvements* afforded an initial broad perspective of conditions and methods in the field of study covered by the research project.

Executives and personnel in a number of state departments and county and municipal offices were ready and tireless in making necessary data available from their records. Among these, particular mention should be made of the Michigan Department of Revenue and the offices of the Registers of Deeds and the County Road Commissions of Shiawassee and Ingham Counties. Valuable information of a more general nature was often obtained from local chambers of commerce and municipal officials. Many owners and employees of local business establishments willingly supplied information needed for the study of trade in by-passed cities. Much valuable cooperation and information was obtained from real estate offices in areas where land values and uses were being studied.

Grateful acknowledgement of their help is made to all of these.

Foreword

This summary report presents the major demonstrable facts disclosed by five studies and groups of studies which investigated various phases of the field covered by the basic research project, "The Economic and Social Effects of Highway Improvements." This project was initiated and carried through by Michigan State University, Highway Traffic Safety Center and was sponsored by the Michigan State Highway Department with participation by the U.S. Department of Commerce, Bureau of Public Roads.

The field of the basic project, as defined by its title, is very broad and complex, but it should be pointed out that the investigations were limited, for the most part, to studies of the effects of relatively recent or current improvements to the pre-existing grid of major highways. Thus, the project did not contemplate, nor does it include, studies of the whole range of impacts which the creation and development of highways for motor vehicle traffic had on the life and activities of the people, communities and areas they served.

The benefits to and changes in trade, productive industries, and living habits resulting from the new, extremely flexible, statewide transportation service, undoubtedly represent the most important and lasting effects of highways, and subsequent improvements are

aimed to broaden and better the service thus created. These initial benefits were based on access to the transportation system, but as motor vehicle use became universal, highway traffic grew to proportions that constituted a huge new consumer market and there developed a whole classification of business enterprises which were oriented to the highways, not for the purpose of access but for exposure to the passing streams of potential customers.

The objective of these research projects was to study and, if possible, forecast the effects of current improvements on the intricate complex of economic and social operations and interests which are closely integrated with and increasingly dependent upon highways and the transportation and access services they provide.

The task of condensing the material to give the essential results and interpretations of the investigators in less technical language was carried out by Mr. Clark Rowley. It is a pleasure to express appreciation of his conscientious and able work in accomplishing a none too easy task.

T. W. Forbes
Assistant Director (Research)
Highway Traffic Safety Center

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Economic and Social Effects of Highway Improvements

General Introduction

Because roads, streets and highways provide access to and egress from the lands in their service areas, the roadway pattern and the design and improvement of individual roadways are closely associated with the utilization and value of the lands served and with the life and livelihood of people located on those lands.

Systems of roadways are developed to meet the needs of the areas and communities they serve, but once in being, they form a rigid framework which very permanently molds the development and pattern of the area or community. Growth and changing activities in the community frequently call for revisions or improvements of the roadway system. Equally, it may be presumed, changes or improvements of roadway or of the roadway system will affect the utilization and value of neighboring lands and the well-being of the resident population.

The vital importance of the relationship between roadways and the adjacent lands currently is given heightened significance by the widespread major construction now going forward in this state as Michigan's part in the development of the 41,000-mile System of Interstate and Defense Highways created and provided for by the Federal Aid Highway Act of 1956. Not only is this construction program providing vastly improved facilities on most of the state's major routes of travel, but some of the modern design features required for the system's high standards of service will make fundamental changes in the accustomed relationships of lands and roadways.

Many long-used routes in both urban and rural areas are being relocated and in numerous instances these relocations will by-pass villages, towns and cities or at least their congested areas. Moreover, on most of the new mileage, entrance to the roadway is limited to designated points and access from the immediate roadside is completely excluded.

This developing situation brought into focus the need to investigate the influence of past highway improvements in relation to land, as a means toward foreseeing and preparing for the impacts of this new highway construction upon the use and value of land and

upon the activities of people in the affected areas. Such an investigation was proposed by the Federal highway agency, the Bureau of Public Roads, in a memorandum dated May 29, 1957. In the same year, Michigan State University's Highway Traffic Safety Center initiated broad research studies of the Economic and Social Effects of Highway Improvements with the sponsorship of the Michigan State Highway Department and participation by the U. S. Department of Commerce through the Bureau of Public Roads.

These studies, under the coordinating direction of the Highway Traffic Safety Center, have been in progress for two years. They are extremely broad in scope, the approach being from the point of view of several different disciplines, and studies have been conducted with the cooperation of some ten departments of the University. The general plan was to make certain specialized investigations of the effects on land and property values, effects on business, and various phases of social change brought about by the development of new and better highways. In addition, it was planned to put together inventories of all possible benefits and disbenefits to highway users and non-users.

These several investigations were completed in 1959 and 1960 and technical research reports are or will be available for technical use. The present report summarizes the contents of this series of technical research reports on "The Economic and Social Effects of Highway Improvements." The summary aims to make the significant findings of these research studies available to highway engineers and administrators and to the citizens who are interested in the facts disclosed but not in the research techniques by which they were obtained.

The individual technical research reports are listed below by the title under the sections of this report in which they are summarized.

SECTION I — Economic Factors Influenced by Highway Improvements.

"An Inventory of the Economic Factors Influenced by a Highway Development Program," by Eric Schenker, Assistant Professor of Economics, Michigan State University, 1959.

SECTION II — Effects of Highway Development on Rural Lands and Communities.

“Effects of Highway Development on Rural Lands,” by Louis A. Vargha, Department of Agricultural Economics and Resource Development, Michigan State University, 1960.

SECTION III — Effects on Businesses in Small and Medium Size Communities of By-Pass Highways.

“Effects on Businesses of By-pass Highways,” by Hugh Faville and Carl Goldschmidt, Department of Urban Planning and Landscape Architecture, Michigan State University, 1960.

SECTION IV — Effects of Highway Improvements on Land Uses and Values.

“Land and Property Values in Relation to Dorr Highway Improvements,” by Ronald Larson, Depart-

ment of Insurance, Law, and Real Estate, and Eric Schenker, Department of Economics, Michigan State University, 1960.

SECTION V — The Trunkline Pattern and the Geographic Pattern of Settlement.

“The Geographic Pattern of Gross Land Uses in the Southern Half of the Lower Peninsula of Michigan in Relation to Major Highways,” by Allen K. Philbrick, Associate Professor of Geography, Michigan State University, 1960.

All of the technical research reports listed above were issued by Michigan State University, Highway Traffic Safety Center and the Michigan State Highway Department, and are available to qualified persons and organizations through the Highway Traffic Safety Center, Wells, Hall, Section D, Michigan State University, East Lansing, Michigan.

SECTION I

Economic Factors Influenced by a Highway Improvement Program*

Introduction

Alfred Marshall, the English economist, once said that the dominant fact in the industrial development of the western world was not manufacturing, but transportation. Since this judgment preceded the full impact of the automotive revolution, it would certainly be even more true today. This revolution has brought about for the nation a new way of life affecting every citizen. It has influenced nearly all the activities of the individual, the family, commerce, and agriculture. Unlike other modes of transportation, the motor vehicle provides direct access to homes, recreation areas, shops, factories, offices, etc.

For this direct access, the various levels of government had to provide highways. For example, the transportation requirements of Michigan today are served by a highway, road and street system totalling 108,036 miles. Of this mileage, 93,428 miles are rural, while

14,608 miles are in municipalities. State trunklines total 9,355 miles. As one might expect, highway development requires government expenditures. Table 1 shows the total direct expenditures for highways by all levels of government.

With the passage of the Federal Aid Highway Act of 1956, the trend toward greater annual expenditures for highway development can be expected to continue. Congress pledged its support for the construction or reconstruction of 41,000 miles of the National System of Interstate and Defense Highways and authorized approximately 24.8 billion dollars for this purpose to be matched by 2.6 billion dollars in state funds at a new ratio of 90-10. In approximately 16 years, the new system will connect 48 of the states and link all but 23 of the nation's cities of more than 50,000 population.

Purpose and Method

The purpose of this paper is to compile an inventory of the economic factors influenced by a highway development program and to state hypotheses for each factor. These hypotheses are the author's own and may be used as a basis for subsequent research. They are not intended to suggest policy, but represent alternatives which can be investigated.

The direct impact of a highway program is felt by every citizen of the United States. Some of these effects are very obvious and definite, others are more general and indirect, while still others are so indirect that it is

difficult to determine with certainty whether they are really economic, or belong to some other category.

One obvious impact of a highway development program is on employment. The U. S. Department of Labor has estimated that each billion dollars spent on highway construction will result in 102 million man-hours of employment on the site of construction and 126 million man-hours off the site. This means that a program of the size that Michigan usually undertakes each year generates 25.5 million man-hours of work on the site of construction plus 31.5 million man-hours elsewhere, or a total of 57 million man-hours.

Another of the more obvious effects of a highway development program, which is consistent with full em-

*Condensed from "An Inventory of Economic Factors Influenced by a Highway Development Program" by Eric Schenker, Michigan State University Highway Traffic Safety Center, East Lansing, 1959.

Table I

Total Direct Expenditures for Highway Purposes by All Units of Government; Gross National Product and Total Government Expenditures (in Millions)

Year	Total Direct Expenditures for Highways	Per Cent Change	Gross National Product	Per Cent of GNP	Total Government Expenditures	Highway Expenditures as Percentage of Total
1929	\$2,237	.024	\$104,436	.021	\$ 10,227	.218
1930	2,536	.134	91,105	.027	11,022	.230
1931	2,398	.058	76,271	.031	12,318	.194
1932	1,908	.257	58,466	.032	10,607	.179
1933	1,722	.108	55,964	.030	10,676	.161
1934	2,033	.181	64,975	.031	12,830	.158
1935	1,784	.140	72,502	.024	13,340	.133
1936	2,491	.396	82,743	.030	15,882	.156
1937	2,314	.076	90,780	.025	14,827	.156
1938	2,659	.149	85,227	.031	16,589	.160
1939	2,486	.070	91,095	.027	17,522	.141
1940	2,381	.044	100,618	.023	18,467	.128
1941	2,140	.113	125,822	.017	28,753	.074
1942	1,725	.241	159,133	.010	64,032	.026
1943	1,374	.255	192,513	.007	93,399	.014
1944	1,369	.004	211,393	.006	103,072	.013
1945	1,419	.037	213,558	.006	92,943	.015
1946	2,035	.434	210,663	.009	47,004	.043
1947	2,848	.400	234,289	.012	43,811	.065
1948	3,433	.205	259,426	.013	59,995	.057
1949	3,898	.135	358,054	.010	59,527	.065
1950	4,123	.058	284,599	.014	61,116	.067
1951	4,525	.098	328,975	.013	79,357	.057
1952	5,019	.109	346,999	.014	94,425	.053
1953	5,597	.115	365,385	.015	102,040	.054
1954	6,511	.163	363,112	.017	96,741	.067
1955	6,864	.054	397,469	.017	98,578	.069
1956	7,702	.120	419,214	.018	104,142	.073

Source: *Highway Statistics*, Department of Commerce, Bureau of Public Roads, Washington, D. C., 1957.

ployment, is to increase the aggregate level of personal income. There will also be long run effects of such a program due to the improvements per se. A direct result is to increase the efficiency and lower the cost of transportation which, in turn, tends to decrease the cost of goods and to extend markets.

Certain individual economic factors and the effects of a highway development program on them are discussed in the following sections of this inventory. The factors are grouped* according to whether they are subject primarily to the impact of the development program as a significant financial and production operation taking place within the economic structure, or are affected by the long run service of the improvements which the program provides. This classification is pertinent to the different objectives for which a highway development program may be undertaken, as it is to the fact that most factors are affected in both ways.

*The grouping classification was added in the condensation to simplify and organize relationships discussed in the original inventory in more detail.

A. ECONOMIC FACTORS AFFECTED BY CURRENT IMPACT OF PROGRAM

1. The Gross National Product (GNP)

The GNP is the money value of a nation's entire output of final commodities and services during a given time period. Although there have been a few years since 1929 when this value has decreased, the trend has been upward. Expressed in current dollar values, GNP in 1957 was approximately four times its value in 1929.

Although expenditures on highway development represent a small percentage of the GNP (about 0.2 per cent), the effect of these expenditures is greater than indicated by this percentage. The reason for this is that these expenditures involve capital investment and, through what is known as the multiplier effect, they induce further private investment. In certain segments of the economy, an accelerator effect gives special and additional impetus to activity.

a. Multiplier

The amount spent by various levels of government on highway development will be received by various individuals as additional income. If it is assumed that these latter devote three-fourths of the amount they receive to consumption, that this expended amount will be received by various other individuals as additional income, and that they, in turn, devote three-fourths of their receipts to consumption, and so on and on, by the time the original government expenditure for highways has had its full effect the rise in the GNP will be four times the original amount invested in the highway development program.

b. Accelerator

The accelerator principle states that a given change (plus or minus) in the production and sales of final products tends, by a sort of leverage action, to bring about greatly magnified changes in the production and sales of capital goods. For instance, a 10 per cent increase of the rate of automobile production or of highway construction might require a 100 per cent increase in the annual production of machine tools or of road building equipment. If one can visualize the accelerator principle at work throughout the economy, one will realize that much net investment is necessary as production and national income increase. Highway expenditures may be a good stimulant of net investment for the economy.

2. Net National Product (NNP)

The NNP is equal to the GNP minus capital consumption allowances, i.e., the value of those capital goods worn out or used up in a given period. The NNP gives a more accurate picture of the net contribution of the productive system to the volume of goods available for consumption and to the economy's total stock of capital goods.

The effect of highway expenditures upon the NNP depends largely upon the use of the expenditure, the multiplier, and the rate of depreciation. For example, floods or other accidental factors, or intensive use of existing highways, increase capital consumption and thus reduce the NNP.

3. National Income

National income is the total of money incomes received by individuals and firms supplying units of the productive agents during a given period. It is equal to NNP minus indirect business taxes and certain accounting items. The distributive shares of the national income are regularly identified as interest payments, wages and

supplements, dividends, rents, undistributed profits, and the unincorporated net income.

National income is affected by highway expenditures in much the same fashion as is NNP, with which it is closely associated, as explained above.

4. Personal Income

Personal income is the total amount of income which individuals receive from all sources, except gifts from other individuals. It includes transfer payments, wages, unincorporated net income, rents, interest, and dividends. The increase in aggregate personal income over the past twenty years has more than doubled its 1939 total of 67.7 billion dollars.

As stated earlier in this paper, a highway program financed with the objectives of being consistent with full employment will increase the aggregate level of personal income. There also will be a long run effect, due to the highway improvements per se.

5. Disposable Income

Disposable income is personal income minus personal taxes and is the amount of personal income available to individuals for purchasing the commodities and services produced in private sectors of the economy, and for personal savings. Expressed in constant 1939 dollars, the 1957 disposable income was \$940 per capita as compared to \$556 per capita in 1939. The amount of goods and services that can be purchased with his disposable income is more important to the individual than his gross income. The prices of these will be inflated if highway expenditures are increased in a period when the economy is fully employed. Provided the economy is not at full employment, such an increase will mean greater aggregate disposable income unless taxes are increased more than enough to offset the multiplier effect.

6. Personal Consumption

Personal consumption includes all consumer expenditures for services and purchase of nondurable goods and of all durable goods except housing. The consumption function is the ratio of the total volume of consumption which results from various levels of national income.

There does not seem to be anything inherent in highway development which would shift the consumption function of the economy. But the tendency for highway expenditures to raise the level of national income will likewise raise the level of consumption. The increase in the level of consumption will, of course, not be as large as the increase in the income; the higher the level of income, the more will be saved.

Important here is what is called "the marginal propensity to consume," which is the ratio of the increase

of expenditures for consumption out of an additional amount of aggregate income. The effect of a highway development program should be to decrease this ratio unless income is at such a level that all income is spent for consumption.

7. Savings

Savings are the part of income which is not spent for consumption. The higher the level of income, the greater is the tendency to save from additional increases in income. A highway development program may increase the schedule of planned savings by raising the aggregate level of income, but the exact effect of such expenditures will depend upon their relationship to the current employment status of the economy.

8. Gross Private Investment

Gross private investment is all expenditures from the private sector of the economy (excluding government spending) for capital replacement and expansionary purposes. Its level depends on the economic activity of the immediate past, the present conditions, and the outlook for the future.

The net effect of any sizeable increase of government expenditures for highway development is generally to brighten future expectations and stimulate neglected capital replacements. Certain industries will feel the immediate impact and soon other sectors of the economy will feel the effects. Thus, such a program has direct, indirect and cumulative effects on gross private investment.

9. Government Expenditures

The functions of government all require the expenditure of funds. In recent decades total — federal, state and local — government expenditures have shown a marked tendency to increase. Often these expenditures have exceeded revenues and the large public debt is the result.

The relationship between public expenditures and revenues at any given time has an important effect on the aggregate levels of production, employment, and income of the whole economy. Thus, if the government consciously adjusts highway revenues and expenditures, desirable effects upon these aggregates may result.

10. Fiscal Policy

Fiscal policy means the manipulation of government revenues and expenditures in an effort to produce effects regarded as desirable on national income, pro-

duction and employment by directly controlling the amount of disposable income in the hands of all the spending units of the economy. This policy is necessary for financing the government's social services and may also contribute to economic growth and stability.

During depression periods it might be desirable for the government to intensify the highway development program so as to make up for the deficit of private investment which characterizes such periods. Contrariwise, during inflationary periods these expenditures could be reduced or taxes increased so as to avoid bidding up the prices of resources then fully employed.

B. FACTORS REFLECTING INFLUENCE OF A HIGHWAY DEVELOPMENT PROGRAM AS AN INSTRUMENT OF ECONOMIC POLICY

1. Business Cycles

Business cycles are alternating waves of prosperity and depression or of business expansion and contraction which affect the economy as a whole. When recession develops out of the cumulative effects of business contraction, enterprises which have built up their inventories to meet rising demand, decrease production until the inventories reach a level more commensurate with the fallen demand. However, the falling prices which occur during a recession stimulate demand and employment and lead to the next revival. The wide fluctuations in employment caused by these cycles are major governmental as well as individual problems. To control at least part of the effects of business cycles, the government may use monetary and fiscal policy in accord with the economy's needs.

Highway and street construction represent an alternative for private investment which is deficient during the recessive stage and excessive during the booming stage of the cycle. Therefore, an increase or decrease in appropriations for highway development provides a channel for government investment which may be used to mitigate the dire effects of business cycles.

2. Unemployment

Unemployment is a condition under which human resources are idle. In any economy, the existence of idle resources is an indication of inefficiency. A highway development program will, by its very nature, increase or offset potential decreases in employment. Employment in this sector of the economy may also serve as an impetus to greater net private investment which in turn means further increased employment.

3. State and Local Finance

State and local governments derive some revenue from taxes (inheritance, income and excise) which are at least roughly similar to those used by the federal government, but they depend most heavily upon general property, sales and use taxes. Local governments' share of the total tax receipts of all units of government has declined from 51.1 per cent in 1903 to 14.3 per cent in 1958. The decline in the percentage of state revenue has not been nearly so drastic. This shift in the incidence of revenue production has not lessened the social responsibilities of state and local governments but it has shifted more state and local government functions to the federal government. An instance is the increasing importance of the interstate highway system and a corresponding decrease in the proportion of state funds going into highway development, a trend accentuated by the Federal Aid Highway Bill of 1956 which lowered the state share for the Interstate Highway System from one-half to one-tenth of the cost.

4. Highway Revenues

Highway revenue is defined as that revenue which is levied against Highway users. These funds consist primarily of excise and/or sales taxes on motor vehicles, fuels and accessories, and vehicle and driver license fees. In practice, both the excise and sales taxes are paid by the consumer and are regressive in operation. Thus the primary burden of these taxes falls on people with the smaller incomes. Since the highway program is supposed to be shouldered by those who will benefit most from such development, a re-evaluation of the method of financing and who it is that benefits would seem desirable.

Congress has instructed the Secretary of Commerce to see that studies be carried out for this purpose. Numerous studies have resulted of which this is one.

5. Federal Personal Income Tax

The federal personal income tax is a progressive tax which applies a higher rate to a larger income than to a smaller one. It is far and away the most important source of revenue, providing about half of federal revenue. When highway expenditures, as earlier indicated, increase the aggregate level of personal income, those individuals whose increased income places them in a higher income bracket, will find themselves bearing a greater percentage of the tax burden.

6. Corporation Income Tax

The corporation income and excess profits tax was the second largest producer of federal revenues in 1958. The level of earnings by corporations and the amount collected by the federal government are determined by the general level of business activity. To the extent that a highway development program will stimulate business activity, provided no other adverse economic phenomena offset the effect of the program, it can be assumed that these activities will increase profits and in turn increase tax returns collected by the government.

C. ECONOMIC FACTORS AFFECTED BY THE SERVICE OF HIGHWAYS IMPROVED BY A DEVELOPMENT PROGRAM

1. Production Cost

Production cost is the monetary expression of the effort involved in making a good or service available. It includes wages and salaries, returns on the use of land and capital and the cost of shipping raw materials needed in processing and final products to consumers. In many instances transportation cost may represent a large percentage of total production cost.

Better highways mean lower transportation costs due to shorter faster routes and reduced maintenance charges. It is assumed that any reduction in production costs will be reflected in the final sales price of the good or service.

2. Productivity

Productivity is the amount of output measured in terms of physical output per man hour or of net output, or value added, per man hour. Changes of productivity may be associated with improvements in managerial skill, technology, quantity and quality of capital, and increased efficiency in the allocation of resources.

To the extent that a highway development program may increase the efficiency of resource allocation, it may also serve to increase the productivity of those resources. Resources which formerly were unproductive because of the high cost of moving them to the productive source may now become productive because of better highways.

3. Economic Growth

Economic growth is the continued long-term increase in real income per capita. A balanced economy is essential to economic growth; that is, an economy in which production is diversified and no one sector advances at too rapid a pace and none acts as a brake on the rest of

the economy. The present concern for highway development is an expression of the fear that our highway transportation system has a bottlenecking potential which could retard our economic growth. The fear is well founded, for the nation's highways have never quite kept pace with the needs.

Well planned highways will facilitate the expansion of our economy by creating more efficiencies in the system and remedying handicaps to economic growth.

4. Market Structure

The market, which is not necessarily a spatially located place, is the system of arrangements by which productive services or products are exchanged with buyers in return for money. It thus determines the kinds and quantities of various economic goods which are to be produced. The efficiency of the market's function is related to the different types of market structure such as pure competition, monopolistic competition, oligopoly, and monopoly.

The goal of the economy is to achieve maximum satisfaction by producing the most important material wants of the society in the most plentiful quantities. When economic efficiency is related to social welfare, the structure based upon the competitive norm obtains this goal most effectively.

The cheaper transportation resulting from a highway development program may enable more remotely located producing areas to compete with firms more favorably located to the source of resources and/or the markets for the product. The net effect is to increase the potential for competition, provided political and social arrangements do not limit it.

5. Industrial Centralization

Industrial centralization refers to the tendency of industries having similar processes and requirements to locate relatively close to one another because of the economies possible for the particular productive process due to the availability in the area of natural resources, skilled or cheap labor, transportation facilities, etc. Location decisions are made primarily on the basis of production costs and the extent of the products market.

The reduction of transportation costs resulting from highway development and improvement may serve as an incentive for new and old firms alike to produce in areas which are more distant from their market or raw materials and this may tend to reduce industrial centralization and facilitate diversification.

6. Specialization

Specialization is the tendency of individuals, and firms in geographical areas, to concentrate productive energies in particular fields of production or parts thereof. This tendency exists because of the inherent economies resulting from the more efficient use of resources which it makes possible. The fractionalization of production with each unit performing a special operation must depend heavily on transportation for the exchange or interchange of goods, materials and services. Hence, improved highway systems will reduce transportation costs and will favor more intensive specialization.

7. Urbanization

Urbanization is characterized by concentrations of populations engaged in nonagrarian, mainly business, activities. The growth of cities is dependent on cheap transportation since it relieves them from the necessity of relying on a local source of supply for all their goods and services.

Inasmuch as improved highways mean cheaper transportation, they also mean greater urbanization. However, in the cases of some cities, improved highways have the somewhat different effect of diffusing highly intensive concentrations of population over an enlarged urbanized area.

8. New Construction

Construction may be defined as increases in the physical volume of all private, commercial and public structures as measured by the dollar expenditures for construction of such structures. Annual new construction reveals a long-range upward trend, but fluctuates with the level of national income.

New construction is affected by a highway development program in two ways: First, by the increased demand for consumer goods resulting from the stimulated increase in national income; and, second, by the opportunities for profit in areas served by new highways. In the absence of other depressing factors, the net effect of these is an increase in total new construction.

D. ECONOMIC FACTORS IN TOTAL TRANSPORTATION AFFECTED BY HIGHWAY DEVELOPMENT PROGRAM

1. Motor Vehicle Operating Costs

Motor vehicle operating costs include the following items: gasoline, oil, maintenance, tires, garage, license fees, depreciation, interest, and insurance. These costs

are, in general, inversely related to the quality of road surfaces and alignment. The new roads are designed to reduce highway accident frequency and many of them are located to lessen travel distances. Therefore, the net effect of a highway development program is to reduce operating costs.

2. Motor Freight Transportation

During 1958 nearly 20 per cent of all freight transported between cities was handled by motor carriers as compared with only about 10 per cent in 1939.

Improvements in the nation's highways will affect motor freight transportation in three ways: Operating costs will be reduced; travel to some areas will be more direct and faster; and rates can be reduced.

3. Intercity Bus Transportation

Travel by motor bus accounts for the largest volume of commercial passenger travel for short distances. This is due to lower rates, and a more frequent and faster service made possible by the small carrying capacity of the buses. The percentage of passengers carried by buses has varied, being 26.0 per cent in 1939, 21.5 per cent in 1943 (during World War II), whereas in 1957 the percentage was 30.6 (not including passenger miles in private automobile).

Unsatisfactory buses and the slow travel through congested districts have retarded the growth of bus operations. Highway improvement should greatly reduce travel time and passenger discomfort and thereby make travel by bus more attractive.

4. Tourist Trade

Touring is a booming business. Each year more than 10 billion dollars are spent for the purpose of vacations most of which are spent within the continental United States. Touring occurs primarily by way of the nation's highways. More than four-fifths of vacation travel is by automobile and at least one-tenth by motor-bus.

Better highways stimulate the touring trade in two ways. First, an indirect stimulus is provided through the employment effect of the highway development program. Second, directly through the ease, comfort

and safety of the new highways and by making travel to less accessible areas more attractive.

5. Air Transportation

Travel by air competes with surface travel, especially for trips longer than 100 miles or so, and has an advantage when the premium is on speed and comfort. Air lines accounted for about .01 per cent of all freight movement and approximately 35 per cent of passenger travel (passenger miles in private automobiles not included).

The improvement of air transportation is related to improvements in highways because airports ordinarily must be located outside the urban areas of the cities they serve and the time between the point of destination and the airport is just as important to a time-conscious traveler as the high speed in the air. Therefore, improvement or development of access highways will reduce the overall origin-to-destination time.

6. Railroad Capital Improvements

Railroad capital improvements include investments in plants and equipment as well as operational facilities. Despite the fact that railroad mileage declined from 254,037 miles in 1916 to 223,779 miles in 1950, there has been an increase in total capital expenditures of from 17.8 billion to 30.2 billion in the same time period. These improvements have been by way of the utilization of internal economies which the railroads have been forced to develop because of the heavy competition from new forms of transportation of which highway transportation was not the least.

Improvement of the nation's highways will divert more traffic from the railroads unless they meet the challenge by further capital improvements. However, the railroads are fully aware of their competition from motor transportation and can be expected to make further intensive capital improvements.

E. CONCLUSION

The purpose of this inventory has been to assemble and describe the economic factors influenced by a highway development program and to state the writer's hypothesis for each factor. These hypotheses can be used as a basic framework for subsequent research work.

SECTION II

Effects of Highway Improvement on Rural Lands and Communities*

The research studies whose findings are summarized in this section investigated three differing aspects of the impacts of highway development on rural lands and communities.

In the first place, these studies report the effects of the improvement of rural farm-to-market and trunkline highways on adjacent and nearby farm lands as reflected by the sales value of these lands for agricultural use.

Next, the studies investigated the effects of the relocation of major trunkline highways on retail businesses

established on the abandoned routes or in small communities by-passed by the relocations.

Finally, highways were studied as physical entities whose location with respect to a small community may affect the pattern of community development and growth in the same manner as a stream, a marsh, a hill, or other physical barrier.

These studies serve to illustrate the variety and complexity of the relationships which exist between roadways and their adjacent lands and the consequent differences in the effects which changes in the road may produce in the lands and for the users of the land.

CHAPTER I

EFFECT ON FARM LAND VALUES OF DISTANCE FROM HARD SURFACE ROADS AND OF MAJOR HIGHWAY IMPROVEMENT — SHIAWASSEE AND INGHAM COUNTIES

It is a well established fact of agricultural economy that availability of roads, suitable and dependable for the transport of products and supplies, is a basic factor in determining the value of farm land. It is generally believed that agricultural land values increase as distance from a hard surface road is decreased, as long as productive potentials of the land are similar. Such non-user benefits have been advanced as arguments for broadening the tax base for highway support.

While it is generally conceded that this relationship between farm lands and roads holds true in times when and in areas where the distances involved are significantly large, there is a question whether it is still operative in Southern Michigan where the system of farm-to-market roads is now highly developed. Is it not possible that benefits are now so evenly distributed that existing

distances are not effective determinants of differences of farm land values?

That is the problem in these studies. They investigate the proposition that at this time, road improvement in an agricultural area, in addition to benefiting road users, facilitates the normal increase of farm land values in step with historical trends, but does not directly increase the value of farm land as such. Shifts of land from agricultural to generally more intensive uses, such as urban residential or industrial, are not considered in these studies which are concerned only with agricultural lands remaining in agricultural use. Changes in land use in relation to highway improvement are discussed elsewhere in this series of research studies.

A. EFFECTS OF DISTANCE FROM HARD SURFACE ROAD

It is the purpose of this study to determine if it is possible to distinguish a consistent difference between the average values of farm lands at varying distances

*Condensed from the technical research report, "Effects of Highway Development on Rural Lands", by Louis A. Vargha, Department of Agricultural Economics and Resource Development, and Michigan State University, Highway Traffic Safety Center, 1960.

from hard surface roads. Pursuant to this purpose, data of farm land sales in two representative Southern Michigan counties Shiawassee and Ingham, were obtained and analyzed in relation to the distance of the lands involved from a hard surface road at the time of the sale.

The studies of the two counties were conducted as separate research projects but inasmuch as like methods were used and like results obtained in both instances, they are here described as a single operation. Likeness of the findings of the two studies tends to substantiate and broaden their general validity.

1. Sources and Analysis of Data

Data regarding a total of 1,492 farm land sales in the two counties were obtained from deeds on file in the county seats.

In Shiawassee County the data were for eight years (1942, 1943, 1947, 1948, 1951, 1952, 1956, 1957), and in Ingham County for six years (1947, 1948, 1951, 1952, 1956, 1957). Care was taken to select only bona fide sales for agricultural purposes and no sales of less than 20 acres were included. Sales value in each case was derived from the Federal Documentary Tax stamps on the deed. While this method would be inadequate if exact quantitative values were required, it was judged to be sufficiently reliable for a study of relative values.

County road maps were obtained from the county road commissions of the two counties. (See Figures 1 and 2.) The sales data were grouped by years into categories based on one-half mile distances from a hard surface road, the last category consisting of land located at distances of three and one-half miles or more from such a road. Distances in each case were miles by road from the farmstead to the hard surface road.

Since there is a rising trend of land values due to increased population pressure and commodity prices, some form of compensation for this underlying factor was necessary if the impact of other influences was to be isolated and observed. The value data for the various years were adjusted to the base year 1948 by using the state index of farm land values prepared by the Agricultural Research Service of the U. S. Department of Agriculture.

The adjusted data were tested for differences by using a standard accepted statistical test, analysis of variance. The logic of this test is: that if the difference between averages is large enough, is consistent, and could not be attributed to chance, then the test would indicate that a statistically significant difference exists. This test was applied to the land values in the several categories in the two counties. The reader who wishes to study the test by analysis of variance in more detail,

is referred to the technical research report which also includes a detailed discussion of the theory of increases in the value of farm lands.

2. Results and Conclusions

The analysis of each year's data, as corrected for non-highway economic trends, showed no statistically reliable differences between land values in the several groups and categories. The analysis of all the years at once also showed no statistically reliable difference.

It was concluded that the absence of any statistically significant difference between the average value of farm lands grouped by distance from hard surface roads is probably due to the presence of an already highly developed system of farm-to-market roads. The time when one hard surface road more or less made a difference in farm land values has passed in the areas studied.

The network of improved roads is developed to the point where few farms are located at sufficient distance from all weather roads so that farm operations are hindered enough to be reflected in farm values. All farms apparently are benefited equally from the existing all weather secondary roads.

In Shiawassee County the increase in the number of all weather roads did not serve to increase the average value per acre of farms sold from 1942 to 1957. Even in 1942 and 1943, when the network was less complete, no statistical difference in land values was evident.

In Ingham County, the increase in the number of all weather roads did not serve to increase the average value per acre of farms sold from 1947 to 1957.

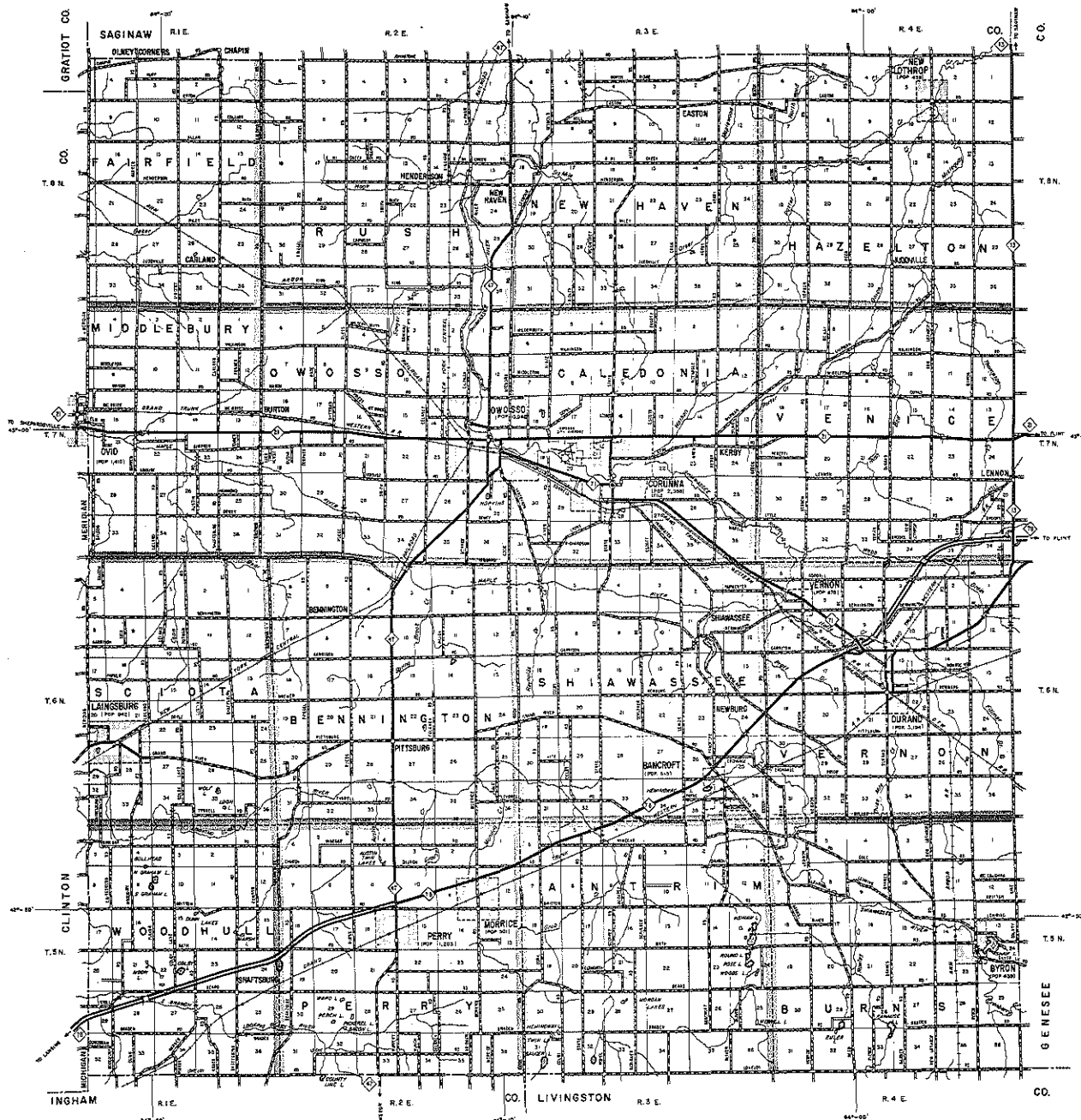
B. IMPACT OF A MAJOR HIGHWAY IMPROVEMENT

Having investigated the effect of distance from all types of hard surface roads on agricultural land values, it was deemed desirable to determine if a major improvement of an important state trunkline highway would have the same or a different impact on the value of farm lands along its route.

To this purpose, a ten-mile section along U.S.-127 in southern Ingham County was selected for study. U.S.-127 is a major north-south route with a heavy traffic load, and the selected section had been improved from a two-lane to a four-lane divided highway with partially controlled access, but with no grade separations. In the study section, parallel service roads provide access to properties previously fronting on the trunkline. The new highway was opened to traffic in December, 1956. (See Figure 2.)

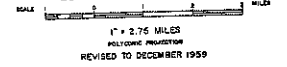
LEGEND

- ROADS
 - UNIMPROVED ROAD
 - GRAVEL AND GRAVEL ROAD
 - SOIL SURFACED ROAD
 - GRAVEL OR SIMILAR ROAD
 - BITUMINOUS SURFACED ROAD
 - PAVED ROAD
 - DIVIDED HIGHWAY
 - DOCKED HIGHWAY WITH FRONTAGE ROAD
- ROAD SYSTEM DESIGNATION
 - INTERSTATE HIGHWAY
 - UNITED STATES HIGHWAY
 - STATE HIGHWAY
- AIRPORTS
 - (WITH FUEL TANKS AND RUNWAYS)
- MILITARY FIELD (SOME FACILITIES AVAILABLE)
 - AIRPORT COMPLETE FACILITIES (COMMERCIAL OR MUNICIPAL)
 - AIRFIELD, LIMITED FACILITIES
 - LANDING AREA OR STRIP (INCLUDING PRIVATE AIRFIELDS)
- RAILROADS
 - RAILROAD (ANY NUMBER TRACKS) USED BY SINGLE OPERATING COMPANY
 - RAILROAD (ANY NUMBER TRACKS) USED BY MORE THAN ONE OPERATING COMPANY OR SAME OR ADJACENT RIGHTS OF WAY (NOT TRACKAGE RIGHTS)
 - RAILROAD STATION
 - RAILROAD ABOVE ROAD
 - RAILROAD BELOW ROAD
 - RAILROAD TUNNEL
- HIGHWAY BRIDGES
 - 100 FT. LENGTH OR OVER
 - 150 FT. LENGTH OR OVER
- GENERAL OVERPASS
- GENERAL UNDERPASS
- SUSPENSION
- ARCH
- TRUSS OR GIRDER
- HIGHWAY GRADE SEPARATION
- INTERCHANGE SHOWING RAMPS
- DRAINAGE
 - NARROW STREAM
 - WIDE STREAM (OVER 250 FT)
- NAVIGATION
 - FREE FERRY
 - TOLL FERRY
- DAMS
 - DAM WITH ROAD
 - DAM WITHOUT ROAD
- BOUNDARIES
 - NATIONAL BOUNDARY
 - STATE BOUNDARY
 - COUNTY BOUNDARY
 - CIVIL TOWNSHIP BOUNDARY
 - CONGRESSIONAL (U.S. LAND) TOWNSHIP BOUNDARY
 - SECTION LINE
- CITY AND VILLAGE
 - STATE CAPITAL
 - COUNTY SEAT
 - UNINCORPORATED COMMUNITIES
 - INCORPORATED CITY OR VILLAGE



GENERAL HIGHWAY MAP SHIAWASSEE COUNTY

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE
STATE HIGHWAY COMMISSIONER
DATA OBTAINED FROM
HIGHWAY PLANNING SURVEY
CONDUCTED IN COOPERATION WITH
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS



KEY TO COUNTIES



FIG - 1

GENERAL HIGHWAY MAP INGHAM COUNTY

MICHIGAN
STATE HIGHWAY DEPARTMENT

JOHN C. MAGIE
STATE HIGHWAY COMMISSIONER

DATA OBTAINED FROM
HIGHWAY PLANNING SURVEY

CONDUCTED IN COOPERATION WITH
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

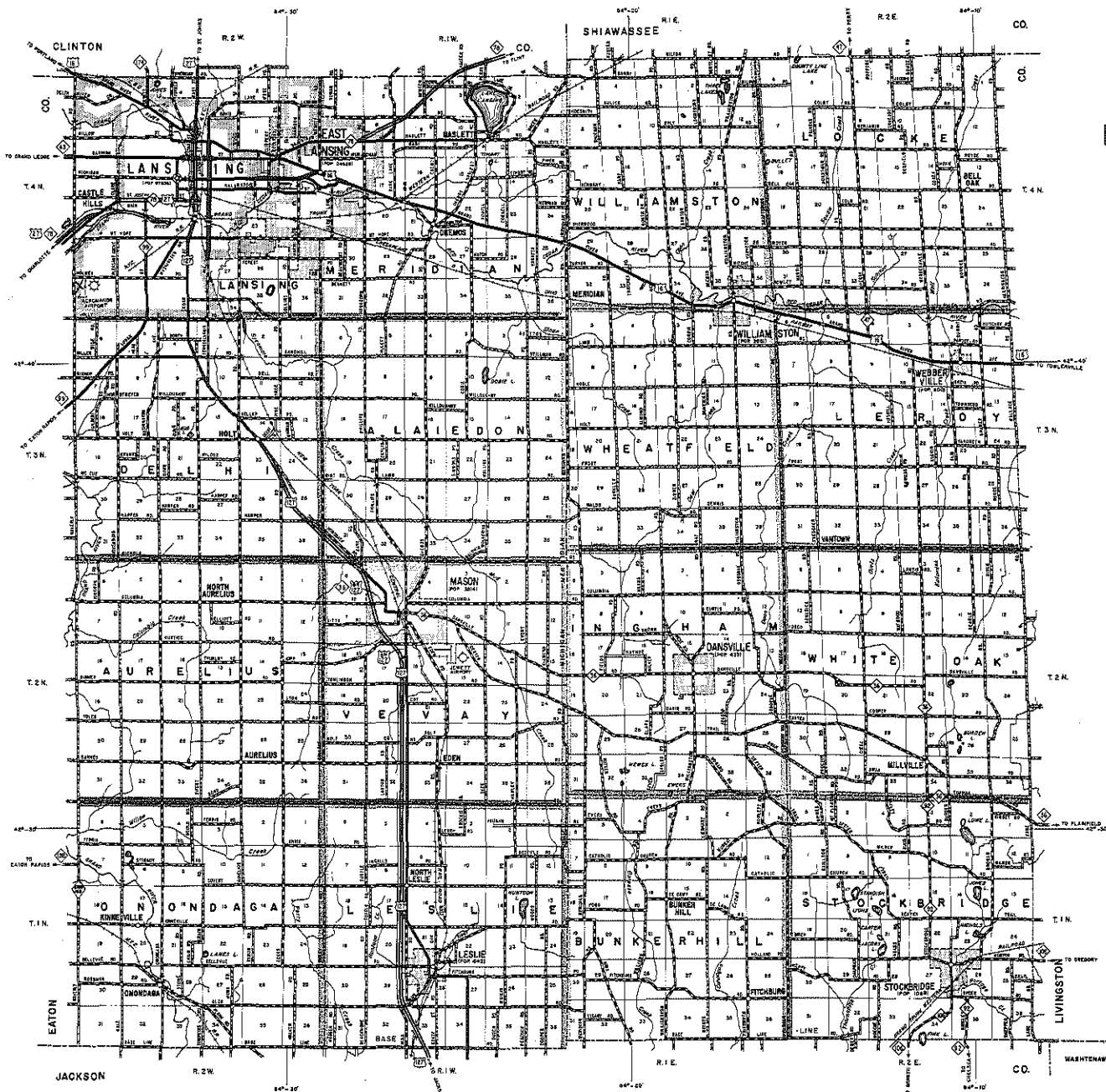
SCALE 1" = 2.75 MILES
PNEUMATIC PLOTTER



KEY TO COUNTIES

FIG - 2

- LEGEND**
- ROADS**
- UNIMPROVED ROAD
 - GRADED AND DRAINED ROAD
 - SOIL SURFACED ROAD
 - GRAVEL OR SIMILAR ROAD
 - BITUMINOUS SURFACED ROAD
 - PAVED ROAD
 - DIVIDED HIGHWAY
 - DIVIDED HIGHWAY WITH FRONTAGE ROAD
- ROAD SYSTEM DESIGNATION**
- INTERSTATE HIGHWAY
 - UNITED STATES HIGHWAY
 - STATE HIGHWAY
- AIRPORTS**
(WITH FIELD LIMITS AND RUNWAYS)
- MILITARY FIELD (ENGINE FACILITIES AVAILABLE)
 - AIRPORT, COMPLETE FACILITIES (COMMERCIAL OR MUNICIPAL)
 - AIRFIELD, LIMITED FACILITIES
 - LANDING AREA OR STRIP (INCLUDING PRIVATE AIRFIELDS)
- RAILROADS**
- RAILROAD (ANY NUMBER TRACKS) USED BY SINGLE OPERATING COMPANY (ANY NUMBER TRACKS USED BY MORE THAN ONE OPERATING COMPANY ON SAME OR ADJACENT RIGHTS OF WAY (NOT TRACKAGE RIGHTS))
 - RAILROAD STATION
 - RAILROAD ABOVE ROAD
 - RAILROAD BELOW ROAD
 - RAILROAD TUNNEL
- HIGHWAY BRIDGES**
(20 TO 200 FT. LENGTH)
- GENERAL OVERBRIDGE
 - GENERAL OVERBRIDGE (200 FT. LENGTH OR OVER)
 - SUSPENSION
 - ARCH
 - TRUSS OR GIRDER
 - HIGHWAY GRADE SEPARATION
 - INTERCHANGE SHOWING RAMP
- DRAINAGE**
- NARROW STREAM
 - WIDE STREAM (OVER 250 FT.)
 - NAVIGATION
 - FREE FERRY
 - TOLL FERRY
- DAMS**
- DAM WITH ROAD
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 - CONGRESSIONAL (U.S. LAND) TOWNSHIP BOUNDARY
 - SECTION LINE
- CITY AND VILLAGE**
- STATE CAPITAL
 - COUNTY SEAT
 - UNINCORPORATED COMMUNITIES
 - INCORPORATED CITY OR VILLAGE



The area chosen for study was a strip six miles wide lying either side of the selected section of highway.

1. Sources and Analysis of Data

As in the preceding studies, sales data were collected for analysis and care was taken to assure that the selected transactions involved agricultural land only. Further screening was effected by comparing sales descriptions with parcels in a detailed land use survey completed in 1958. Also as before, land values were derived from Federal Documentary Tax stamps affixed to the deeds.

Originally, the study area was divided into three zones based on distance from U.S.-127, as follows: Zone I, within one mile of the highway; Zone II, between one and two miles; and Zone III, between two and three miles from the highway. An attempt was made to distinguish a hierarchy of land values by zones. This proved to be impossible, which supports the conclusions drawn in the earlier studies.

Subsequently, all sales within the study area were grouped by years in one classification and average values per acre were calculated for each year and plotted on a semilogarithmic graph. Average values per acre for agricultural land sales in all of Ingham County were also calculated and plotted on the graph for comparison. The trend of land values in the study area was found to be not significantly different from the trend of farm land values in the county as a whole. Both trends basically followed a general rising pattern in line with the statewide trend.

2. Conclusions from U.S.-127 Study

Two conclusions were drawn from the analysis of the data. First, although land values moved upward before the opening of the improved facility, they turned downward after the route was opened to traffic, and there is no difference between the values of farm land in the study area and in Ingham County at large. Secondly, the improvement of U.S.-127 has had no discernible continuing impact upon farm land values in the study area.

A general conclusion is inferred from the two conclusions above. The system of roads and highways serving agriculture in southern Michigan is so extensive and so well developed that the needs of agriculture are well served. Their benefits are so pervasive that effects cannot be isolated in a small area on the basis of differential location with respect to improved roads. It appears that economic conditions in general, rather than specific highway or road improvements, are of basic importance in this area.

C. GENERAL CONCLUSIONS AND SIGNIFICANCE OF STUDIES OF HIGHWAY IMPROVEMENTS AND AGRICULTURAL LAND VALUES

These studies of the effect of the existing hard surface farm-to-market network and of major highway improvements on farm land values, point to broad conclusions which have important implications regarding basic problems of highway policy and planning. However, it should be remembered that the conclusions, and therefore their implications, are valid only as they concern farm lands remaining in agricultural use.

1. General Conclusions

The absence of any statistical difference between the average values of farm lands grouped by distance from hard surface roads is due to the presence in south-central Michigan of an already highly developed system of farm-to-market roads and to the extensive use of gasoline powered equipment which have made distances to market almost inconsequential in that area.

The increase in the number of all weather secondary roads did not serve to increase the average value per acre of farms in either Shiawassee or Ingham County. This would indicate that increasing the density of the network of hard surface roads had no effect on the level of farm land value. Further, since the farm-to-market road systems are well developed, even location in the direct service area of a major highway facility is not of primary significance in determining farm land values.

This is not to say that major state and federal arterials are of no value to agriculture, but that, since the farms' local transportation needs are so well served in this area, benefits of the trunkline highways are spread so evenly and widely that lands in corridors adjacent to such facilities enjoy no advantage over lands some distance from them.

Studies in other states or areas, where the secondary road network is less densely developed, may indicate at what point distance from a hard surface road becomes a critical factor in determining farm land values. Such information would be extremely useful in applying the principle involved in areas of Michigan where farm-to-market road systems are not as highly developed as in the area studied.

2. Some Basic Implications of Findings

While policy formulation obviously is not a function of research, some of the findings of these studies are pertinent for consideration by those who have

decision-making responsibilities, particularly in the fields of highway planning, finance, and right-of-way acquisition.

Since the data studied indicated that, in the areas investigated, benefits from the system to farm lands as such were evenly spread it appears that benefits to property from highway construction or intensive road improvement would probably be greater in areas where the existing level of road development permits improvements of facilities to give definite location advantages.

CHAPTER II

IMPACT OF MAJOR HIGHWAY RELOCATIONS ON RETAIL TRADE IN AREAS AND COMMUNITIES ADJACENT TO THE FORMER ROUTE

Roadside locations along open highways have long attracted commercial establishments. Such locations are advantageous for retail businesses because the highway affords access for customers from within and from beyond the adjacent area and, as traffic grew, because of the opportunity to attract and serve passing travelers. When the increased volumes and importance of the traffic movement made it necessary to provide new and modern highway facilities, this roadside development not only became a significant factor in planning and routing the new highways, but was itself much affected by the highway improvements.

The planning and construction of the Michigan segments of the National System of Interstate and Defense Highways has involved the relocation of important sections of major routes and the by-passing of communities. While the necessity and desirability of such relocations are seldom questioned, questions have been raised regarding the effects on businesses established on the former route of a relocated highway and on general business activity in the bypassed communities when they are deprived of direct access to the main traveled route.

Access is a different matter for retail business than for productive enterprises, including farming. Retailers do not go to market in the same sense that producers do; in a way, their markets come to them. For retailers, access means direct access to their business sites, although for most of them a complete and developed transportation system is of basic importance since they commonly are grouped in community business districts or shopping areas. Access to such a district or area is as important as is access to the individual establishments within the group. Changing or disrupting a customary traffic pattern may have serious consequences for retail businesses, especially for those that are dependent on

If "non-user benefits" are to be used as a tax base for highway finance, other criteria of benefit than distance from hard surfaced roads will have to be explored in agricultural areas where land values apparently are not increased by road improvement.

In areas where distance from a hard surface road does not significantly affect farm land value, the factor of farm land location on such a road may be deleted in farm appraisals for right-of-way acquisition.

trade with passers-by rather than with persons purposefully traveling to them. Businesses catering to transients on the highway are said to be "transient oriented" and obviously would be most sensitive to changes in "normal traffic movement."

This chapter reports the findings of two research studies, one of which investigated the impacts on retail business in areas affected by the relocation of U.S.-16 in western Oakland County and the other, the impacts of the relocations of U.S.-23 in southeastern Genesee County and of U.S.-127 in southern Ingham County. The two latter relocations involved by-passing two small communities, Fenton in Genesee County and Leslie in Ingham County. Both these studies were complicated by the fact that the relocations took place in the midst of a business recession which widely affected business conditions in the areas studied.

A. U.S.-16, GRAND RIVER ROAD, IN OAKLAND COUNTY

U.S.-16 is a major east-west highway connecting Detroit with Lansing, Grand Rapids and Muskegon. It is an important commercial and industrial route and, since it affords access to the Lake Michigan shore and to attractive lakes areas in Oakland and Livingston Counties, it also is much used by tourist and recreational traffic. It was originally established as a state trunkline on the route of the old Grand River Road and during half a century underwent an intermittent process of piecemeal improvement. However, after U.S.-16 was designated as a primary route on the Interstate Highway System, the section from Farmington northwest to the intersection with U.S.-23 near Brighton was relocated and developed to Interstate standards.

1. Purposes and Area of Study

It was the purpose of this study to determine the effects of the relocation of U.S.-16 upon businesses located on the section of Grand River Road which reverted to the status of a county road when the new divided, controlled-access highway was opened between Farmington and Kent Lake in Deember, 1957. In the area studied (See Figure 3), relocated U.S.-16 lies about a half mile north of Grand River Road which still is accessible as an alternate route between Detroit and Kensington Metropolitan Park at Kent Lake, but there was no through travel beyond the latter point inasmuch as relocation plans had made no provision for a bridge to carry Grand River Road across the Huron River.

Although the study section is within the Detroit Metropolitan Area, it is an area of low density urban development. There is some commuting to Detroit but, although there is little local industry, most residents work in the area. Commercial development was and is oriented primarily toward the transient trade provided by U.S.-16 (Grand River Road) traffic, much of it Detroit recreational traffic bound for the Oakland-Livingston lakes areas.

2. Methods and Data Used in Study

It was decided to study the receipts of businesses in the study area by compiling and analyzing sales tax data for the businesses involved, for a six-year period, 1953-1958. The trends in these data were then analyzed in relation to trends in data of such other indicators as general economic conditions, tourism, area and county growth, traffic movement, etc., most of them covering the nine years, 1950-1958.

Sales tax information, in such form that individual businesses could not be identified, was obtained from the State Department of Revenue for area businesses and for corresponding business categories in all Oakland County. Data regarding employment, disposable income for the Detroit Metropolitan Area, were used as indicators of general economic conditions. Average daily traffic volumes on the highways involved and park attendance data for pertinent state parks were obtained as indices of tourist and recreational activity. Basic development trends in the area and in Oakland County were represented by records of population and building permits.

3. Compilation and Analyses of Data

All data were prepared for graphing on trend charts. Such data as had a dollar value were adjusted by using the Consumer Price Index (1947-49 = 100.0) to

obtain constant dollar values. Other data were used as collected.

In considering the type of analysis to be used, it was decided to employ trend prediction based on statistical evaluation of the trends plotted graphically. The logic of this method is that: if a trend for the activity being tested is predicted on the basis of the trend of a similar activity which is not subject to the influence under analysis, and if the predicted trend differs significantly from the first activity's actual trend, then the difference may be attributed to that influence. Although the period of observation was short, it was hoped that trend prediction would be possible and the adjusted data, as graphed, were prepared for that purpose.

a. Gas Stations

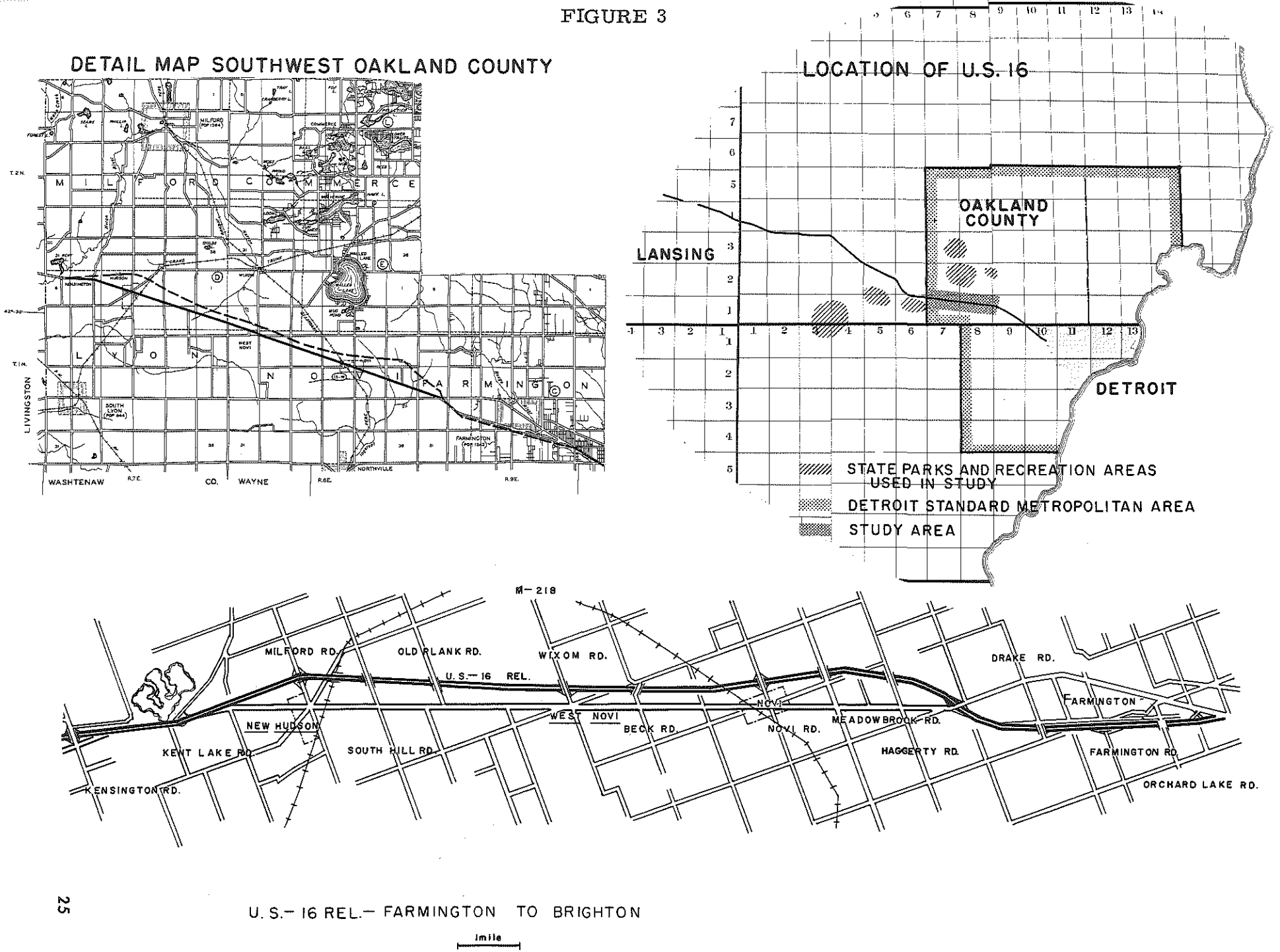
Gas stations, by the nature of their products and service, tend, in some degree, to be transient oriented. The trend in sales tax receipts for the eleven gas stations in the study area are compared with the trends of certain other indicators in Figure 4.

The effects of general economic conditions are observable in the sales tax trend for gas stations as in other indicators, but the gas stations in the area are particularly oriented toward transient business, and the trend of their activity is more variable. Like the other indicators, including gas station sales throughout Oakland County, the trends turn down in 1957, corresponding with the downturn in disposable income. But in the case of the trend for the area gas stations, the downward trend is intensified in 1958. The only other trend with a similar characteristic is that for state park attendance.

Since there was a fairly high correlation between state park attendance and the receipts of gas stations in the area for the period 1953-57, an expected or predicted sales tax value was determined for the stations for 1958 on the basis of the state park attendance trend data. The predicting line, error limits, and statistical figures are presented in Figure 5.

If the predicted gas station sales tax values for 1958 had corresponded with the observed values for that year, the conclusion would have been that the decrease in receipts was due to the recession. However, the two values differed to a statistically significant degree. The observed value was much lower than the predicted value. Although this does not absolutely prove that the relocation of U.S.-16 late in 1957 adversely affected business receipts of the gas stations, it does support the conclusion that the relocation aggravated the downward trend caused initially by the economic recession in southeastern Michigan.

FIGURE 3



b. Restaurants, Taverns and Refreshment Stands

Sales tax data for the nine restaurants in the study area and for the four businesses included in the category, "taverns and refreshment stands", were plotted against other selected control data. These groups are usually considered to be transient oriented. While countywide receipts for these businesses follow the trend of disposable income very closely, the trend for the businesses in the area more closely resembled that for state park attendance.

However, no trends corresponded precisely enough with the sales tax receipts for restaurants or taverns, etc., to warrant a statistical prediction. On the basis of the non-statistical comparisons, it was believed that the trends of these and of state park attendance reflected the general economic conditions rather than trunkline relocation, although the latter may have aggravated the decline of tavern receipts in 1958.

c. Grocery Stores

Grocery stores are usually considered to be fairly stable business oriented toward the local area and customers, but in the study area, neither of these generalities apply. Trend data in Figure 6 show sales receipts for grocery stores in Oakland County are fairly stable, while those for the five groceries in the study area are variable and their trend follows that for state park attendance quite closely, indicating their orientation toward transient trade.

It was felt that a statistical prediction might prove useful and a correlation between sales tax receipts for the nine groceries and state park attendance was made. (The prediction line, error limits, and the predicted and observed values are shown in Figure 7). However, the result is not statistically significant and it was concluded that the downturn in the trend for groceries, as for park attendance, was due to lessening recreational travel caused by the economic recession.

d. Other Business Groups

The ten other businesses in the study area fall into three groups: fruit and vegetable stands, building supplies, lumber and hardware, and sporting goods. No useful trend information could be developed for these groups and it was concluded that their downward trend was due to other causes than the relocation of U.S.-16.

4. Conclusions Regarding Effects of Relocation of U.S.-16

At present, as in the recent past, the orientation of retail business in the study area has been toward transient

trade. Of the 35 businesses, most were operating to a large extent on the basis of transients. There was a notable lack of businesses offering goods for the local shoppers market. The area should have been particularly sensitive to changes in the traffic pattern.

a. Immediate and Indirect Effects

The analyses of trend data indicate that the general downturn in business activity is due primarily to the reduction of transient traffic caused by the economic recession. There are some indications that the traffic diversion due to the relocation of U.S.-16 may have intensified this basic reduction slightly, although it is not clear whether this effect was the result of the relocation as such, or of the dead-ending of Grand River Road due to the lack of a bridge over the Huron River. It is possible that the construction of this bridge – now in progress – will remove any detrimental effects which the relocation may have caused.

b. Longer Range Effects Include Some Benefits

There are some indications of a change in the business orientation of the study area. The local area is growing. A new Lincoln-Mercury plant located at nearby Wixom has greatly broadened the area's industrial base and will act as a stimulus to further growth. Ford officials have stated that the selection of this location for the plant was based in great part on the excellent transportation provided by relocated U.S.-16. Further evidences of a build-up in the area served by the new highway are the incorporations of three local communities: Wolverine Lake (1955), Walled Lake (1956), and Wixom (1958). In the study area four new businesses have been established, three of them retailers of "shopping goods," and the fourth, a small manufacturer who bought and operates in a building formerly occupied by a restaurant. All these are signs of a shift of interest from transient trade to the local market and economy.

c. Public Relations Aspects

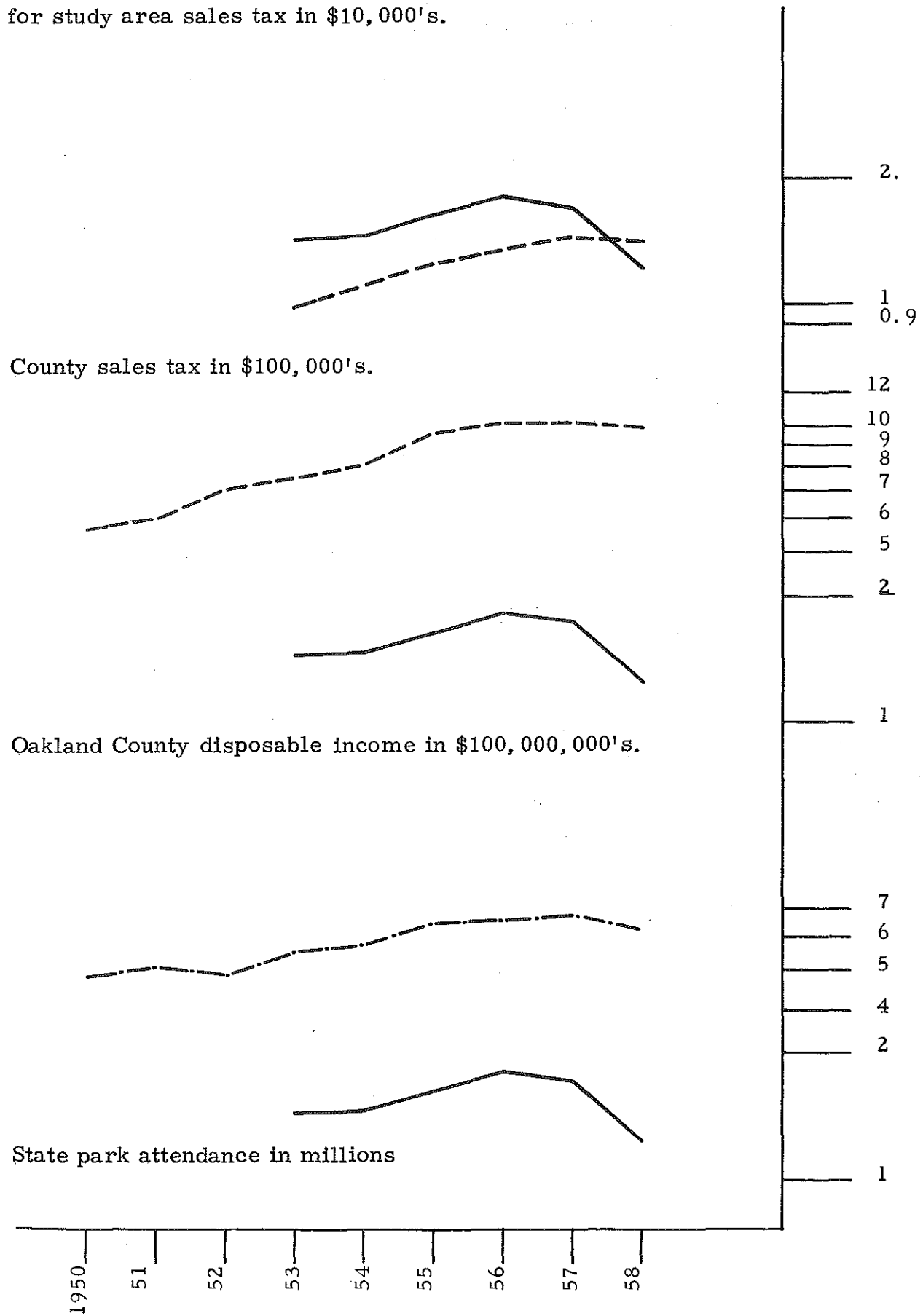
The relocation of a major route is always an extremely complicated process which may have important impacts on the businesses and lives of local people.

These should be assisted in making necessary adjustments by providing them with accurate information regarding the plans for and probable effects of such a relocation. For a discussion of the public relations problems involved in the relocation of U.S.-16, in Oakland County, see the technical research report.

(e)

Figure 4 Study Area Sales Tax Trends for Gas Stations and Comparison with Selected Indicators.

Solid line is in all cases trend for study area sales tax in \$10,000's.



(h)

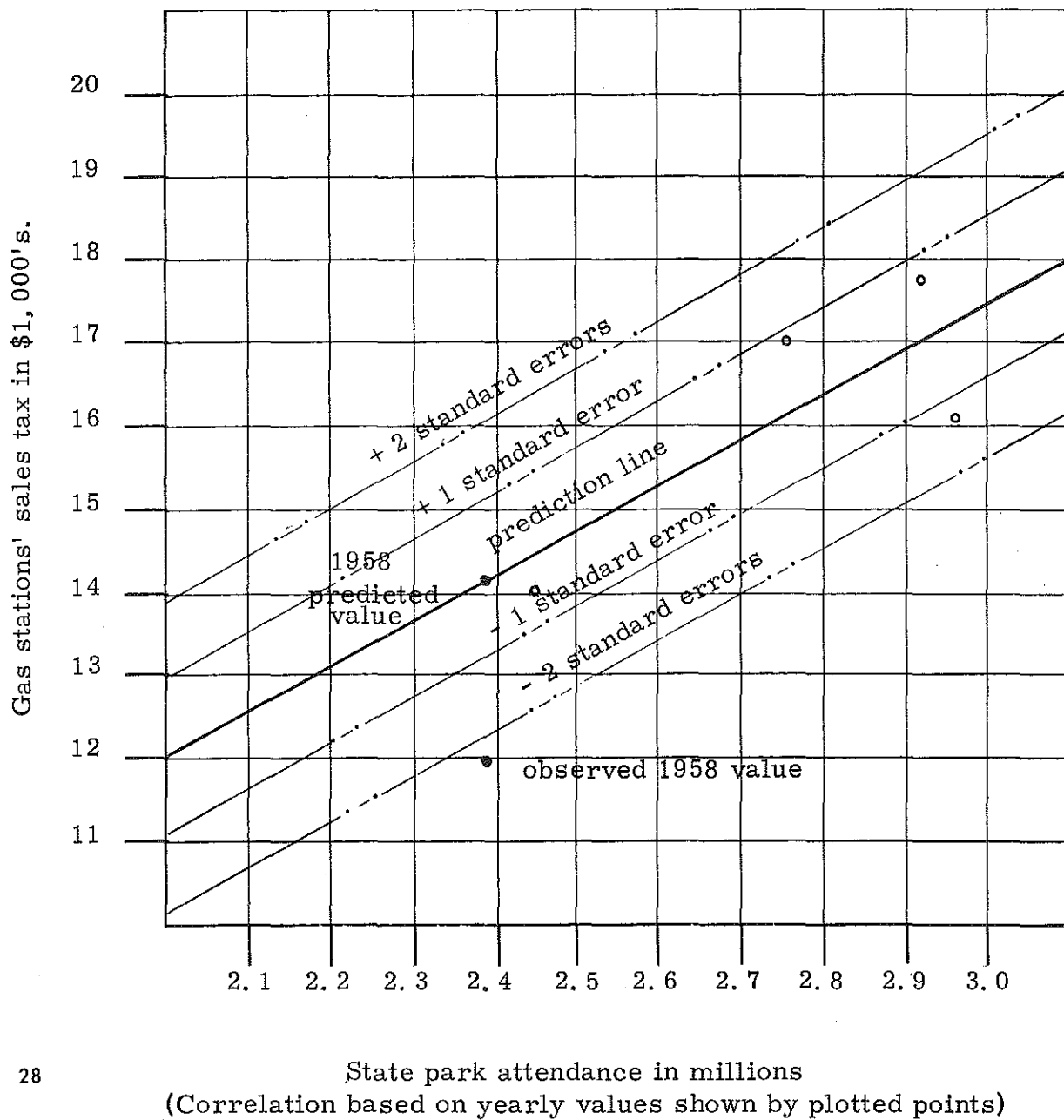
Figure 5 Prediction Line and Error for Gas Station Receipts Based on Correlation With State Park Attendance

$a = 1.45$
 $b = 5.34$
 $S_{xy} = .939$
 $r^2 = .845$
 $r = .713$

predicted value for 1958 is 14.23 thousand dollars

observed value for 1958 is 11.95 thousand dollars

the observed value for 1958 is significantly different from the predicted value at the 0.75% level.



B. RELOCATIONS OF U.S.-23 IN GENESEE COUNTY AND OF U.S.-127 IN INGHAM COUNTY

The routes of U.S.-23 in Genesee County and of U.S.-127 in Ingham County were opened to traffic coincident with the relocation of U.S.-16 in Oakland County, and it was hoped that a study of the impacts on businesses located on the former routes and in the by-passed villages of Fenton and Leslie would permit comparisons with the results and control data of the U.S.-16 study.

1. The Study Areas

Both highways are heavily traveled north-south tourist routes, but the two study areas differ in that the U.S.-23 area is under the direct influence of metropolitan Flint while the area on U.S.-127 is more distinctly rural. Of the two by-passed communities, Leslie is a small rural service center, while Fenton, as a satellite community center in the Flint complex, is larger and is growing rapidly.

2. Method of Study

The data and methods used in this study were similar to those employed for the U.S.-16 study. Sales tax data for businesses located on the former routes were obtained and analyzed and trends of these data were compared with a number of control trends including county sales tax receipts, county disposable income, population, employment, and state park and recreational area attendance. Where similarities warranted, correlation and prediction were tried as means of separating the effects of relocation from those of the economic recession.

3. Results of Analysis

In the U.S.-127 area, a prediction for gasoline stations supported the contention that traffic diversion had severely reduced the business volume of these strongly transient oriented establishments.

In the U.S.-23 area, two predictions were attempted; the first indicated that tavern receipts in Fenton were not impaired by the relocation; the second was a prediction of receipts of hardware stores in Fenton and, although these normally are thought of as locally oriented businesses, the test indicated a material reduction of volume, probably because in this area fishing and hunting supplies are major items in hardware sales.

The other trends studied in the two areas did not compare closely enough for any reliable statistical predictions.

4. Conclusions from Results

In these areas, the over-riding effects of the economic recession are evident. The relocation of U.S.-127 has not been a general depressant to business in the vicinity of Leslie where only one type of business, gas stations, could be definitely considered as having been adversely affected. In the U.S.-23 area, only two groups of businesses showed such effects. All others, although their trends were downward, had not been affected by the relocation, but by general economic conditions.

It must be remembered that a very short time has passed since the new facilities were opened to traffic. There is as yet little business development adjacent to access points on the relocated routes, and establishments on the old routes may still be servicing traffic of the new route by what could be termed default. It is to be expected that future developments will reduce the number of highway users seeking services at any distance from the new facility. This will further increase the adverse effects of the relocation for businesses on the former routes.

C. GENERAL CONCLUSIONS REGARDING THE EFFECTS OF HIGHWAY IMPROVEMENTS AND RELOCATIONS ON ROADSIDE LANDS AND BUSINESSES

One general conclusion that is drawn from the studies of these three highway relocation areas is that most businesses are dependent on local trade for stable activity. A greater number of apparently "transient oriented" types of business are stabilized by local trade than normally would be assumed. Even those businesses on the former trunkline route between Fenton and Flint drew local trade and were found to be more closely tied to the area's economy than to transient traffic. In such cases, the adverse effects of a relocation will be minor and of very small consequence. The results revealed by these successive studies tend to substantiate this conclusion as the general case.

Two general comments are necessary for any reader attempting to generalize from these studies.

First, the time interval used for the statistical test is short, although the coefficients of determination and correlation are high enough to partially offset this weakness.

Second and most important, the effects of a new highway are continuing and broad; they cannot be completely assessed in terms of business receipts alone, and surely not in terms of a single year.

Studies such as these make available the facts of

experience as an offset to apprehensions of businessmen and other citizens and so have value for public information, but they give no final answers to questions regarding the impacts of highway improvements. To provide such answers, prediction and not recapitulation is necessary for the impact of greatest importance and

least known is on the future utilization of lands in areas such as these. As has been stated, this aspect of the effects of highway development was investigated as a separate project in this broad study of the Economic and Social Effects of Highway Improvement and the results are presented elsewhere in this report.

CHAPTER III

HIGHWAY BY-PASSES, NATURAL BARRIERS AND COMMUNITY GROWTH IN MICHIGAN

The foregoing chapters of this section of the report have presented the findings from several studies of the effects of highway construction and improvement in certain economic fields; namely, farm land values in relation to proximity to hard surface roads, and the effects on retail trade of the traffic diversion resulting from a highway relocation. However, farm land value is only one aspect of the influence of highways on land utilization, and business activity is only one of many possible economic activities. Moreover, highways may have even more basic impacts than on economic factors.

The influence of highways, as heretofore discussed, was in relation to their functional service as channels for transportation movement. But these channels are also physical entities and are as much topographical features as are hills, valleys or streams, and like these, may be barriers affecting the pattern of community development and growth.

It is the purpose of this study to illustrate and discuss the effects of physical barriers and of the interaction of such barriers and highway by-passes on the growth patterns of small Michigan communities, and to discuss some principles which may be useful in determining by-pass locations to insure orderly community growth and a useful service life for the by-pass facility.

A. BARRIERS AND COMMUNITY GROWTH

Numerous geographers and economists have explored the forms in which communities grow. Such patterns as "stars" and concentric zones have been delineated; and linear cities, described as "strassendorfs", have been charted. These various forms have been explained and accounted for in terms of transportation, physical environment, etc.; for instance, true "stars" and near "circles" owe their symmetry to having developed on flat terrain which posed no physical barriers to distort the pattern of growth.

In Michigan there are a number of common natural physical barriers to growth such as lakes, rivers valleys,

flood plains, swamps or marshes, and large areas of organic soil. Extreme slopes also are barriers, but are relatively less common except in the Upper Peninsula, although sand and gravel pits and glacial moraines are found in many southern sections.

However, constructed physical features may impart many barrier-like effects. Railroad rights-of-way, marshalling yards and industrial districts have qualities which are felt to be undesirable and thus may act as physical barriers. Highways, too, may have a similar influence. A by-pass constructed around a small community becomes a part of the community's physical environment. Its function entails relatively heavy high-speed traffic with elements of noise and danger. The danger element can be greatly reduced by controlled access design, but this in turn brings an additional problem by its physical isolation from the roadside; it is and acts as a barrier.

The importance of barriers stems from two basic problems to which they give rise. The first problem is difficult and costly construction which may result from extreme slopes, rock out-croppings, or swamps; lakes, of course, fall in the extreme end of this category because they may render construction almost impossible. Organic or poorly drained soils present problems not only of construction, but of water supply and sewage disposal.

The second major problem posed by barriers is one of physical or spatial isolation, if development hurdles the barrier. River valleys, flood plains, marshes, railroad rights-of-way and even lakes can be crossed by a community, but the trans-barrier development is spatially separated from the original growth. In larger cities, which often are divided into communities and then into neighborhoods, this discontinuity would be a normal phase of city life. Even small cities customarily are divided into neighborhoods, but in small towns and villages where community and neighborhood are synonymous and where proximity and continuity are accepted and functional requirements of both, there is a reluctance to accepting spatial discontinuity and iso-

lation and this leads to delays in extending development across barriers.

In such cases a growing small community usually expands in a direction away from the barrier and this continues to a distance where building sites at the fringe are as isolated from the primary focus of the community as are those across the barrier. Thus, a point of indifference is reached and further development may take place in both directions, resulting in growth by sprawl instead of development in an integrated community pattern.

B. METHODOLOGY AND MATERIALS OF STUDY

The method of this study was to examine the extent and nature of natural barriers in Michigan and their effect on the growth of the state's small communities, to analyze the interaction of highway by-passes and natural barriers in terms of location theory, and then to test the applicability of the theory by reference to the case histories of two small communities in Shiawassee County.

To determine the extent and nature of natural physical barriers in Michigan, geological survey maps, available for most of the southern one-third of the state, were studied. It was possible to determine whether or not natural barriers to growth existed in the case of 218 of the smaller communities (population under 2500). Of these, 123, or 56.4 per cent, were considered to have such barriers around them. In the case of 31 other places, it was determined that the barriers were not important, i.e., either they had been crossed (mainly by larger communities) or were too small to be significant. Of the 218 places studied, 145 were located on state or U.S. highways and 60 per cent of these had significant natural barriers. Practically all of the barriers in all cases were water or water associated.

To illustrate the effects of natural barriers upon the growth patterns of small communities, 20 communities were selected at random for special study from the 218 small southern Michigan communities included in the geological survey maps of that part of the state. Maps and analytical comments for 10 of these places are shown on Figures 8 and 9 of the following pages.

C. EXAMPLES OF GROWTH PATTERNS

COOPERSVILLE, population 1371, Ottawa County. (See Figure 8A) The only physical barrier of any consequence is the flood plain associated with Deer Creek on the east. Notice that, although this is a fairly sizeable small community, relatively little development has occurred across Deer Creek even though it is not an extensive barrier.

MATTAWAN, population 400, Van Buren County. (See Figure 8B) Mattawan has no important natural physical barriers around it. Note, however, that the topography to the southeast is severe enough that growth at this time has been away from the base of the ridge line. Only a few residences have been built upon the slopes. This may be explained also by the railroad track which lies at the base of the morine and adds another barrier.

WESTPHALIA, population 459, Clinton County. (See Figure 8C) Westphalia has no natural barriers of any significance other than a general condition of heavy soils throughout the area. Note that although this is not the first community mentioned in this study as having no appreciable physical barriers to growth, it is the first to approximate a regular star pattern along highways.

CARLETON, population 1039, Monroe County. (See Figure 8D) There are no important physical barriers in the vicinity of Carleton, but its growth patterns show clearly the effects of railroads as barriers. Note that the intersection of the D. T. & I. R.R. and the C. & O. R.R. forms two acute angles and two obtuse angles, and that almost all of the town's growth lies within the two obtuse angles.

LAMONT, population 150, Ottawa County. (See Figure 8E) Lamont has two major physical barriers to growth, both located to the south. The first and most obvious is the Grand River and its flood plain. The second is the steep bluff-like slope of the Grand Valley at this point. These two factors have combined to influence the linear growth of Lamont, which is as close to being a "Strassendorf" settlement pattern as any community in Michigan.

GREGORY, population 200, Livingston County. (See Figure 9A) Gregory is situated in an area of gently rolling land wherein low spots usually are marshes and these constitute the major barriers to growth. Note the irregularity of the road pattern in the immediate vicinity. Growth from the community has tended to follow local roads as these in general thread their way through the marsh areas on high ground. The large marsh to the east is the major barrier, and the smaller marsh to the southwest is a secondary barrier. Major growth has been confined to the upland part of the moraine situated between these barriers.

MAYBEE, population 428, Monroe County. (See Figure 9B) The area presents no natural physical barriers of consequence. The area is level with lake clay and internal drainage, as well as run-off, is slow and consequently low areas are avoided as building sites. Note that only one building is located below the 635 foot

(n)

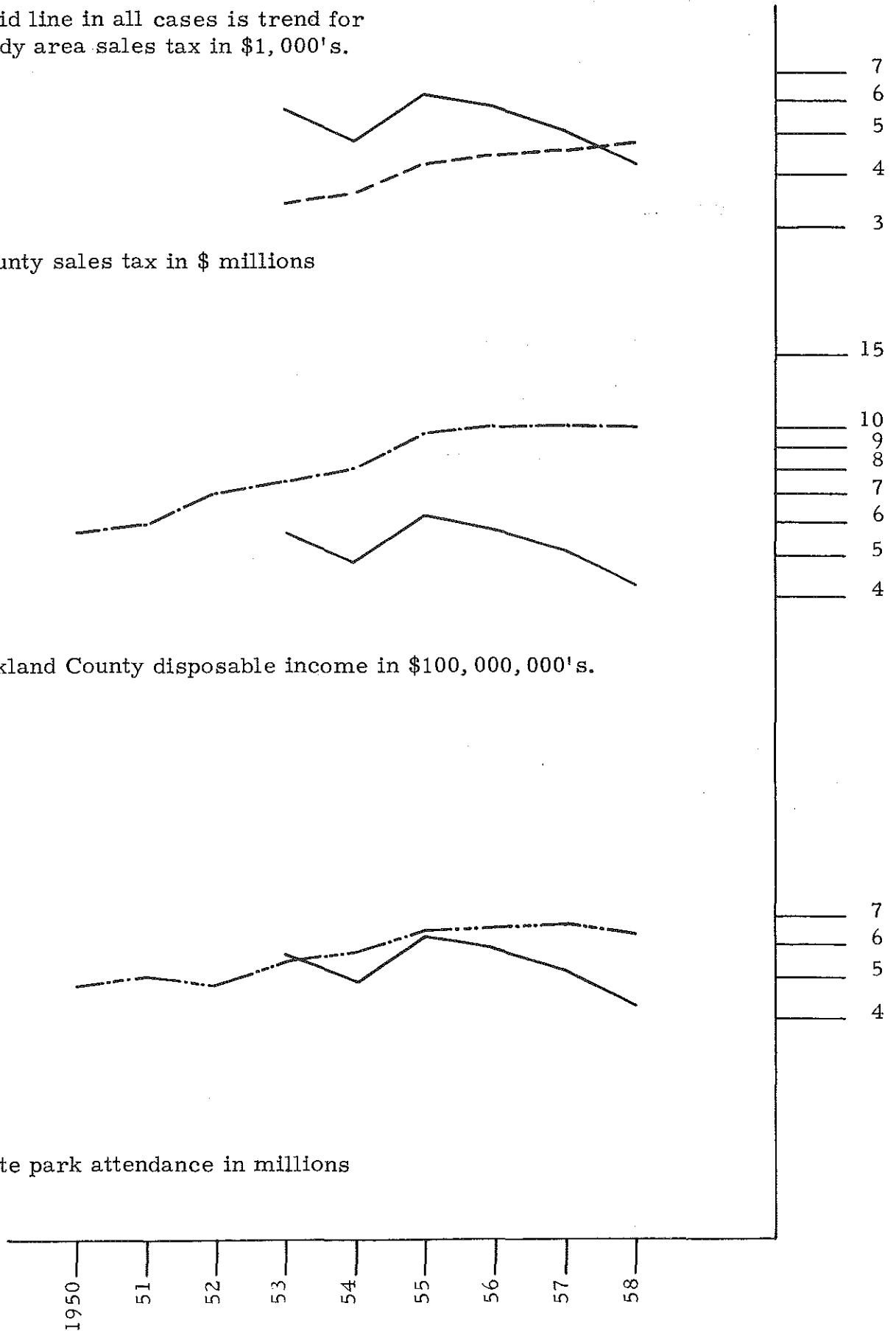
Figure 6 Study Area Sales Tax Trends for Grocery Stores and Comparisons with Selected Indicators

Solid line in all cases is trend for study area sales tax in \$1,000's.

County sales tax in \$ millions

Oakland County disposable income in \$100,000,000's.

State park attendance in millions



(q)

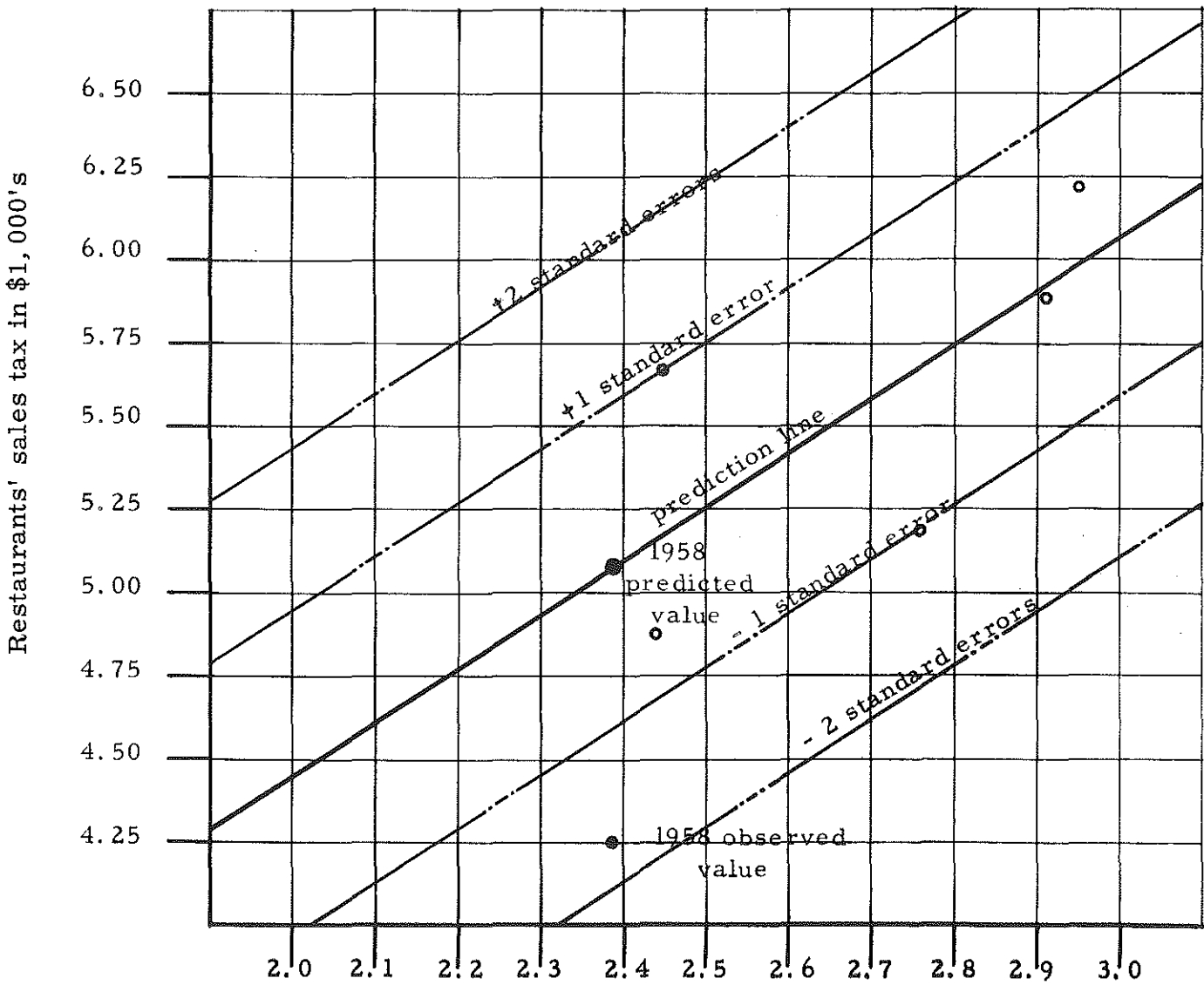
Figure 7 Prediction Line and Error for Grocery Store Receipts Based on Correlation With State Park Attendance

$a = 1.41$
 $b = 1.54$
 $S_{xy} = .468$
 $r^2 = .684$
 $r = .467$

predicted value for 1958 is 5.09 thousand dollars

observed value for 1958 is 9.26 thousand dollars

there's no statistically significant difference between these values.



State park attendance in millions
(Correlation based on yearly values shown by plotted points)

contour level, indicating this aversion to low, poorly drained land and its effect on a community of this size.

GOODRICH, population 570, Genesee County. (See Figure 9C) Goodrich is located in a ground moraine area. Notice that topography is irregular and that some local relief is relatively severe. There are several barriers to growth. First, the marsh to the north limits growth in that direction. Local relief to the west is severe enough to hamper development, and the mill pond and marsh to the south also hamper development in that direction. Primary growth has occurred on high level ground west of Kearsley Creek; recent growth has crossed the creek and is located on terraces which provide level sites for further expansion.

NAPOLEON, population 370, Jackson County. (See Figure 9D) Napoleon is situated on an outwash plain at the base of a moraine. The major barrier is a marsh which is quite extensive and limits southward growth. Growth has been westward and northward on the sandy, well-drained, level outwash plain away from this barrier. Note the westward expansion along M-50 and the northern expansion toward the railroad. Note also that growth has stopped south of the railroad right-of-way and has not crossed this man-made barrier.

MENDON, population 844, St. Joseph County. (See Figure 9E) Mendon is located on a level outwash plain on the north bank of the St. Joseph River which poses a barrier to the town's southward expansion. Growth has been basically northward, although there is a small enclave on the western edge whose focus is the Pennsylvania Railroad and the supporting facilities found clustered around the railroad in agricultural service centers. Observe the very slight growth south of the St. Joseph River.

Mendon provides an example of how important the nature of physical barriers can be when decisions are made regarding by-pass location. Highway M-60 now goes through Mendon, constantly staying north of the St. Joseph River. If a by-pass were built around the community, close to its northern edge, the constricting effects can be easily deduced. If the by-pass were a controlled access facility, Mendon would have two physical barriers to overcome. If the facility were non-controlled access, development eventually would take place along the by-pass and local traffic, turning movements, agitation for speed control and traffic signals would soon negate many of the advantages provided by the by-pass. In either case, growth also might be forced across the river, which would increase the cost of community services and interrupt the continuity of community growth.

1. General Inferences Regarding Natural Barriers and By-pass Location

The effects of the various kinds of natural physical barriers, as analyzed in the survey of 218 smaller communities in southern Michigan, reveal certain general characteristics of natural topographical features considered as barriers to community growth.

It appears that the barrier effect of the natural features is relative to the size of the community. Some of the features may be barriers for a community of 200 population and have no effect on a community of 1000 population. Others may be barriers for communities of 1000 or 2000 people, but not for substantially larger places.

Analyses indicate that natural features which block expansion of a community of a few hundred people cease to be effective barriers when the community's population grows to between 1200 and 2000. In that population range it appears that absolute physical and spatial continuity becomes less important and a community naturally splits into two or more neighborhoods.

In general, this study has been concerned with natural barriers in relation to smaller communities, usually of less than 1500 to 2500 population. In the modern highway pattern, such places are way points on the lines connecting the larger centers which are the principal origins and destinations of the trips that make up the total trunkline movement. In modern highway location practice, such communities are frequently by-passed.

Natural physical barriers involve conditions which create high costs not only for community expansion, but for highway construction. For that reason, economy will dictate a location for the by-pass away from these conditions. That means that the cordon of barriers will be extended around another and hitherto open side of the community. Unless careful consideration is given to the effects of the by-pass location, the community may be caught in an encirclement that precludes the possibility of orderly growth and the by-pass' usefulness may be impaired by encroachment of community activities and requirements.

2. Two Case Studies in Community Growth

The interaction of natural physical barriers and highway by-passes in relation to community growth was analyzed in some detail in a study of two Shiawassee County villages, Perry and Vernon.

a. PERRY, population 1203, Shiawassee County. (See Figure 10)

The base map shows the natural and man-made barriers in and around Perry, and the community's growth

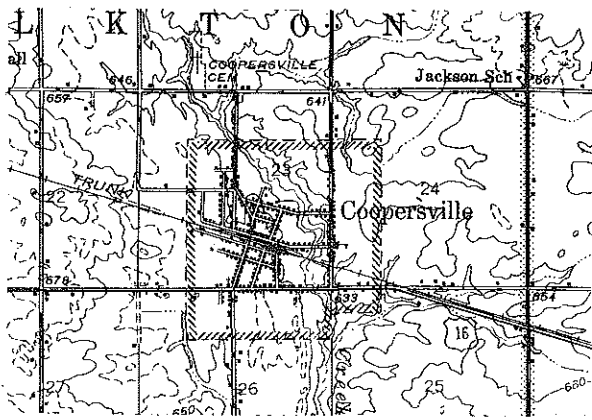


Figure 8 - Coopersville

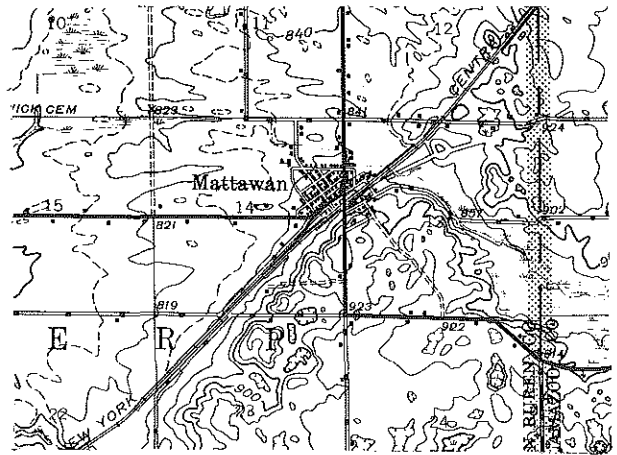


Figure 8 - Mattawan

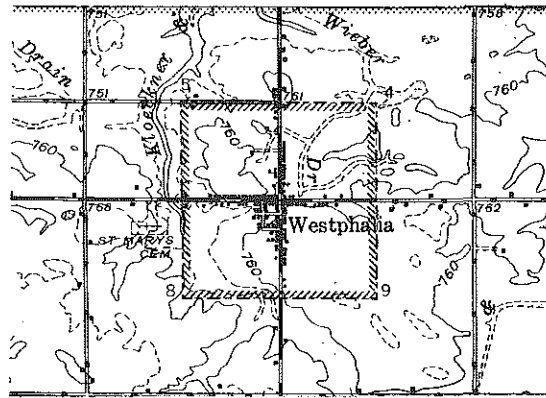


Figure 8 - Westphalia

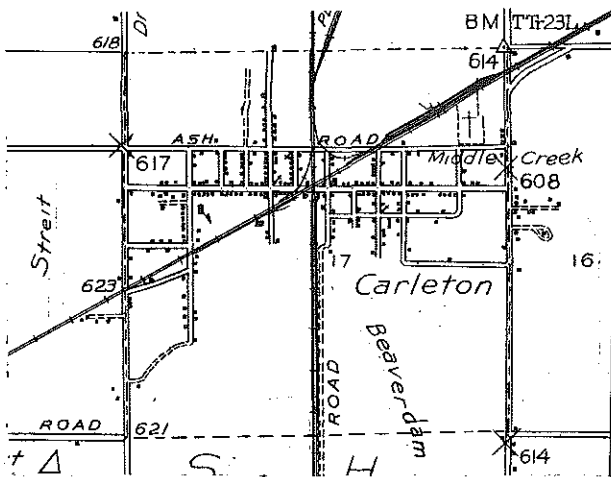


Figure 8 - Carleton

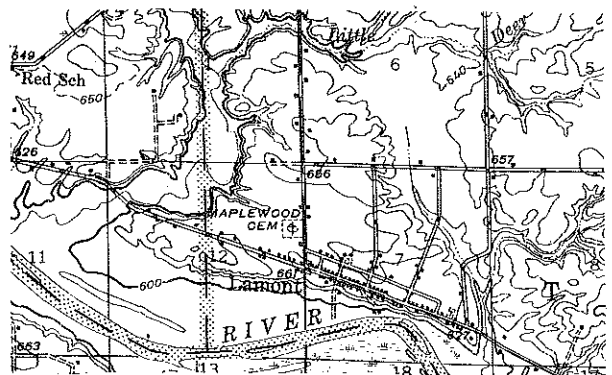


Figure 8 - Lamont

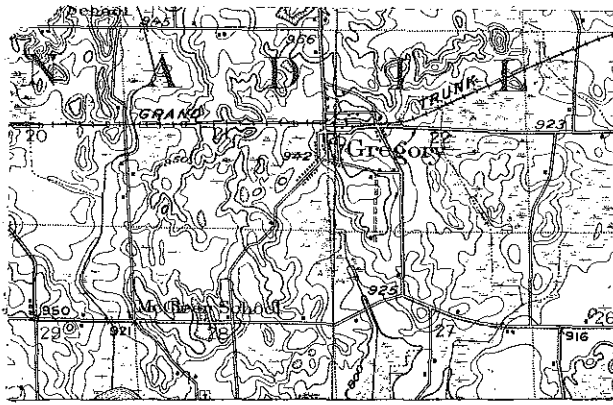


Figure 9 - Gregory

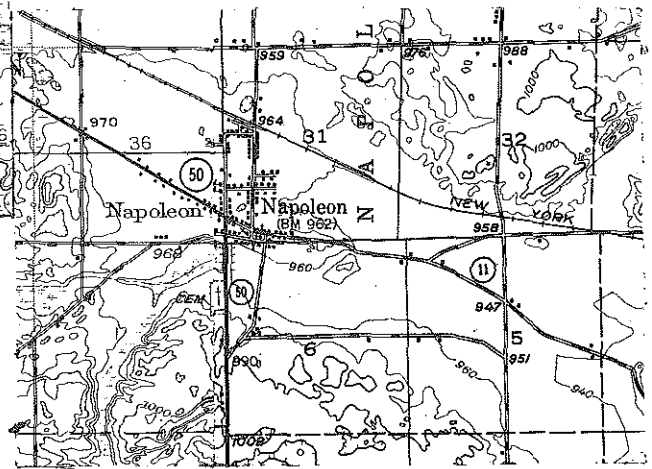


Figure 9 - Napoleon

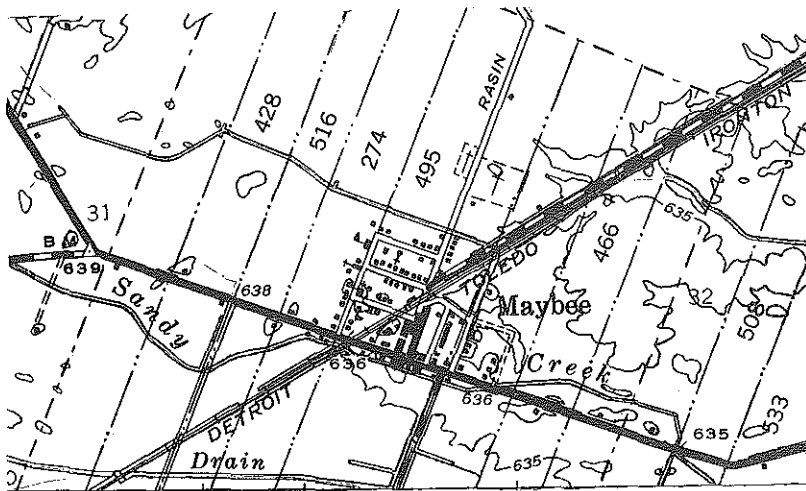


Figure 9 - Maybee

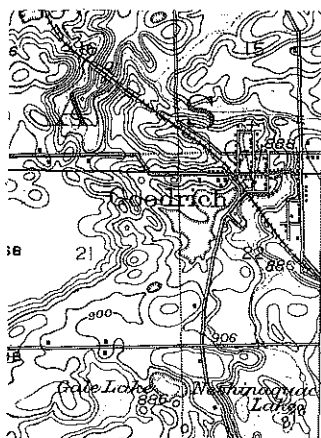


Figure 9 - Goodrich

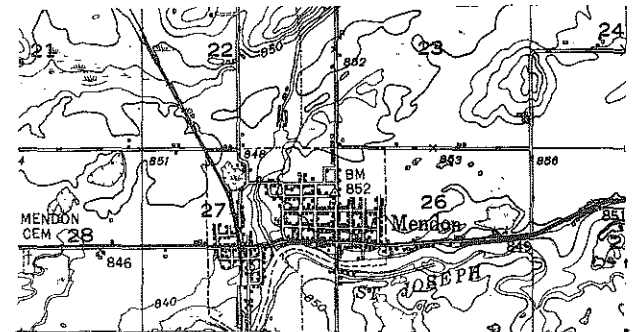


Figure 9 - Mendon

to 1940. The overlays show the pattern of growth in each of the two following decades.

Perry is located in southwestern Shiawassee County on the Grand Trunk Western Railroad and near the intersection of state routes M-47 which passes through the village and M-78 which by-passes Perry a quarter mile north of its northern fringe. Perry has been an active rural service center, but is within easy driving distance of Lansing and is becoming more of a satellite community. However, much of village life remains and many area residents work in small local industries serving area needs.

Most of the residential growth as well as the commercial center are south of the railroad, but since growth in this section is limited by heavy soils to the south and east, a second development area began north of the tracks. Perry has continued to expand within its core area, but more recently the limiting barriers have forced some settlement to take place north, on and across M-78, and south, across the belt of organic soil.

A real problem has developed for Perry because of constriction between the state highway and the series of extensive natural physical barriers on its south and east sides.

Had M-78 been located further north, it probably would have been advantageous for both the town and the highway. The community's growth would have been more compact and orderly and less development would have occurred on the highway roadsides to impair traffic operation.

The problem is not that simple, however, for the more northerly location involves topographical difficulties which would have increased costs.

That poses a policy question: What is more important, orderly community growth or increased cost of construction? The latter may at least be estimated. The social and economic costs of disorderly community growth, fringe disintegration, and reduced highway efficiency, due to forced frontage residential development, are other and less tangible debits, but they are none the less real and important.

b. VERNON, population 678, Shiawassee County. (See Figure 11)

Vernon is another example of a community constricted between a highway and natural physical barriers. A small rural service center located in a good agricultural area, Vernon has enjoyed a steady growth. The Shiawassee River valley and flood plain, tight contour and railroad rights-of-way severely hinder growth to the west and northwest, while the Holly Drain, the railroads and an extensive belt of heavy soils are barriers to southward growth.

In the middle thirties, in conjunction with the construction of M-78, M-71 was built as a connection between that highway at Durand and M-21 and M-47 at Owosso. M-71 was located to by-pass Vernon, but very close to the northern and northeastern fringe of the community's growth.

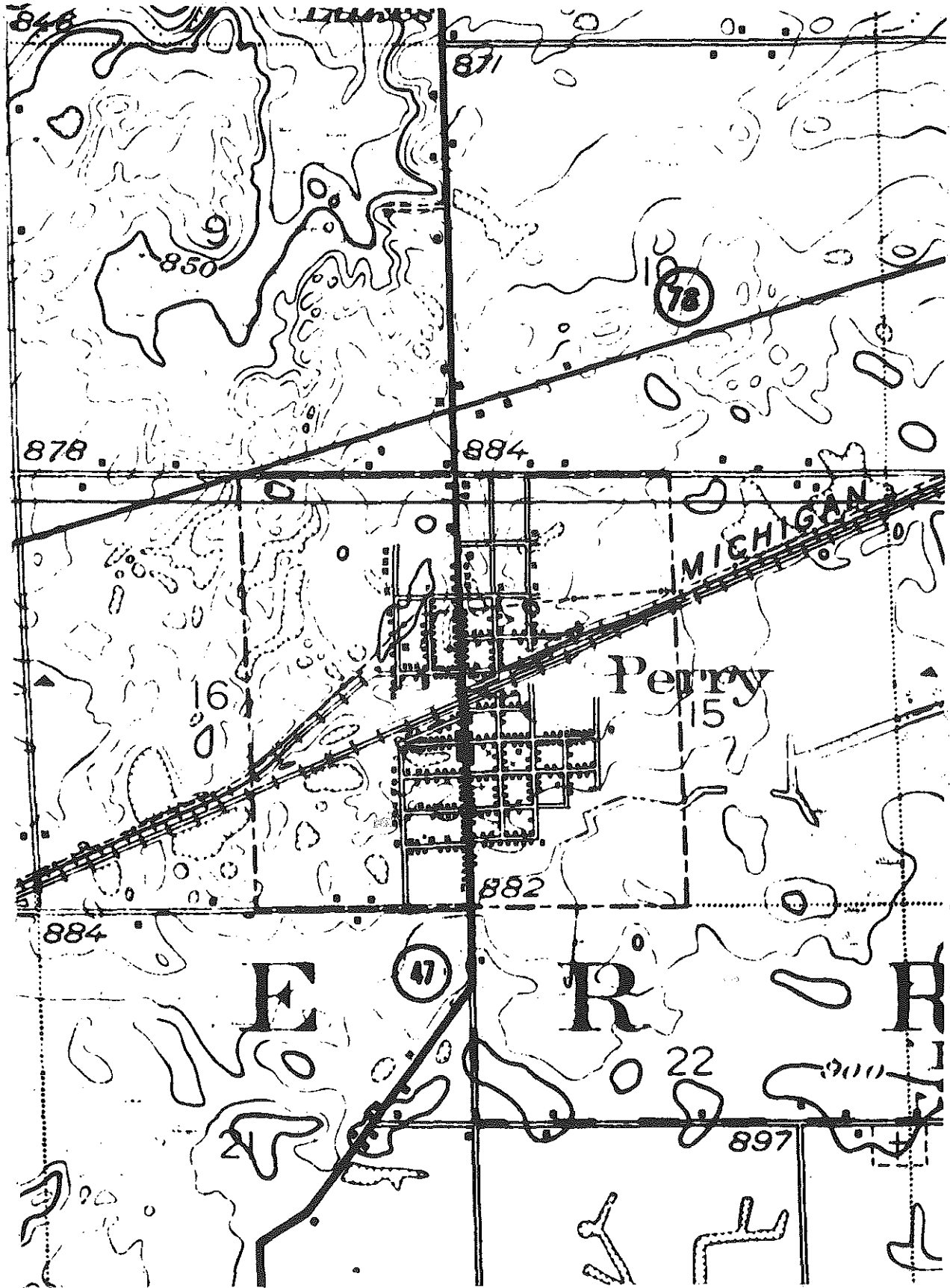
From the growth pattern shown in Figure 11, it is evident that Vernon's growth has spilled onto frontage property abutting M-71 because northeast was the only direction left for expansion. It would seem to be a safe assumption that development on the highway at this point has not increased the efficiency of the by-pass. Further, there has been agitation for speed limits in this area and for a traffic signal at the intersection of M-71 and Vernon's main street. Future development of the community can be expected to intensify this need and to further reduce the efficiency of traffic flow.

In all probability, this condition could have been avoided, if in the 1930s it had been considered that growth could only be in one direction, and a route had been selected at a greater distance from the village's then existing northern fringe.

D. CONCLUSIONS AND RECOMMENDATIONS

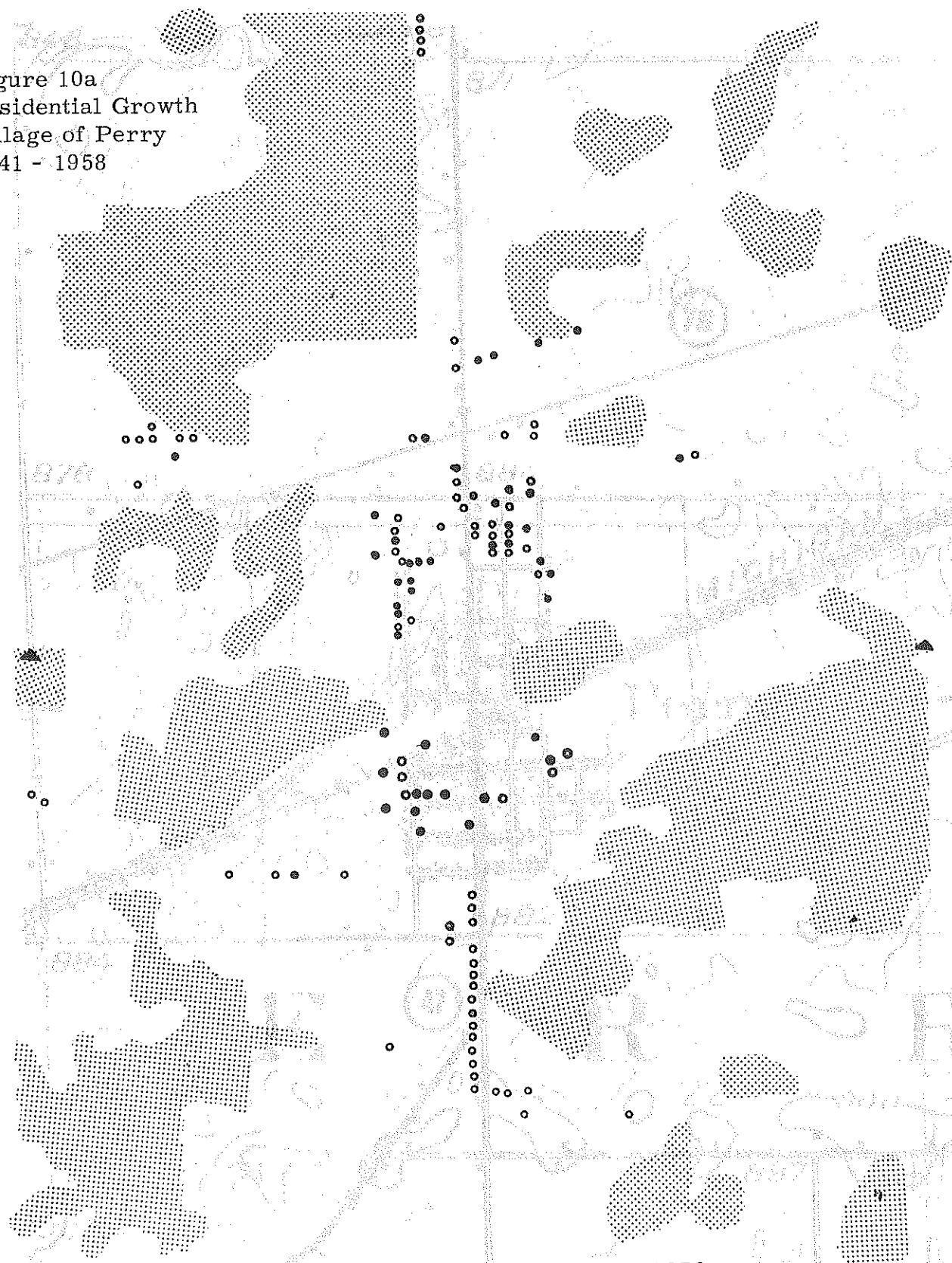
In the portion of southern Michigan covered by the study, natural physical barriers to community growth were found to be widely distributed and significant determinants of community growth patterns. The difficulty of bridging such barriers and the barrier-like effects of by-passes on small communities indicated a need for careful selection of by-pass routes. If the growth of a community is to be orderly and not of such a character as to obviate the advantages of a by-pass, the route for the latter should be located at a considerable distance from the core of a community's growth. This is necessary because growth on a by-pass may be more easily accomplished than the crossing of most natural barriers.

It was determined that most small communities bridge natural barriers when their population has exceeded between 1200 and 2000, depending upon the extent of the natural barrier. This conclusion is supported by an analysis of the cases of seventeen small places whose growth had crossed such barriers. In only two instances had barriers been crossed by communities of less than 1000 population. In three cases, the communities had between 1000 and 1200 population. Of course, it is impossible to pinpoint exactly when these barriers were crossed; however, the preponderance of communities with population less than 1200 have not bridged natural barriers. And, since the majority of communities that have bridged their natural barriers have more than 1200 population, it is reason-



38 Figure 10b Community Development Village of Perry by 1940 and Physical Environment

Figure 10a
Residential Growth
Village of Perry
1941 - 1958



- Residential Construction between 1941 and 1950
- Residential Construction between 1951 and 1958

Shaded Area Indicates Agricultural Land Removed from
Crop Production Due to Physical Limitations

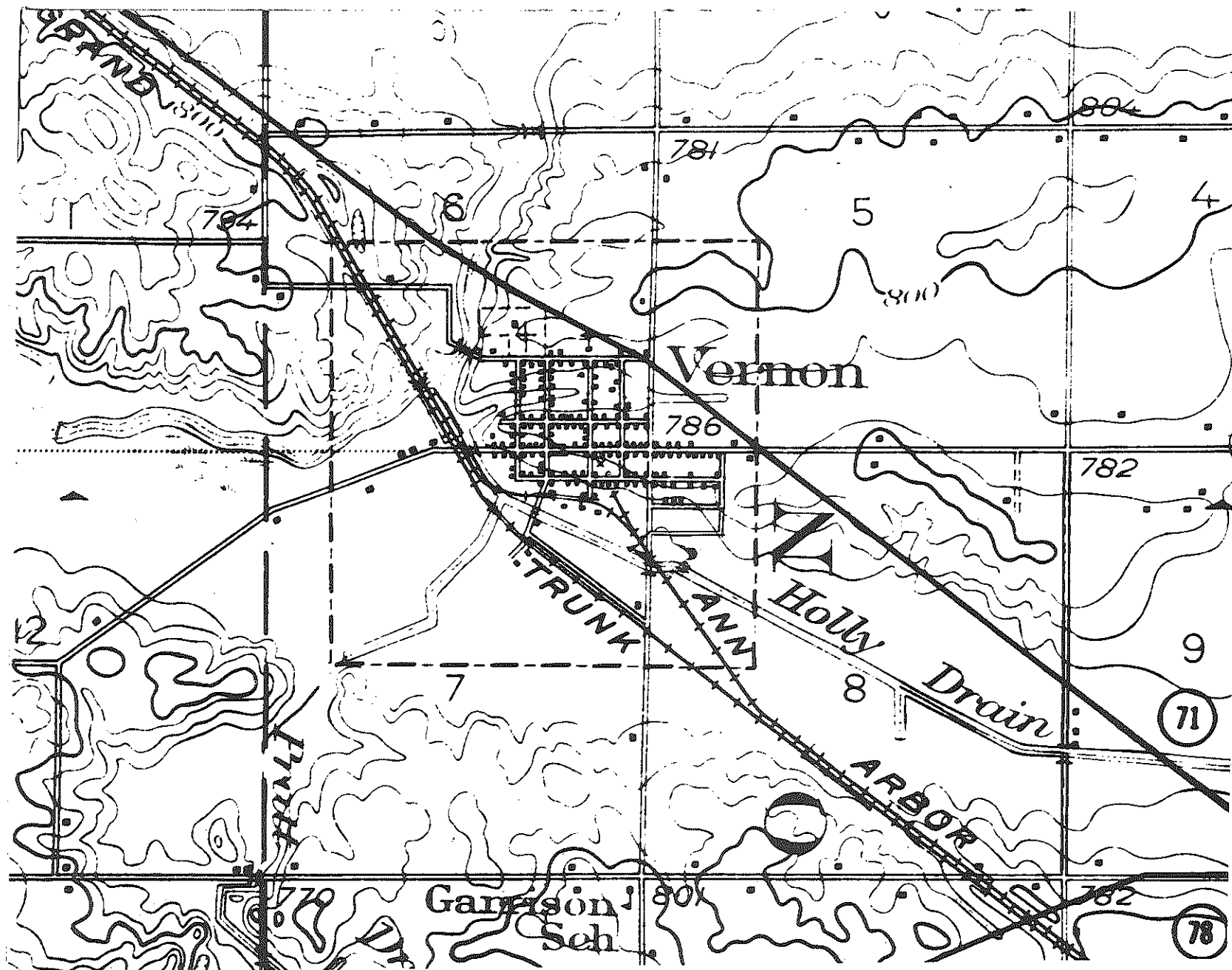


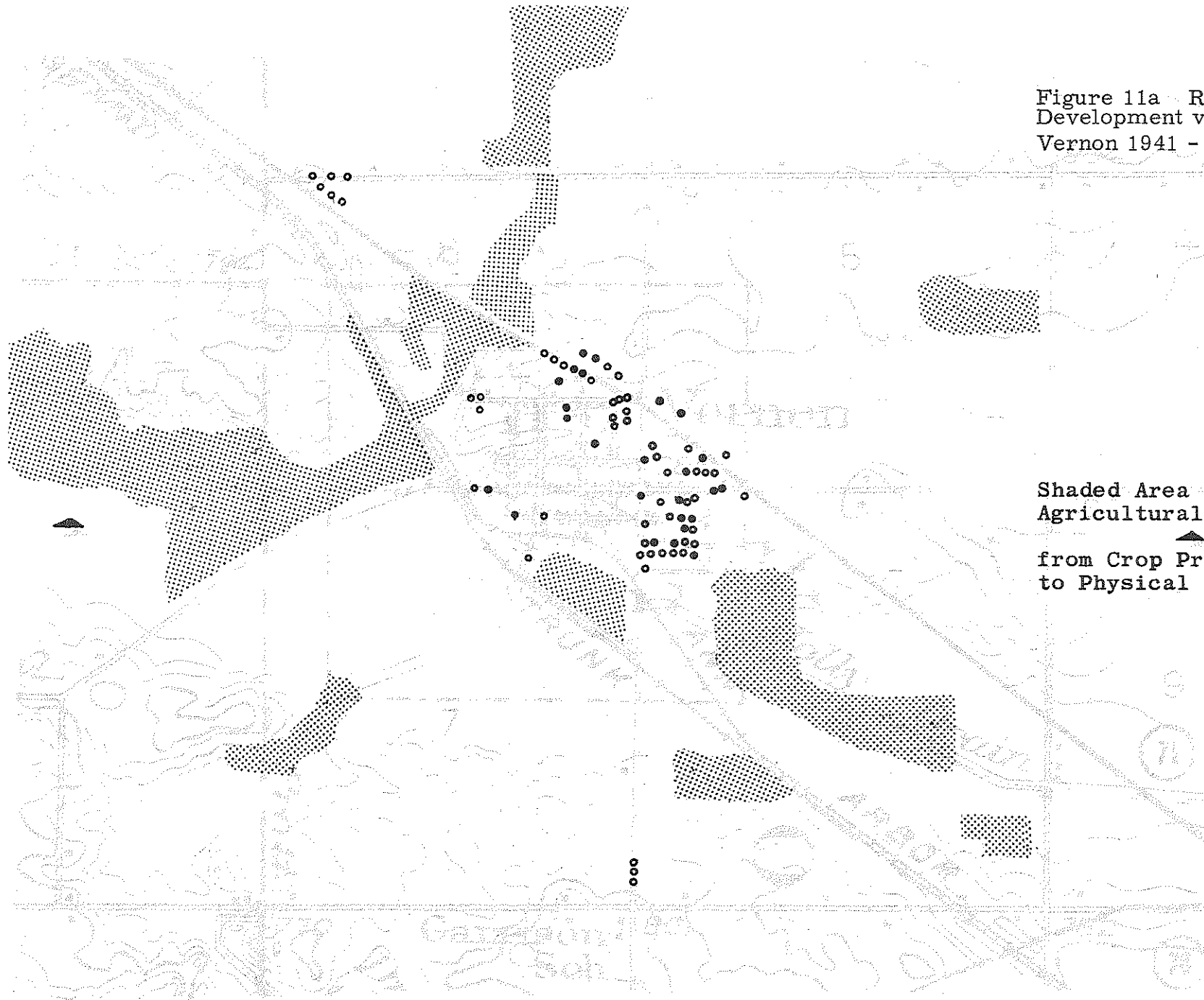
Figure 11b
 Community
 Development
 Village of
 Vernon by 1940
 and Physical
 Environment

Figure 11a Residential
Development village of
Vernon 1941 - 1958

Development of
Village of
Vernon by
and Physical
Environment

- Residential
Construction
1941 - 1950
- Residential
Construction
1951 - 1958

Shaded Area Indicates
Agricultural Land Removed
from Crop Production Due
to Physical Limitations



able to infer that the break normally would occur when the population has reached a number between 1200 and 2000.

The following recommendation is based on the above deduction:

By-pass routes should be located at a distance from the community's fringe sufficient to allow enough normal growth at existing density patterns so that a population of between 1200 and 2000 can be accommodated.

Such a policy will enable a growing community to expand across the natural barriers and thus avoid forced development on the by-pass roadsides.

It is pertinent to point out that the problem here discussed has critical importance only in the cases of growing communities. For a detailed discussion of this and charts showing the growth characteristics of Michigan counties and communities in various size ranges, see the technical engineering report.

SECTION III

Effects of By-Pass Highways on Retail Businesses in Small and Medium Size Communities*

Foreword

Among the most important features of the highway routes now being built in this state is the selection of routes and alignments which by-pass most small communities and even many larger cities which formerly straddled our trunkline highways. This is done with the purpose of expediting the movement of traffic with the maximum feasible degree of safety. The by-passes make it possible for the motorist to maintain rural speeds free of the frequent slowdowns and stops necessitated by urban development along the highway. They also remove from the central areas of the communities the through traffic, particularly heavy commercial traffic, which has no reason or desire to be there.

However, whatever the good features of by-passes, many people fear that re-routing through traffic away from the centers of these communities will have adverse effects on local business activity which, they assume, is dependent on a large volume of automobile traffic past the front door. There is some basis for this fear inasmuch as it is possible to point to examples of businesses which have suffered adverse effects from such a diversion of traffic; however, the most striking examples of

this are businesses located on former trunklines in rural, not urban, areas.

With a growing number of Michigan communities being by-passed, it is natural that a research project on "Economic and Social Effects of Highway Improvement" should include a study of the effects of by-passes on such communities. How much will business be affected, if at all? What types of business are most vulnerable to adverse effects from by-passes? Will there actually be a loss in business volume, or will the effect be limited to preventing growth at a rate comparable to that of businesses not affected by the by-pass?

The objective of this series of by-pass studies has been to evaluate the general effect of highway by-passes on six communities of various sizes, but all meeting the following four requirements.

1. Be by-passed by a U.S. or state route.
2. Have been by-passed long enough to allow valid comparisons of before and after conditions.
3. Have population less than 25,000.
4. Be located outside large metropolitan areas.

CHAPTER I

METHODOLOGY

To provide a relatively unbiased and objective comparison of retail business activity in selected Michigan

*This section is condensed from the technical research report, "Effects on Businesses of By-Pass Highways," by Hugh Faville and Carl Goldschmidt, Michigan State University, Highway Traffic Safety Center, 1960.

communities before and after the opening of highway by-passes, the sales tax records of the Michigan Department of Revenue were utilized. This chapter outlines the procedure followed and some of the problems encountered in using this information.

A. SOURCES AND CHARACTER OF DATA

Much of the required information on sales tax collections is contained in the Department's monthly Research and Statistical Bulletins for the years covered by the by-pass studies. At the time of the study, the sales tax collection data were arranged according to the Department's classification of tax-paying establishments into 57 "type of business" categories which, in turn, were assigned to one of nine "groups" of broader nature.

The information contained in the Bulletin includes statewide sales taxes collected from each of the 57 "types", subtotaled for each of the nine "groups" and a grand total for the state. Also included is a tabulation of sales tax collections by counties and by cities of over 10,000 population. Data are tabulated only in the nine basic groups for cities of more than 10,000 population and are not coded and segregated from county information for the smaller cities. Inasmuch as cities in both categories were included in these studies, it was necessary to undertake considerable research to obtain the data required.

B. PROCEDURE AND METHODS

In order to meet the secrecy requirements of the Department, and not disclose sales tax information for any given establishment, it was necessary to place the businesses in categories such that there were at least three establishments together for which the total gross sales and sales tax payments could be obtained. Some of the smaller cities have too few establishments in most "type-of-business" categories to permit obtaining of information for each type, and in these cases a "group" classification was necessary to obtain the required sales tax information.

In this manner sales tax data were obtained for selected kinds of retail business in each of the study cities for a certain number of years before and after its by-pass highway was opened, and like data were obtained for the same businesses and years for the balance of the county in which the city was located and for the state at large.

These sales tax receipts data for each study city were then tabulated and the percentages of change from before to after the opening of the by-pass were computed. The degree of change was indicated either by the percentage figures or by index numbers and on these are based the conclusions regarding the effect of the by-pass on retail business, as presented in the reports of the results of the studies of six Michigan cities in the six succeeding chapters of this section.

Some problems in the use of sales tax data were posed by characteristics of the data themselves. All business establishments are classified by the Department of Revenue on the basis of their post office addresses. This means that businesses in a fringe area, where they may be benefited by a by-pass, are grouped with those within the city where an adverse effect might be experienced.

Then too, the fact that the tax on auto sales is paid directly to the Secretary of State creates a special problem as regards estimates of the business of automobile dealers inasmuch as this tax is included in county and state totals for this type of business in the Department of Revenue reports, but is not included in data published by the Department regarding these establishments in individual cities.

Despite these problems, it has been possible to arrive at some conclusions. Comparisons of the activities of types of business such as gas stations, which are susceptible to the adverse effects of diversion of through traffic, with those believed to be immune from such effects, has yielded significant results. In other cases the comparisons made with county and state figures point up differences in business activity which can be attributed, at least in part, to the diversion of through traffic to a by-pass. The most accurate studies are those in which changes for several establishments of the same type, some located on and some off the abandoned route, can be compared; this approach worked well in studies of gas stations, since the large number of these provided opportunities for such comparisons, even in the smaller cities.

CHAPTER II

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESSES IN CITY OF HART

Hart, the county seat of Oceana County, is a small city with a population of 2,172 in 1950, and of 1,968 in 1960. It is a trading center for the recreational and resort area along the Lake Michigan shore, eight miles west, and the active service and processing center for the county's

prosperous fruit growing industry. Prior to December 2, 1955, the city straddled U.S.-31, the major highway route paralleling Lake Michigan's eastern shore. On that date the by-pass was opened through the eastern edge of the city. (See Figure 1)

HART

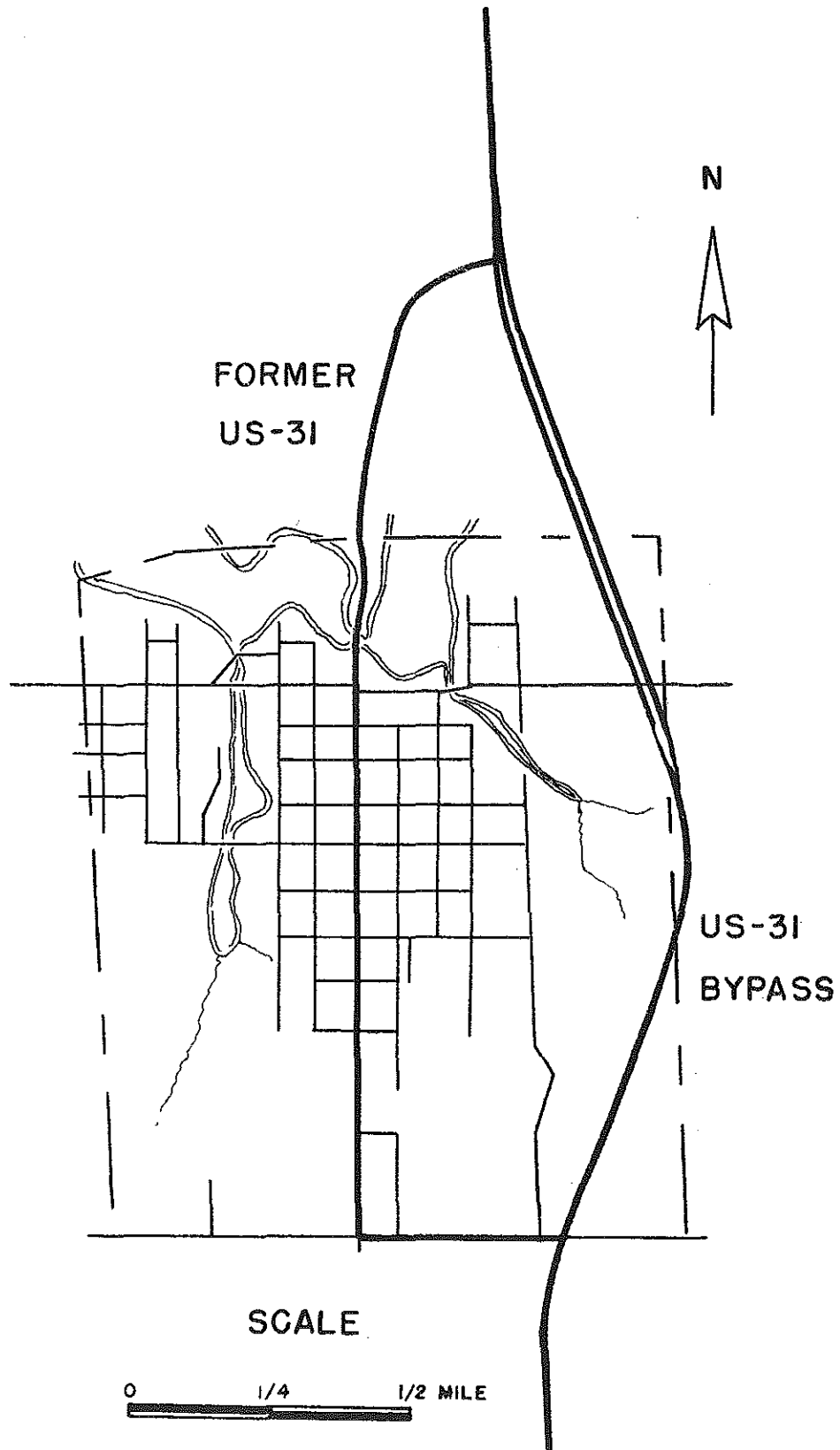


Fig. 1

U.S.-31 is a major north-south tourist route to the cities and resort areas of western and northern Michigan. Formerly, the alignment passed through Hart which it traversed on State Street, the city's main central artery. The by-pass location eliminates this bulge by straightening the alignment. The by-pass was constructed as a controlled access highway, four lanes divided for about half its length; the remainder continues U.S.-31's normal two-lane design.

The effect of the by-pass on Hart was viewed from two standpoints: that as expressed in the subjective views and opinions of local businessmen and officials, and as determined from a more objective statistical analysis of retail sales tax collections. The two viewpoints did not produce greatly different results and both tended to substantiate the hypothesis that, while certain types of business would be adversely affected, the general business activity of the community might be benefited.

A. LOCAL OPINION — PRO AND CON

Initially, it was said, there was little opposition to the proposal to by-pass the city — Hart was especially plagued by a truck problem, accentuated by a long grade through the city and a traffic signal in the center of the business district. Now this problem virtually has been eliminated and both the "livability" of the city and the "shopability" of its business district have been greatly improved. Local opinion is that Hart business in general has not been adversely affected, or only slightly. However, operators of certain businesses oriented toward motorist services report decreases in business activity, in some cases sizable. But even the "losers" often acknowledge that the by-pass has been good for the city in general.

B. THE SALES TAX STUDY

Interesting as personal opinions are in a by-pass study, a more objective approach is needed to properly evaluate business activity in Hart. For this purpose the retail sales taxes paid by Hart businesses on sales the year prior to the opening of the by-pass were compared with those for the first and second years after its opening. The changes in business activity were in turn compared with those for comparable business types and groups of businesses in Oceana County and in the entire state. Index numbers, representing the degree of change from the base year, 1955, are shown in Table I.

1. General Business Activity

It will be noted that two types of "Total Tax" are shown in the table; the first type excluding, for reasons out-

lined in the preceding chapter, taxes paid by businesses in the automotive group; and the second including all groups reported by the Department of Revenue. In both cases the index numbers based on the total sales taxes collected from Hart businesses included in the study show that, collectively, they had increases in both years after the by-pass opening which exceeded those of comparable businesses in Oceana County and Michigan.

At the same time, Table I makes it clear that certain types of business did experience adverse effects and it is interesting to note that the statistical analysis yields results which are in general agreement with the opinions gained from brief personal interviews.

a. Gas Stations

There were three gas stations in Hart which were in operation throughout the study period and two new stations were opened near the south end of the by-pass after that highway was placed in use. Totals for the gas station group show increases after the by-pass opening roughly equal to or in excess of those of stations in the county and state. However, it is apparent that some or all of this increase represented sales at the new stations and that the in-town stations suffered losses after the opening.

b. Restaurants

All of the Hart restaurants included in the analysis are either on the former route of U.S.-31 or are in the business district, so it is assumed that all received some patronage from motorists passing through the city. The number of these establishments varied from a high of five during each summer down to two each winter, indicating their and the city's dependence on summertime residents and tourists.

Index numbers for restaurants show that while restaurants in the county and state had slight increases in sales taxes paid, those in Hart experienced a drop of about 14 per cent for each of the two years after the by-pass was opened. It appears that the Hart restaurants lost much of the business of summertime tourists who now by-pass the city.

c. Taverns, Pool Rooms, and Refreshment Stands

The six establishments in this "type of business" classification are located in the general vicinity of the business district. Their sales tax payments showed slight change and when compared with similar establishments in the county and state, it can only be concluded that the by-pass had little or no effect on this type of business in Hart.

d. Groceries

Since groceries are normally purchased near home by local customers, they are classed as "convenience goods". For that reason it is generally believed that the business of grocery establishments is relatively unaffected by the diversion of through traffic to a by-pass. The nine grocery stores in Hart are not concentrated in the business district or on the former route of U.S.-31. The sales tax paid by these businesses in 1956 was 19.9 per cent greater than for the year preceding the by-pass opening; in 1957 it was 26.7 per cent greater. The latter increase is twice that indicated for groceries in the entire county and state during the same year.

e. General Merchandise

All four businesses in this group are located within a one-block stretch of State Street, in the heart of the business district, and on the former route of U.S.-31 through the city. Theoretically all are subject to the same effect from the opening of the by-pass and at the same time they should have reflected its effect on the Hart business district. The first year after the by-pass opened this group showed an increase in sales of 15.6 per cent, slightly more than the comparable group in Oceana County, and much greater than in the state. In the second year after the opening, the general merchandise stores in the county showed additional gains while those in Hart dropped slightly, but the latter still ran well ahead of the state stores in this group. No definite reason is known for the fact that both the city and county did so much better than the state, but the fact that Hart did about as well as the county in general indicates that the by-pass did not adversely affect the General Merchandise group in Hart.

f. Apparel

The seven Hart establishments in the apparel group also are all located in close proximity within the business district; only one of these stores is not located on State Street. Thus it is not surprising that this group shows increases in the two years following the by-pass opening, of 13.2 and 17.0 per cent, roughly equal to those enjoyed by the general merchandise group, although in this case the Hart stores did better than those in the county during both years. Meanwhile, the apparel stores in the state had the same modest 3 per cent increase as those in the general merchandise group. This group, too, does not appear to have been adversely affected by the opening of the by-pass.

C. SUMMARY AND CONCLUSIONS

On the basis of the changes in the total sales tax receipts, and in the general merchandise and apparel groups individually, it is concluded that the opening of the U.S.-31 by-pass did not adversely affect general business activity in Hart. In fact the removal of through traffic and the attendant congestion and noise from the business district may have benefited the "shopping goods" establishments in that area.

At the same time, it appears that some types of business providing motorist services did suffer adverse effects from the opening of the by-pass. Most noticeably affected were the restaurants which collectively experienced a decrease of business amounting to approximately 14 per cent. Also, analysis showed that the in-town gas stations either experienced reductions of business volume or just held even. Other types of business analyzed in Hart do not appear to have been adversely affected.

CHAPTER III

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESS ACTIVITY IN THE CITY OF MASON

Mason, the county seat of Ingham County, had a population in 1950 of 3,514; ten years later the population was 4,490. It is centrally located in the county twelve miles south of Lansing on the route of U.S.-127 to Jackson. It is a prosperous rural trading center.

U.S.-127 is a heavily traveled north-south route carrying large volumes of resort and recreational traffic. Prior to the opening of the by-pass on July 23, 1953, the trunkline entered the city from the south on Jefferson Street, traversed a residential area and part of the business district and then turned left on Ash Street which it followed for three blocks to a 90-degree turn north into

Cedar Street on which it continued north and northwest across the city limits. This route involved a sharp grade and two railroad crossings at grade. (See Figure 2)

The original by-pass started at South Jefferson Street, swung west of the closely built-up section of the city and ended at its intersection with Cedar Street just beyond the northwest city limits, for a total length of approximately three miles. Originally built as a two-lane highway, the by-pass was expanded in 1957 to a four-lane divided highway as part of the general improvement of U.S.-127 between Lansing and Jackson.

MASON

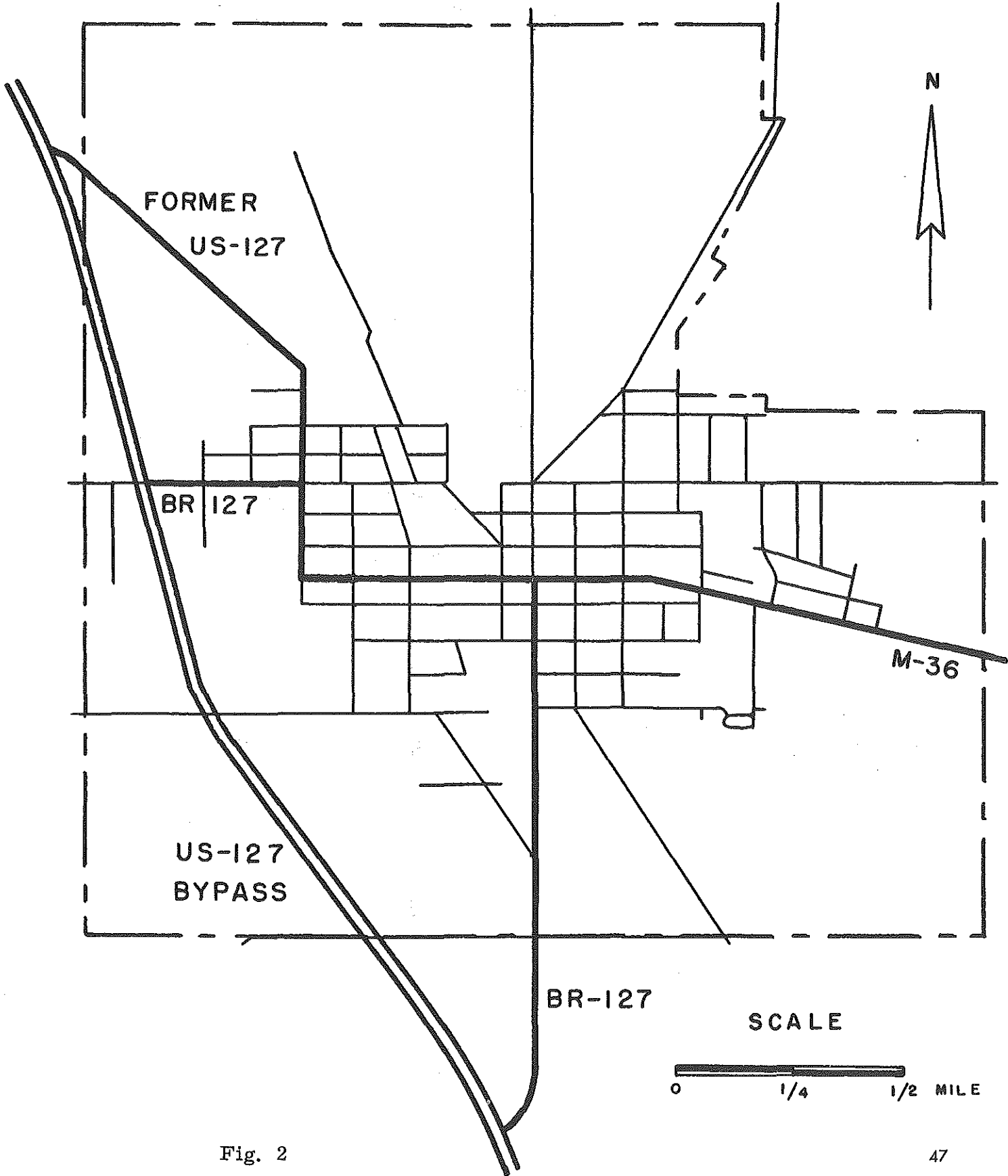
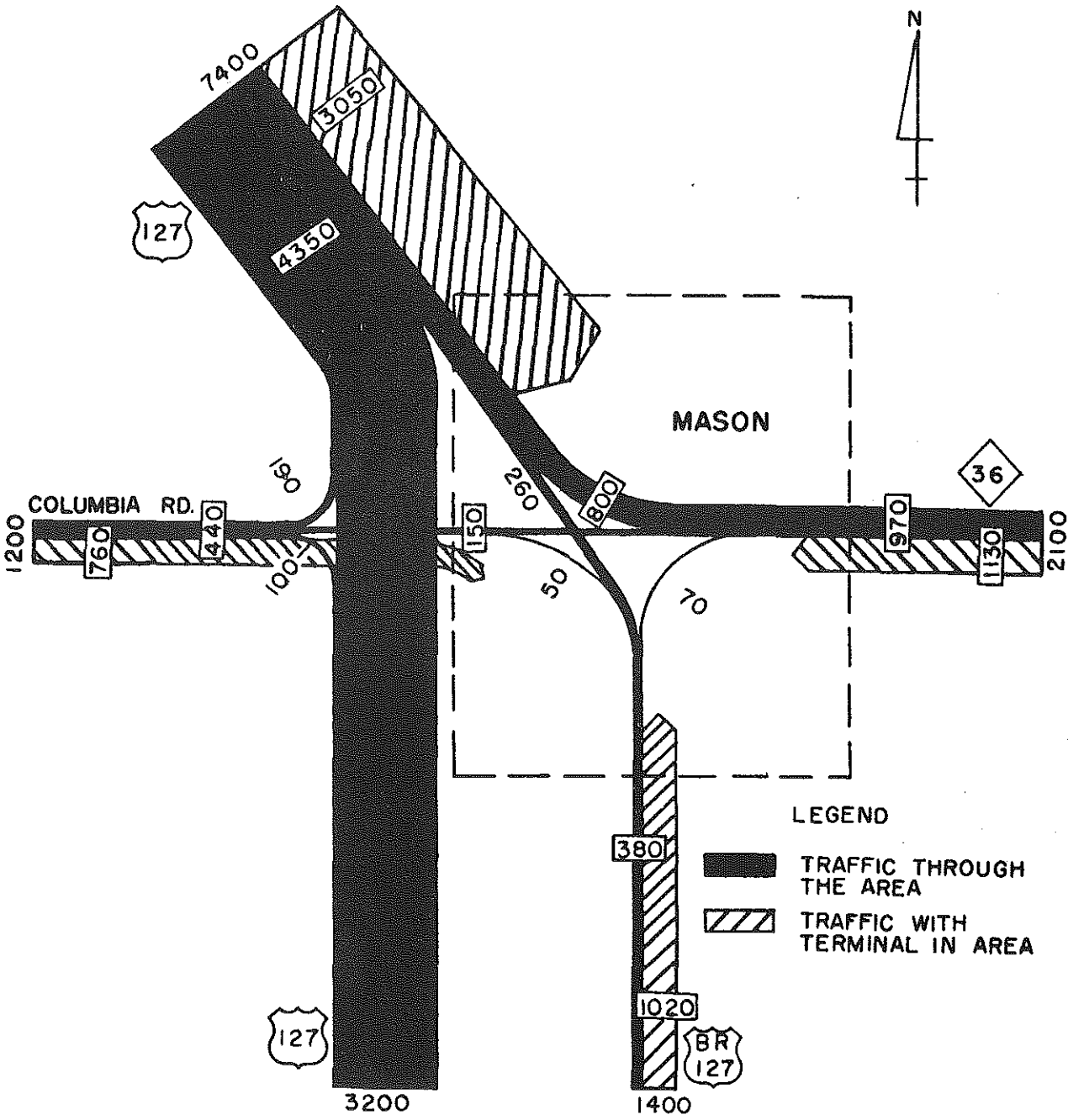


Fig. 2

MASON

DISTRIBUTION OF TRUNKLINE TRAFFIC 1955 A.D.T.



MICHIGAN STATE HIGHWAY DEPARTMENT
PLANNING AND TRAFFIC DIVISION

Fig. 3

Opening the by-pass to regular traffic use in 1953 resulted in the diversion of more than 3,000 vehicles away from the former route through the central parts of the city. Traffic counts taken on the former route (now Business Route U.S.-127) at the south limits of Mason showed a drop in the average daily traffic from 4,100 vehicles per day before the by-pass was opened to a little over 1,400 vehicles per day two years later. (See Figure 3) The count also indicated that this reduction included a decrease in commercial vehicle traffic on the city streets amounting, on the average, to 27 such vehicles per hour.

It is evident that the city in general has benefited from the virtual elimination of through traffic, especially trucks, from city streets. Its effect on business activity is the subject of this study.

A. SALES TAX STUDY

To provide a means of measuring business activity in Mason during the period of transition, the sales taxes paid by Mason businesses the year immediately preceding the opening of the by-pass (August 1952 through July 1953) were compared with those paid in the year following the opening (August 1954 through July 1955). The percentage change for each type or group of business was compared with the percentage changes for the same type or group of business in Ingham County and Michigan during the same two-year period. These percentages are shown in Table II.

Table II
CHANGES IN RETAIL SALES TAX
COLLECTIONS

From year before opening of by-pass
to year after

Type of Business or Group (1)	Mason	Ingham Co.	Michigan
Total Tax (Excluding Auto Sales)(2)	+6.90%(3)	+4.26%	+3.97%
Gas Stations (Along Former Route of US 127).....	+22.4		
Gas Stations (Not Along Former Route).....	+56.4		
Gas Stations (All).....	+39.4	+10.5	+11.6
Restaurants.....	-13.2	+2.87	+0.86
Taverns, Pool Rooms, Refresh- ment Stands, Etc.....	+6.92	-4.44	+1.69
Groceries.....	+6.49	+5.77	+5.19
Apparel Group.....	+12.4 (4)	+5.00	-2.44
Furniture & General Merchandise Groups (Combined).....	+1.25 (4)	+4.12	-1.34
Autos.....	-5.10 (4)	-0.46	-6.14

(1) Only the types of business and groups considered significant in this study are shown separately, although all are included in the "total tax" figures, with the exceptions noted.

- (2) The reason for excluding auto sales is discussed below in the section on autos.
- (3) Sales tax information was not obtained for all Mason businesses paying this tax. However, this figure is based on over 90 per cent of the taxable sales in the city and, it is believed, 100 per cent of the sales which might be directly affected by the by-pass in the two-year period.
- (4) Mason figures based on gross sales.

Sources:

County and State: Michigan Department of Revenue, *Research and Statistical Bulletin*, monthly issues for time periods covered.

City: Tax and sales data from Michigan Department of Revenue, based upon field survey and establishment grouping by Project Staff.

a. Total Business Activity

On the basis of sales taxes paid, it appears that total business activity in Mason increased significantly more in the study period than it did in Ingham County or the entire State of Michigan, but it is equally apparent that this increase was not uniformly spread throughout the business community. A more detailed analysis of some specific types of business is needed to understand what took place in this two-year period.

b. Gas Stations

The large increase in gas station sales in comparison with the county and state is most surprising in view of the fact disclosed by studies in other states that gas stations, along with restaurants and bars, are very frequently affected adversely by by-passes. This may be due to any of a number of factors, but the actual cause could not be determined without exhaustive further research and analysis. At the same time, the marked difference between the increase for establishments on the former route of U.S.-127 and those not on the route seems to indicate that the loss of business resulting from the transfer of through traffic to the by-pass prevented the former group from gaining even half as much as stations in the rest of the city.

c. Restaurants

The five restaurants in Mason experienced an overall drop of 13.2 per cent in their business volume. This is not unexpected as these establishments are of a type usually considered to be oriented toward transient trade. A month by month analysis of the restaurant data suggests that the loss was not so much due to failure to attract customers during the peak tourist season as to changes in the habits of year round routine patrons such as salesmen, truck drivers, etc.

In the years of readjustment following the opening of the by-pass, two new restaurants have been established in the small retailing center which developed

along the by-pass at the point where it diverges from the former route just northwest of the city. An analysis of the restaurant business in the Mason area today might present a more favorable picture.

d. Taverns, Pool Rooms, and Refreshment Stands

The sizeable increase in the business of the three taverns which comprise Mason's establishments in this category, during a period when those in the county experienced a loss and those in the state a small gain, is difficult to explain. It might be assumed that favorable local economic conditions were the principal factor, although improved accessibility and easier parking as a result of traffic diversion may also have been important.

e. Groceries

The sale of groceries, as with other convenience goods, should not be materially affected by the by-pass. The 6.49 per cent increase in grocery sales is in step with the increases in both the county and the state and seems to indicate they were not affected by the by-pass or other unusual local condition.

f. Apparel, Furniture and General Merchandise

Establishments in these groups comprise the hard core of Mason's central business district and should reflect the adverse or beneficial effects of the by-pass opening on that district.

Businesses in the apparel group experienced a 12.4 per cent increase in gross sales the year after the by-pass opened. During the study period all these establishments had a change of ownership, which often

affects gross sales. Nevertheless, it is apparent that, for whatever reason, these businesses showed a large gain at a time when the county's apparel stores increased their sales only half as much and when those in the state experienced a 2.44 per cent loss.

Since neither the furniture nor the general merchandise group had enough establishments in Mason to permit tabulation of data for each group alone, they were combined for purposes of data tabulation and analysis. The percentage changes for the city, county and state are shown in the table. However, it is questionable whether any valid conclusions can be drawn from a comparison of these changes.

g. Automobiles

As explained in Chapter I, the sales tax data for automobile dealers in individual cities are based on the sales of motor fuel, parts, accessories, etc, but not automobile sales. It is believed that due to the nature, size and cost of the product, automobile sales would not be materially affected by the by-pass. Comparison of the available automobile dealer data indicates that Mason dealers did 5.10 per cent less business in the year following the by-pass opening while statewide dealers lost 6.14 per cent and Ingham County dealers only 0.46 per cent.

B. SUMMARY AND CONCLUSIONS

A broad look at all the statistical information obtained on business activity in Mason during the period of the by-pass study leads to the conclusion that, in spite of some adverse effects on a few types of business, the removal of U.S.-127 through traffic from Mason did not prevent the total retail activity of the city from enjoying a significantly greater increase than that in the county or state.

CHAPTER IV

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESSES IN THE CITY OF ZEELAND

Zeeland is a small city centrally located in southern Ottawa County about 21 miles southwest of Grand Rapids and seven miles east of Holland on M-21 which is now part of the Interstate route between Grand Rapids and Chicago. Zeeland is a market and service center for a prosperous farm and trucking area, is an important shipping point for baby chicks, and has some manufacturing establishments, mostly furniture. Its population of 3,075 in 1950 rose to 3,692 in 1960.

Formerly M-21 was routed through Zeeland on

Washington Street a block north of and parallel to the city's main business artery. The only available information indicates that traffic amounted to between 12,000 and 13,000 vehicles per day. However, early in December, 1956, the present by-pass along the south edge of the city was opened to traffic. (See Figure 4)

The objective of the Zeeland study was to attempt to ascertain whether or not the removal of through traffic to the by-pass was followed by a determinable decline in business volume. While the most factual and

reliable means for assessing the state of retail business is through the use of sales tax data, the expressions of the people of the community are significant reflections of the local attitude.

A. VIEWS AND COMMENTS

There seemed to be no disagreement about the benefit to Zeeland as a consequence of the by-pass. The general opinion was that the economy of the city is not based upon either the travel business or services to the motorist. Hence, through traffic is best off outside of town. A number of changes in the locations of local business sites were cited as evidences of general improvement. A summarizing comment was, "We're very happy with the by-pass."

B. THE SALES TAX STUDY

The principal purpose of this study of sales tax collections was the discernment of trends, and the comparison of trends for comparable businesses in different geographical areas as well as among different business types in the same area. Figures in terms of dollars are not suitable for this purpose; therefore, all tax figures were converted to index numbers. The first year of the study — the year before the by-pass opening — was the base year and all tax payment totals for that year are expressed as the base index number, 100.

The amounts of the retail sales tax paid by the various types or groups of businesses in each of the study years, together with the corresponding index numbers are shown for Zeeland, Ottawa County and Michigan, respectively, in the three parts of Table III.

1. Gasoline Stations

Since this analysis is aimed to study the likely effects of the by-pass, particular emphasis is placed upon sales trends of motorist-oriented businesses. In Zeeland the gasoline stations located on the previous route of M-21 experienced a decline of sales of 1.4 per cent from 1956 to 1957 while other stations in the city had an increase of 7 per cent. However, from 1957 to 1958 the stations on the old route gained far more than the others, bringing their index up to 109.5 as compared to the others' index for that year of 108.6. Both these Zeeland indices are slightly higher than that for gas stations in Ottawa County and almost up to that for the entire state. Except for the 1957 decline for the Zeeland stations on the former route, the different groups of stations follow much the same trend, indicating that the adverse effects of the by-pass were small and temporary even for this most sensitive business category.

2. Auto Parts and Accessories

This type of business which could serve transient clientele accounted for less taxable sales during the first year after the by-pass opening than for the preceding year, but in 1958 regained most of this loss. Nevertheless, these establishments did better than their counterparts in the county and although they did not participate in the statewide rise in 1957, their 1958 index was above that for the state.

3. Restaurants

Restaurants are a third business which generally is important to the traveler. Although Zeeland restaurants registered slight gains over the period, they did less well than those in the county, but better than the state average.

4. Household Furniture and Appliances

Sales for this group of businesses held steady in Zeeland, while in the county they increased moderately and experienced a sharp decline in 1958 in the state as a whole. However, the various types of businesses included in the group showed quite divergent trends. Furniture sales in Zeeland rose slightly in 1957 and then dipped in 1958, but in both years were higher than for like stores in the county and the state.

Radio and television stores made a quite different record. These establishments enjoyed a phenomenal rise in Zeeland while similar stores in the county and state experienced declines of from 12 to 19 per cent. Zeeland stores selling other household appliances had a sizable decline in sales in 1957, but in the following year regained their 1956 level. In the same period, these stores throughout Ottawa County enjoyed booming sales, while those in the whole state had a moderate rise and then a considerable decline in sales volume.

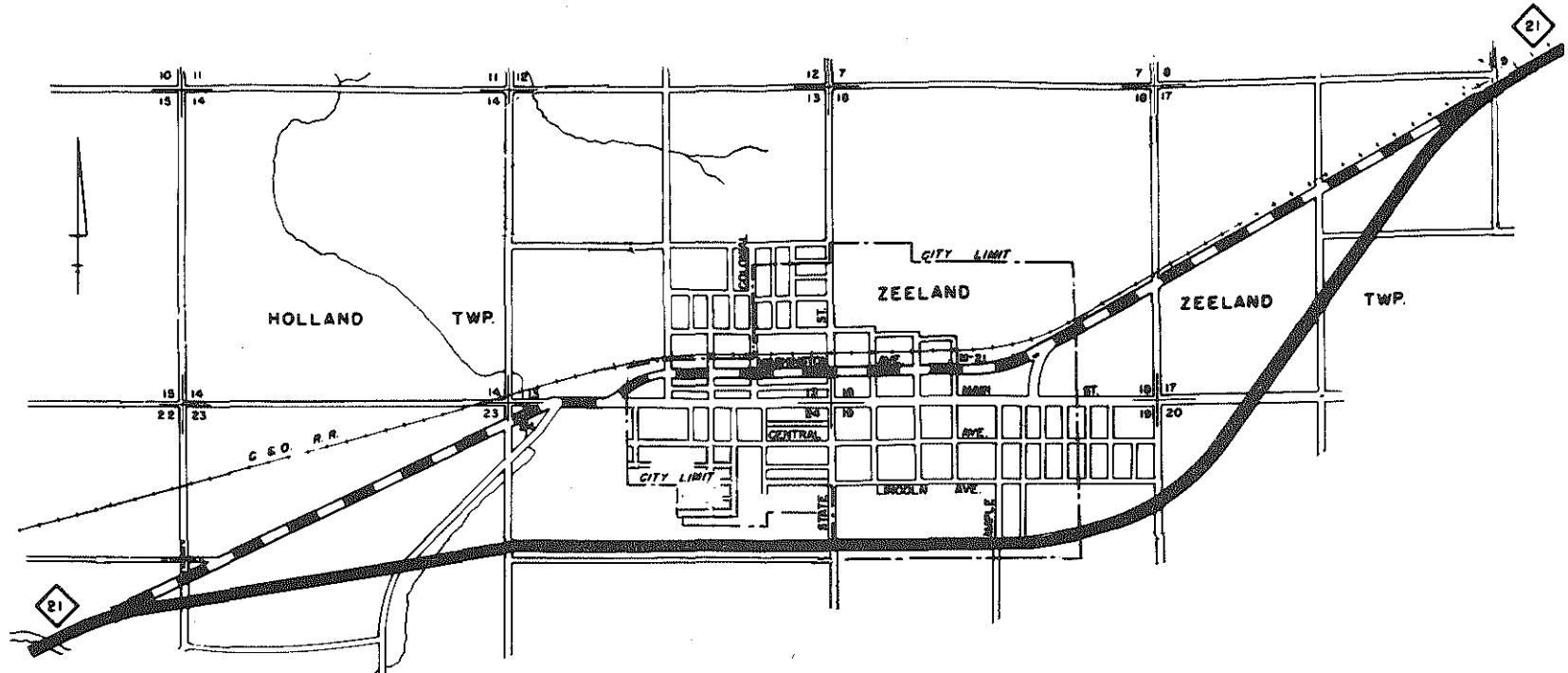
5. Apparel

Apparel stores in Zeeland did not follow county and state trends during the study period. While Ottawa County and Michigan's apparel sales declined from 1957 to 1958 after a slight gain in the former year, those for Zeeland showed a good gain from 1956 to 1957 and then kept right on climbing to 110 index points in 1958.

6. Hardware

Sales of Zeeland hardware stores reflected the precipitously declining sales in the county during the period, but more nearly resembled the less steep decline statewide.

ZEELAND



SCALE: 1" = 1/2 MILE



-  M-21 PRIOR TO PRESENT ROUTE
-  PRESENT M-21

Figure 4

TABLE III
SALES TAX PAYMENTS

By Study Groups for the City of Zeeland, and Comparable Business Types for Ottawa County and Michigan in Dollar Amounts and Index Numbers (1956=100) for Study Years (December through November) 1956, 1957 and 1958.

Business Category Designations denote Establishment Grouping for Zeeland, and the comparable Department of Revenue Business Types for Ottawa County and Michigan.

UNDERLINED Business Category Designations denote combinations of appropriate Establishment Groupings for Zeeland, and the comparable Department of Revenue Business Groups for Ottawa County and Michigan.

ZEELAND

Business Category	1956		1957		1958	
	\$ Tax Paid	Index Number	\$ Tax Paid	Index Number	\$ Tax Paid	Index Number
Auto Parts & Accessories.....	4,174	100.0	4,097	98.16	4,111	98.49
Gas Stations on Previous M-21.....	10,069	100.0	9,929	98.61	11,027	109.5
Gas Stations Rest of City.....	11,626	100.0	12,443	107.0	12,628	108.6
<u>AUTOMOTIVE</u>	<u>25,869</u>	<u>100.0</u>	<u>26,469</u>	<u>102.3</u>	<u>27,766</u>	<u>107.3</u>
<u>APPAREL</u>	<u>17,009</u>	<u>100.0</u>	<u>17,463</u>	<u>102.7</u>	<u>18,711</u>	<u>110.0</u>
Farm & Truck Equip.....	2,107	100.0	2,217	105.2	2,166	102.8
Hardware.....	3,741	100.0	3,525	94.23	2,897	77.44
Building Materials.....	24,381	100.0	19,182	78.68	20,018	82.10
Heating, Plumbing.....	4,602	100.0	4,726	102.7	5,226	113.6
BLDG. MAT'S., LMBR., HDWR.....	34,831	100.0	29,650	85.13	30,307	87.01
Restaurants.....	8,594	100.0	8,623	100.3	8,802	102.4
Food Stores.....	42,338	100.0	51,295	121.2	54,557	128.9
<u>FOODS</u>	<u>50,932</u>	<u>100.0</u>	<u>59,918</u>	<u>117.7</u>	<u>63,359</u>	<u>124.3</u>
Radio, TV.....	1,656	100.0	1,606	96.98	2,509	151.5
Furniture Stores.....	25,731	100.0	26,803	104.2	24,222	94.14
Household Appliances.....	6,108	100.0	5,048	82.65	6,145	100.6
<u>FURNITURE</u>	<u>33,495</u>	<u>100.0</u>	<u>33,457</u>	<u>99.89</u>	<u>32,876</u>	<u>98.15</u>
Recreation.....	1,291	100.0	1,233	95.5	960	74.36
Drug, Variety Stores.....	9,986	100.0	10,063	100.8	10,573	105.9
Books, Printers.....	2,030	100.0	1,941	95.62	1,980	97.54
Jewelry, Flowers, Etc.....	4,601	100.0	4,899	106.5	4,638	100.8
<u>SPECIALTY STORES</u>	<u>17,908</u>	<u>100.0</u>	<u>18,136</u>	<u>101.3</u>	<u>18,151</u>	<u>101.4</u>
Fuel Dealers.....	7,152	100.0	7,143	99.87	7,035	98.36
<u>TOTAL TAX PAID</u>	<u>187,196</u>	<u>100.0</u>	<u>192,236</u>	<u>102.8</u>	<u>198,205</u>	<u>105.9</u>

Source: Zeeland Data from Michigan Department of Revenue based upon business establishment grouping by author.

OTTAWA COUNTY

Business Category	Bus. Type Code	1956		1957		1958	
		\$ Tax Paid	Index Number	\$ Tax Paid	Index Number	\$ Tax Paid	Index Number
Auto Accessories.....	12	32,045	100.0	31,136	97.16	30,296	94.54
Gas Stations.....	14	215,193	100.0	232,450	108.0	232,735	108.2
<u>AUTOMOTIVE APPAREL</u>	<u>(20)</u>	<u>102,122</u>	<u>100.0</u>	<u>102,781</u>	<u>100.6</u>	<u>100,516</u>	<u>98.43</u>
Farm Equipment.....	36	10,149	100.0	10,090	99.42	10,719	105.2
Hardware.....	35	80,800	100.0	55,117	68.21	47,421	58.69
Building Materials.....	31	213,863	100.0	210,903	98.62	210,029	98.21
Heating, Plumbing.....	33	55,390	100.0	44,837	80.95	38,551	69.60
BLDG. MAT'S., LMBR., HDWR.....	(30)	420,132	100.0	372,118	88.57	352,782	83.97
Restaurants.....	41	94,309	100.0	100,829	106.9	99,813	105.8
Groceries.....	43	608,141	100.0	650,151	106.9	681,796	112.1
<u>FOODS</u>	<u>(40)</u>	<u>887,424</u>	<u>100.0</u>	<u>932,874</u>	<u>105.1</u>	<u>954,260</u>	<u>107.5</u>
Radio, Music Supply.....	54	36,420	100.0	33,579	92.20	31,929	87.67
Household Furniture.....	52	59,305	100.0	55,834	94.15	52,204	88.03

OTTAWA COUNTY — Continued

Business Category	Bus. Type Code	1956		1957		1958	
		\$ Tax Paid	Index Number	\$ Tax Paid	Index Number	\$ Tax Paid	Index Number
Household Appliances.....	53	18,691	100.0	30,748	164.5	32,663	174.8
FURNITURE.....	(50)	133,975	100.0	143,106	106.8	142,817	106.6
Drugs, Cosmetics.....	71	77,326	100.0	79,324	102.6	81,348	105.2
Stationery & Books.....	75	3,748	100.0	3,019	82.47	3,549	94.69
Jewelry.....	74	15,165	100.0	14,042	92.59	12,396	81.74
SPECIALTY STORES.....	(70)	167,156	100.0	170,547	102.0	172,249	103.0
TOTAL TAX PAID.....		3,087,511	100.0	3,058,118	99.05	2,960,684	95.89

Source: Ottawa County Data from unpublished records of Michigan Department of Revenue.

MICHIGAN Dollar Amounts in Thousands

Business Category	Bus. Type Code	1956		1957		1958	
		\$ Tax Paid	Index Number	\$ Tax Paid	Index Number	\$ Tax Paid	Index Number
Auto Accessories.....	12	3,122	100.0	3,192	102.2	2,938	94.11
Gas Stations.....	14	19,640	100.0	21,263	108.3	21,482	109.4
AUTOMOTIVE APPAREL.....	(20)	14,766	100.0	14,774	100.1	13,267	89.85
Farm Equipment.....	36	889	100.0	720	80.99	636	71.54
Hardware.....	35	4,771	100.0	4,444	93.15	4,172	87.44
Building Materials.....	31	14,553	100.0	12,830	88.16	11,667	80.17
Heating, Plumbing.....	33	3,969	100.0	3,210	80.87	2,857	71.98
BLDG. MAT'S., LMBR., HDWR.....	(30)	28,709	100.0	24,957	86.93	22,661	78.9
Restaurants.....	41	12,167	100.0	12,365	101.6	11,806	97.03
Groceries.....	43	59,976	100.0	63,381	105.7	64,784	108.0
FOODS.....	(40)	94,712	100.0	97,568	103.0	97,256	102.7
Radio, Music Supply.....	54	2,659	100.0	2,442	91.84	2,145	80.67
Household Furniture.....	52	6,003	100.0	5,916	98.55	4,811	80.14
Household Appliances.....	53	3,532	100.0	3,888	110.1	3,289	93.12
FURNITURE.....	(50)	14,642	100.0	14,543	99.32	12,400	84.69
Drugs, Cosmetics.....	71	9,608	100.0	10,010	104.2	9,839	102.4
Stationery & Books.....	75	1,384	100.0	1,324	95.66	1,354	97.83
Jewelry.....	74	1,896	100.0	1,852	97.68	1,539	81.17
SPECIALTY STORES.....	(70)	19,642	100.0	19,781	100.7	18,954	96.50
TOTAL TAX PAID.....		306,498	100.0	308,010	100.5	288,567	94.15

Source: Michigan Data from appropriate issues of *Research and Statistical Bulletin* of Michigan Department of Revenue.

7. Building Materials

Businesses in this group in Zeeland experienced a sharp decline from 1956 to 1957, but a gain was shown thereafter in spite of continuing declines in the county and state.

8. Food Stores

Grocery sales gained throughout the period showing an overall rise of 28.9 per cent. Although food sales were increasing generally, the gain in Zeeland was more than twice that in Ottawa County and more than three times that in the state. It is probable that customers from outside contributed to the city's record and that better parking and driving conditions in Zeeland's business section as a result of the by-pass opening may have been a factor in attracting them.

C. CONCLUSIONS

There are abundant indications that Zeeland, rather than being hurt by the diversion of traffic to the by-pass, has recognized the advantages of freedom from through traffic. The former route of the trunkline has again become a usable street for local traffic and a desirable location for new and expanded business. New residential development adjoins the by-pass and a new hospital overlooks it; no reduction in development potential of land adjacent to the new by-pass is discernible. The successful readjustment of the gasoline stations and restaurants is evidenced by significantly increased taxable sales.

It is reasonable to conclude that Zeeland's experience is one in which the optimum benefit of a by-pass has been realized.

CHAPTER V

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESSES IN THE CITY OF NILES

Niles, Michigan, was plagued by problems associated with heavy movements of through traffic and trucks until December 1, 1956, when a new by-pass for two of the principal highways traversing the city was opened. This occurred immediately following the opening of the Indiana Toll Road, seven miles south, and these two new highway facilities have greatly altered traffic flow patterns in the Niles area.

The Niles study was aimed primarily to evaluate the effect on the city of the opening of the by-pass, but also to some extent the effect of the opening of the Toll Road, through analysis of retail sales tax collection data for two years before and two years after the by-pass opening.

A. NILES, ITS ECONOMY AND TRUNKLINE CONNECTIONS

Niles is situated in the southeast corner of Berrien County only a half-mile west of the Cass County line and about 12 miles north of South Bend, Indiana. Its population, according to the 1950 census, was 13,145; in 1960 it was 13,763.

Manufacturing is the major factor in Niles' economic base and in 1956 was represented by 36 industrial establishments with a total of 5,300 employees of whom about one-fifth lived in South Bend or elsewhere beyond Niles' urban area. About an equal number of Niles residents were employed in South Bend industries. One of the strong points in the local economy is the balance provided by agriculture, inasmuch as Berrien County ranks high, nationally, in the production of fruits and berries and is also an important source of vegetables and nursery and greenhouse products.

Niles is at the focal point of several major highways — more than are usually found in a city of its size. (Figure 5) U.S.-31-33, leading south to South Bend and northwest to St. Joseph, Benton Harbor and north along the Lake Michigan shore, is most important in terms of the amount of traffic carried. The two east-west trunklines — M-60 and U.S.-112 — are both sections of routes from Detroit to Chicago, the former by way of Jackson, and the latter by a more southerly route through Coldwater. Formerly these routes merged within Niles, continued together westerly to the Lake Michigan shore, where they dropped their designations in making junction with U.S.-12 for Chicago. M-40 from Dowagiac and Paw Paw enters Niles from the north and terminates at its junction with U.S.-31-33 in the center of the

city. M-140, leading directly north to South Haven, does not actually enter Niles, but terminates at its junction with 31-33 about a mile north of the city limits. In addition, an important county road leads due west to Buchanan.

B. THE BY-PASS, THE TOLL ROAD, AND TRAFFIC FLOW

Prior to the opening of the M-60 by-pass, the converging trunklines, combined with the street pattern in Niles, forced all trunkline traffic to pass through the heart of the city where it created serious problems of traffic movement and accommodation. These problems were intensified by the large percentage of heavy commercial vehicles in the trunkline traffic streams and by sharp turns and grades on the routes in the central portions of the city.

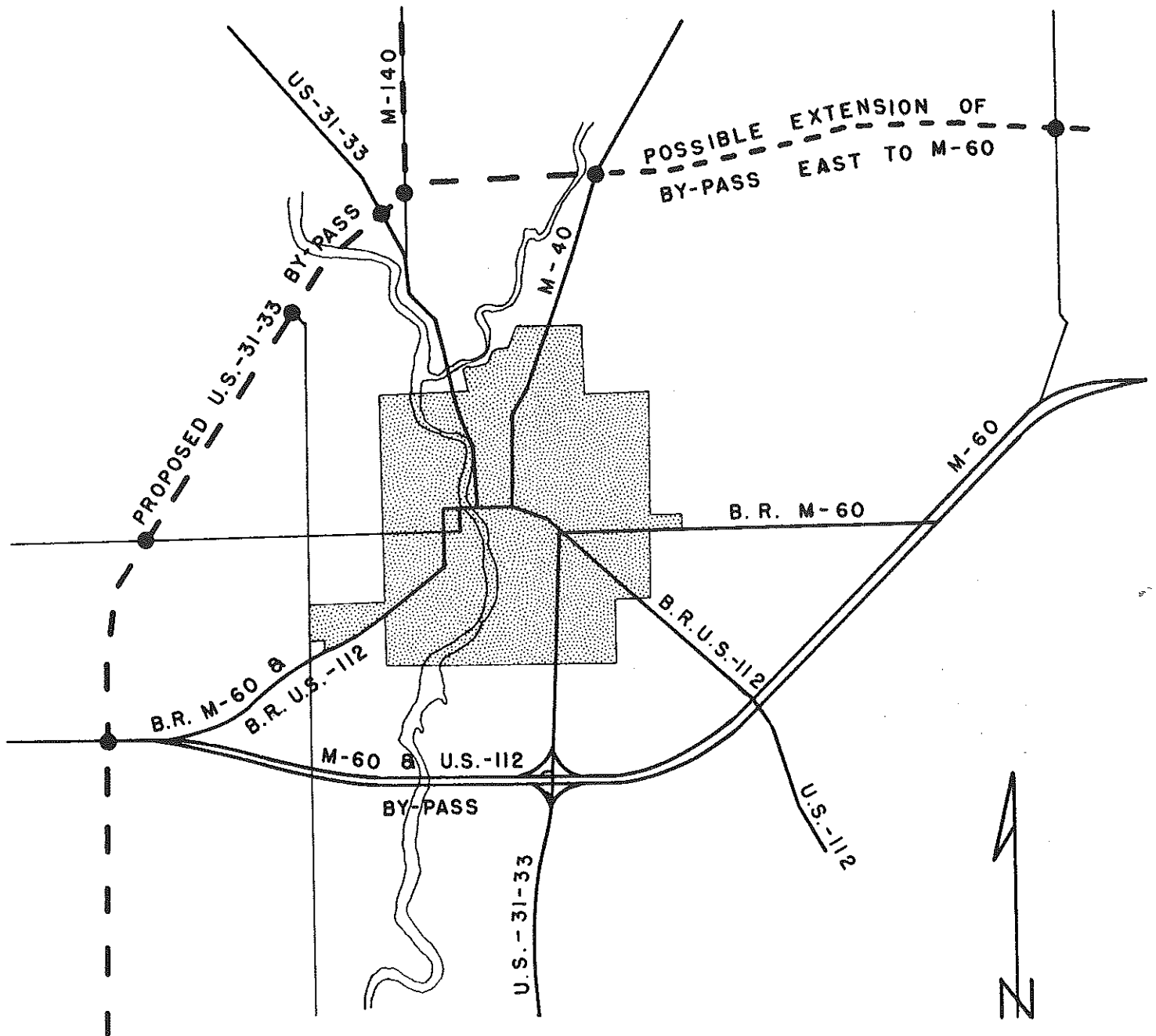
1. The 1949 Niles Area Traffic Study

A discussion of the effects the M-60 by-pass and the Indiana Toll Road have had on traffic flow in the Niles area should properly start with the findings of a traffic study made in that area by the State Highway Department in 1949. In this study data were obtained from drivers interviewed on a July weekday at stations on each of the seven major highways entering the Niles area. Most significant were the analyses of through trips and the interchanges of such trips between the highways.

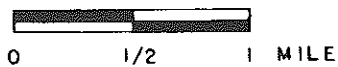
Overall, the through trips accounted for 59 per cent of the traffic crossing the cordon line at the stations and a large part of this traffic was changing routes in Niles. For example, 51 per cent of the 9,977 vehicles per day on U.S.-31-33 south of Niles were on through trips, but only 36 per cent of these through trips were entering or leaving the area on U.S.-31-33 northwest of the city, while 33 per cent left or entered via M-60 east of the city.

In contrast, on U.S.-112 southeast of Niles, 65 per cent of the 2,413 vehicles were on through trips, but 71 per cent of the through trips were destined for or came from U.S.-112 west of the city. On M-60, east of Niles, 58 per cent of the 5,694 vehicles were on through trips but, while 40 per cent of these trips came from or were going to M-60 west of the city, 50 per cent were going to or came from U.S.-31-33 south of Niles. Also important was the 83 per cent of through trips on M-40 which entered or left the area on U.S.-31-33 south.

Figure 5: Major Highways, Existing and Proposed, in the Niles Area



SCALE



The pattern resulting from these analyses made quite clear the need for two by-passes around Niles; one on the line of the M-60 by-pass, since constructed, and the other to carry U.S.-31-33 around Niles and to permit an interchange with M-40 outside the city. The analysis of trailer combination trips in the area indicated which of the two should have priority. It revealed that 89 per cent (or 1,942 vehicles per day) were through trips. The bulk of the trips were represented by the movements between M-60 east and west, U.S.-112 southeast and west and between U.S.-31-33 south and M-60 east. Provision of a by-pass for M-60 and U.S.-112 should cut the volume of through trailer combination trips by as much as 80 per cent. Since it was this type of vehicle that was creating many of the traffic problems in the center of the city such an improvement would be of maximum benefit.

Largely on the basis of the findings of this survey, the M-60 by-pass was built. It is a four-lane divided highway with partially controlled access but with several highway and one railroad intersections at grade. The former routes of M-60 and U.S.-112 became the business routes of those trunklines into and through the Niles urban area. A proposed by-pass to carry U.S.-31-33 west of the city is under study. (See Figure 5.)

This 1949 traffic study also included analyses and estimates of the effect that the construction of the then projected Interstate Highway 94 connecting Chicago and Detroit and passing north and west of Niles, would have on traffic in the Niles area. It was shown that the opening of Interstate 94 would drastically reduce through east-west traffic on M-60 and U.S.-112, reducing passenger car trips to less than 30 per cent and trailer combination through trips to about 11 per cent of the then existing volumes.

Unfortunately, but for obvious reasons, no recognition could be given at that time to the Indiana Toll Road which was not yet proposed; however, as will be shown, its effects were very similar to those predicted from Interstate 94.

2. Effects of the Highway Improvements on Traffic Patterns

During the four-month period immediately preceding the opening of the M-60 by-pass on December 1, 1956, the four sections of the Indiana Toll Road linking the Ohio Turnpike with the Illinois-Chicago expressway systems were opened to traffic. The Toll Road extends across northern Indiana close to the Michigan state line, passing only eight miles south of Niles.

The practically simultaneous opening of these two highway facilities greatly altered the pattern of traffic

flow in the Niles area. Figure 6 shows generalized traffic flows on trunklines within the area. Those on the trunklines outside the city are for the years 1955 and 1957, before and after the by-pass and toll road were opened, and the flows for the two years are superimposed to permit easy comparisons. The flows within the city are for the year 1958 only and are shown to indicate the distribution of traffic between routes in the center of the city.

As would be expected in view of the highway pattern in the Niles area, there was little change in the volume of traffic using the routes north of the city other than the normal increase reflecting the general rising trend of highway travel. However, east, south and west of the city there are very significant changes which can be attributed in part to the opening of the M-60 by-pass and in part to the opening of the Toll Road.

The most noticeable change occurred on the former route of M-60 now designated as Business Route M-60. East of Niles between the by-pass and the city limits the 1957 volumes dropped to less than half those measured in 1955 before the opening of the by-pass. Even more striking was the change west of Niles where the same highway carries both M-60 and U.S.-112; there, the 1957 volume was only one-quarter to one-third that in 1955. It is obvious from the 1957 volumes recorded on the by-pass that the diversion of through traffic to that highway was responsible for a large part of the decrease on what is now Business Route M-60.

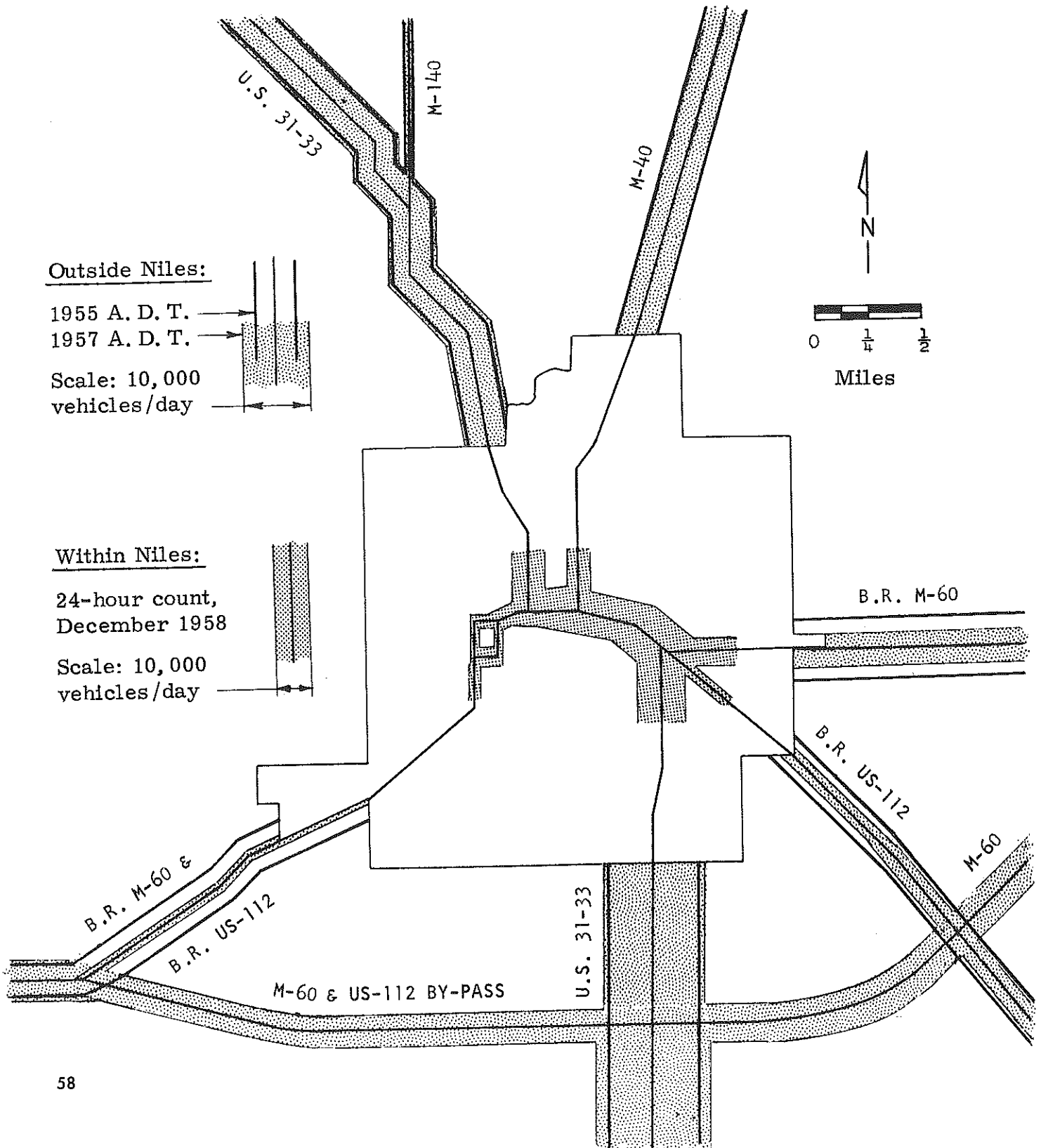
At the same time, it is necessary to point out changes that occurred in the volumes of the traffic approaching the Niles area on these trunklines. Traffic volumes on M-60 east of the by-pass dropped from a daily average of 7,000 vehicles in 1955 to 4,900 vehicles in 1957 and somewhat lesser decreases were recorded on this trunkline all the way east to Jackson. On U.S.-112, while the by-pass is probably responsible for a decrease on Business Route U.S.-112 between the by-pass and the city limits, southeast of the by-pass there was a still greater decrease which, like the drop in M-60 traffic, is attributable to the diversion of through traffic to the Indiana Toll Road after the opening of that artery.

Thus, it is reasonable to conclude that the traffic now entering Niles on these business routes is made up largely of local trips between Niles and points in the rural areas and communities served by the two east-west trunklines.

Traffic on U.S.-31-33 increased both south and northwest of Niles, but the heaviest increase occurred on the section of this route south of the by-pass which indicates that this section is used as a connection with the Indiana Toll Road to or from the other routes converging on Niles. In the case of M-60, and U.S.-112, these

Figure 6: Generalized Traffic Flow on Trunklines in the Niles Area

1955 and 1957 Average Daily Traffic on trunklines outside the city and 24-hour counts taken within the city on December 22-23, 1958



inter-route transfers are made via the by-pass, but the increased through traffic on U.S.-31-33 continues to move through the heart of the city.

From the information available, it is impossible to determine exactly what changes in traffic in the Niles area were caused by the by-pass and what by the toll road. However, it is clear that they have resulted in significant reductions in the volumes of through traffic traversing central business streets and areas on the former trunkline urban routes. While this has reduced congestion, noise and hazard, it also has reduced the number of potential transient customers passing the establishments in these streets and areas. What the net result of these changes has been for retail business in the affected areas is indicated in the following section.

C. BUSINESS ACTIVITY IN NILES

1. Opinion and Comment

Prior to the construction of the by-pass there were strong differences of opinion as to its desirability. The average citizen was reported as being strongly in favor, while the average merchant was in fear of being hurt. The general effect of the opening of the by-pass, along with the Indiana Toll Road, has been desirable — there has been a very noticeable improvement in traffic flow on Main Street due especially to the elimination of much of the truck traffic. However, comments since the opening indicate that some establishments experienced a loss in business as a result of the reduction of traffic volumes and that outlying service stations in particular have been hurt.

Experience in other by-passed cities has shown that service stations are apt to be among those businesses most affected by the diversion of through traffic. Comments of the operators of such stations in Niles range from "Not as bad as was expected" to "The by-pass hurt a lot", and claims of as much as 25 per cent falling off of business. In the light of such comments and the drop of traffic volume, it is a little surprising that new stations have sprung up on what is now Business Route M-60, but it indicates a recognition of the fact that urban service stations derive most of their income from local trade, not through traffic.

Niles' businesses have been attacking the problems arising from the diversion of through traffic by means of concentrated retail promotions, provision of off-street parking, and store modernization. Signs suggesting that the trunkline motorist "Turn Right (or Left, as the case may be) Business Route to Niles" have been placed at turn-off points on the by-pass.

2. The Sales Tax Study

While the reporting of personal opinions and observations has a certain value, it had been concluded, on the basis of earlier studies, that analyses of sales tax collection data and comparisons of the results with those in Berrien and Cass Counties and the entire state would provide the more objective approach required to accurately evaluate the effects of the traffic changes on retail businesses in Niles.

Table IV and the accompanying graphs of Figure 7 summarize the findings based on published retail sales tax information. Analyses covered two years, 1955 and 1956, prior to and two years, 1957 and 1958, following the by-pass opening. Data for Niles are compared with those for the Benton Harbor-St. Joseph community, the Berrien County-Cass County area excluding the three cities and the entire state.

There are, of course, many factors that influence the economic well-being of a city or area. In the Niles study, the influence of the openings of the by-pass and the Indiana Toll Road proved to be minor as compared to that of the economic recession which occurred in the post-by-pass years. In general, as indicated by the figures for Michigan, the recession started in the latter part of 1957 causing sales tax collections which had been rising in step with the increasing population and inflation to be approximately equal to those for 1956. The real decline came in 1958. But the recession was not felt at the same time, in the same manner, or to the same degree in Niles and the other areas with which it was compared. This fact adds to the difficulty of arriving at any firm conclusion regarding the effects of the M-60 by-pass (and the Indiana Toll Road) on retail business in the city. However, the separate and more detailed study of gas stations in the Niles area yields more definite evidence of the influence of changing traffic.

a. General Business Activity

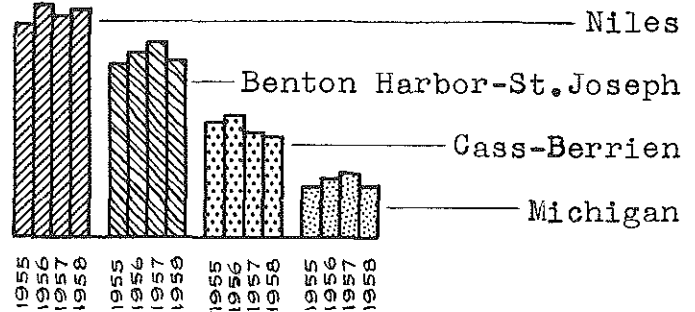
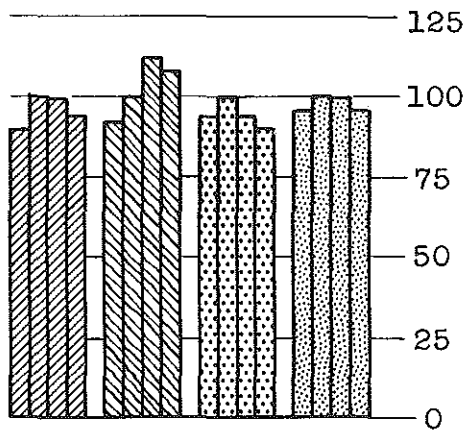
In both years, 1957-1958, after the opening of the by-pass, Niles' business activity, as indicated by the total tax excluding the automotive group, dropped from the 1956 level, but this drop was about the same as that in the entire state and was somewhat less than the drop recorded in Cass and Berrien Counties which points to the recession and not the by-pass as the principal cause of the falling off of business activity. In the Benton Harbor-St. Joseph area, however, the impact of the recession was slower in arriving and sales tax collections increased from 1956 to 1957 at a rate equal to that from 1955 to 1956, helped to some extent by a good fruit crop in the area during 1957.

Figure 7

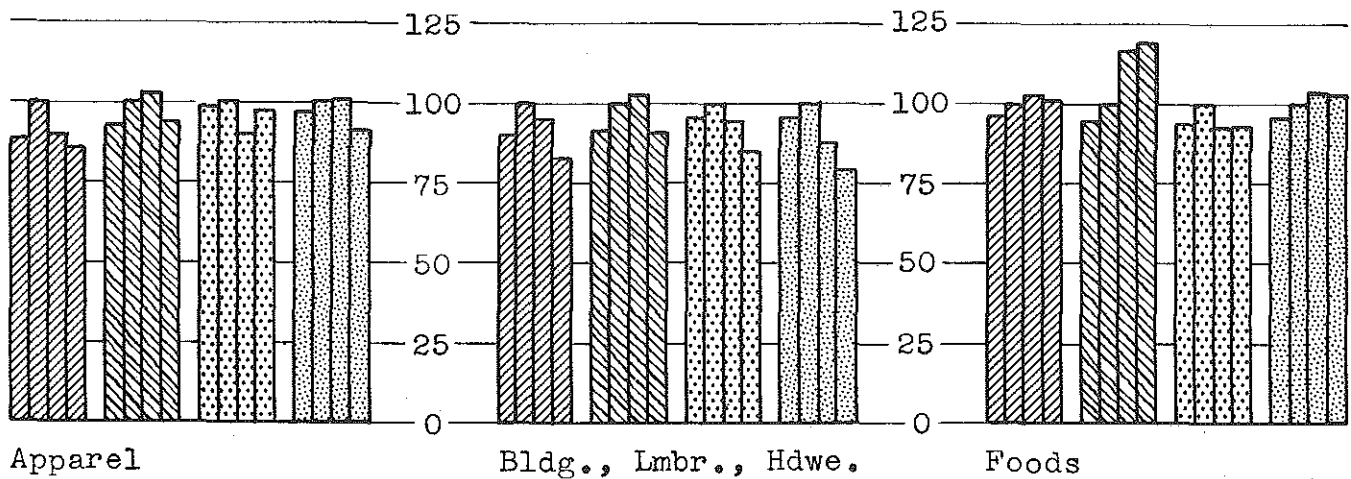
CHANGES IN SALES TAX COLLECTIONS:
 NILES / BENTON HARBOR-ST. JOSEPH
 CASS-BERRIEN COUNTIES / MICHIGAN

1956 Base Year Collections = 100

For sales from:
 Dec. 1954 through Nov. 1955 (1955)
 Dec. 1955 through Nov. 1956 (1956)
 Dec. 1956 through Nov. 1957 (1957)
 Dec. 1957 through Nov. 1958 (1958)



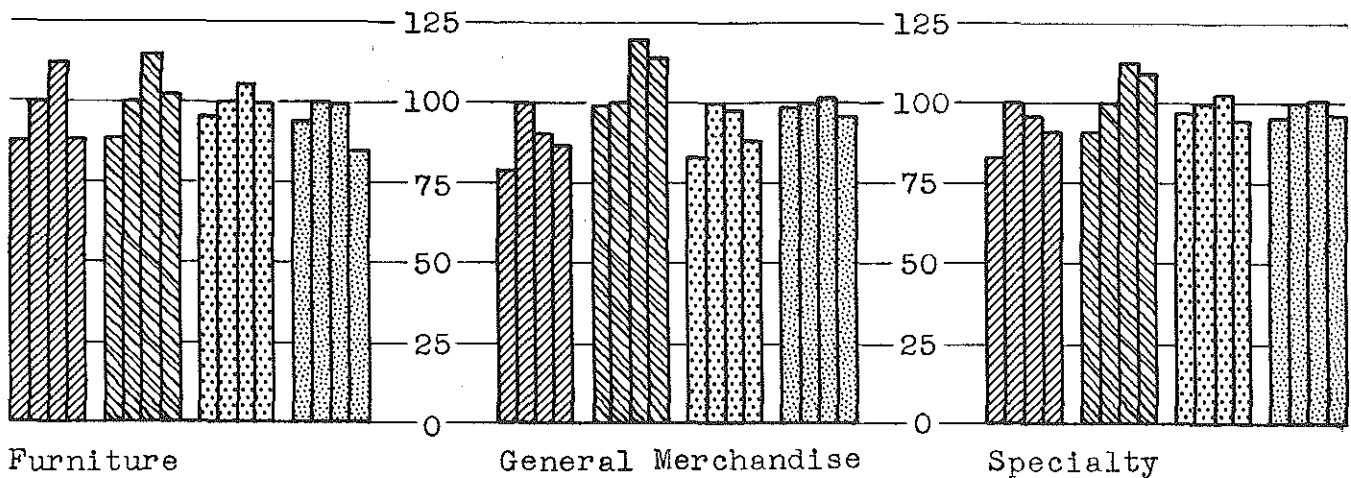
Total Tax excluding Automotive Group



Apparel

Bldg., Lmbr., Hdwe.

Foods



Furniture

General Merchandise

Specialty

Note: Collections from the three cities are excluded from the Cass-Berrien figures.

Source: Michigan Department of Revenue, Research and Statistical Bulletin

TABLE IV

**CHANGES IN RETAIL SALES TAX COLLECTIONS: NILES — BENTON HARBOR-ST. JOSEPH —
CASS-BERRIEN COUNTIES — MICHIGAN**

For sales from: December 1954 through November 1955 (1955) December 1956 through November 1957 (1957)
December 1955 through November 1956 (1956) December 1957 through November 1958 (1958)

Expressed in terms of index numbers with the 1956 Base Year = 100.0

	NILES				BENTON HARBOR- ST. JOSEPH				CASS CO. AND BALANCE OF BERRIEN COUNTY				MICHIGAN			
	1955	1956	1957	1958	1955	1956	1957	1958	1955	1956	1957	1958	1955	1956	1957	1958
Total Tax																
Excluding the Automotive Group	90.0	100.0	99.9	94.5	91.7	100.0	112.0	108.3	94.0	100.0	94.1	89.9	95.1	100.0	99.6	95.3
Total Tax (For all 9 groups)	94.5	100.0	99.4	93.6	94.5	100.0	110.1	104.2	97.8	100.0	98.0	90.4	99.2	100.0	100.6	93.7
Groups																
Apparel	88.2	100.0	88.9	85.4	92.2	100.0	102.2	93.5	98.4	100.0	89.3	97.2	96.9	100.0	100.1	89.8
Building, Lumber, Hardware	89.7	100.0	95.4	82.1	91.8	100.0	102.5	90.4	95.7	100.0	94.8	84.8	96.1	100.0	86.9	78.9
Foods	97.1	100.0	103.1	101.9	95.0	100.0	117.0	119.1	94.0	100.0	92.7	93.1	95.9	100.0	103.0	102.7
Furniture	87.2	100.0	111.7	87.6	88.3	100.0	114.4	101.9	95.8	100.0	105.7	99.9	94.5	100.0	99.3	84.7
General Merchandise	79.0	100.0	90.1	86.7	99.1	100.0	120.0	113.8	82.5	100.0	97.6	87.4	97.8	100.0	101.3	95.6
Specialty	82.5	100.0	96.4	90.8	90.7	100.0	112.6	108.9	97.1	100.0	102.7	94.8	95.3	100.0	100.7	96.5

Source: All data from the Michigan Department of Revenue, *Research and Statistical Bulletin*, monthly issues for the time period covered.

b. General Merchandise, Apparel and Furniture

Sales of the stores in these groups are considered to be the best indicators of central business district activity and should reflect the effect of the by-pass on that vital sector of the city's commercial economy.

The general merchandise and apparel stores in Niles fared badly in 1957 and 1958 compared with those in the other areas shown. Furniture, by contrast, had a significant increase in 1957, which slightly exceeded the increase of like stores in Benton Harbor-St. Joseph, but in the following year suffered a severe decline exceeding that in any other area.

Were it not for the fact that local sources indicated that Niles felt the recession in early 1957, that the Twin Cities did not feel it until 1958, and that Niles' apparent prosperity in 1956 emphasizes declines in following years, one might be inclined to blame the relatively poor showing of the general merchandise and apparel stores to the opening of the by-pass and the toll road. This may have been a factor, but there is not sufficient evidence for such a conclusion. Thus it is concluded that the opening of the highway facilities had no major effect on business activity in the Niles central business district.

c. Foods and Other Groups

The *Food Group*, as here studied, includes not only restaurants and other transient eating places, but groceries and other vendors of food for home consumption, the latter accounting for about two-thirds of the sales of the group. Food sales in Niles parallel those in the state as a whole. Furthermore, the combined food sales of the Twin Cities and rural Berrien and Cass Counties produce a similar index pattern. Therefore, it is concluded that the establishments in the food group in Niles were not adversely affected by the by-pass and toll road openings.

The *Specialty Group* is a somewhat heterogeneous one in which drug and cosmetic sales are most important. Niles stores in this group experienced a decline from 1956 to 1957 while like stores in the other areas had rising sales and by 1958 the drop in Niles was considerably greater than the decline elsewhere. But, as in the general merchandise group, the base year, 1956, was one of relatively high sales in Niles and subsequent declines are measured from that peak.

The *Building, Lumber, Hardware Group* reflects building activity. Niles' establishments in this group did as well in the post-by-pass years as those in the counties,

better than those in the entire state, but somewhat worse than those in the "booming" Benton Harbor-St. Joseph area. As would be expected, this class of business is little affected by diversion of through traffic to the by-pass.

d. Gas Stations — A Detailed Study

To obtain a clear-cut picture of the effects of the by-pass on establishments similarly oriented toward transient trade, but experiencing different degrees of traffic change, a sales tax study was made of all gas stations in Niles and the immediate area which appeared to obtain the major part of their income from the provision of automotive services. A total of 43 such stations, all but three of which were on trunkline routes, were included in the study. There were enough stations (three or more) on most segments of each of the different routes to permit a comparison of business activity between groups of stations which, theoretically at least, should have been affected differently by the diversion of through traffic to the M-60 by-pass. The locations of the stations and their grouping is shown on Figure 8 together with short descriptions of each group.

Stations in the "C" groups were all located on former trunkline routes and some streets where decreases in traffic volume (some as high as 70 per cent) had occurred. Stations in the "D" groups were in locations which should not have been affected at all, or which should have been benefited by, the diversion of through traffic. Groups D-2 and D-3 taken together are considered the "control group" in this study.

Table V contains the index numbers of the sales taxes paid by each of the various groups of stations in Niles, by all Niles' stations, and for comparison, by all gas stations in Michigan, Berrien and Cass Counties. In addition, the table includes indications of the changes in traffic volume passing each group and in the number of stations making returns. Figure 9 shows graphically the month-by-month variation of sales taxes collected from each of the groups of stations.

It should be pointed out that the data on which analyses are based are influenced by factors extraneous to the subject of the study. Not only did the number of stations in each group change during the study period, but there was a rise in the retail price of gasoline, 6 per cent statewide and said to have been more in the whole Cass-Berrien County area, which is reflected in the various totals. In consequence of these factors, the most meaningful comparisons are those between the various groups of Niles' stations.

The index numbers in Table V support, in general, the basic preliminary assumptions as to which groups of

stations would be adversely affected and which would be benefited. All of the "C" groups show decreased sales after the opening of the by-pass and the toll road, while all of the "D" groups show increases, in some cases quite sizable. Because of the large increase of the number of stations in some of both kinds of group, the experience of individual stations could have been radically different from that indicated by the group totals. The drop for stations in the C-3a group, in which the number of stations remained unchanged, may give a better indication of what happened to individual stations.

It is significant to note in Figure 9 the trend in sales taxes collected from the group C-1 stations which are located on former M-60 east of Niles and which would have been the first to be affected by the opening of the Indiana Toll Road to South Bend in August 1956. Collections from these stations in that year declined from an August-September peak to a low in December below that of any of the other study years. Since this trend does not appear in any other group so early in the fall, it is assumed that it is due to the opening of the toll road.

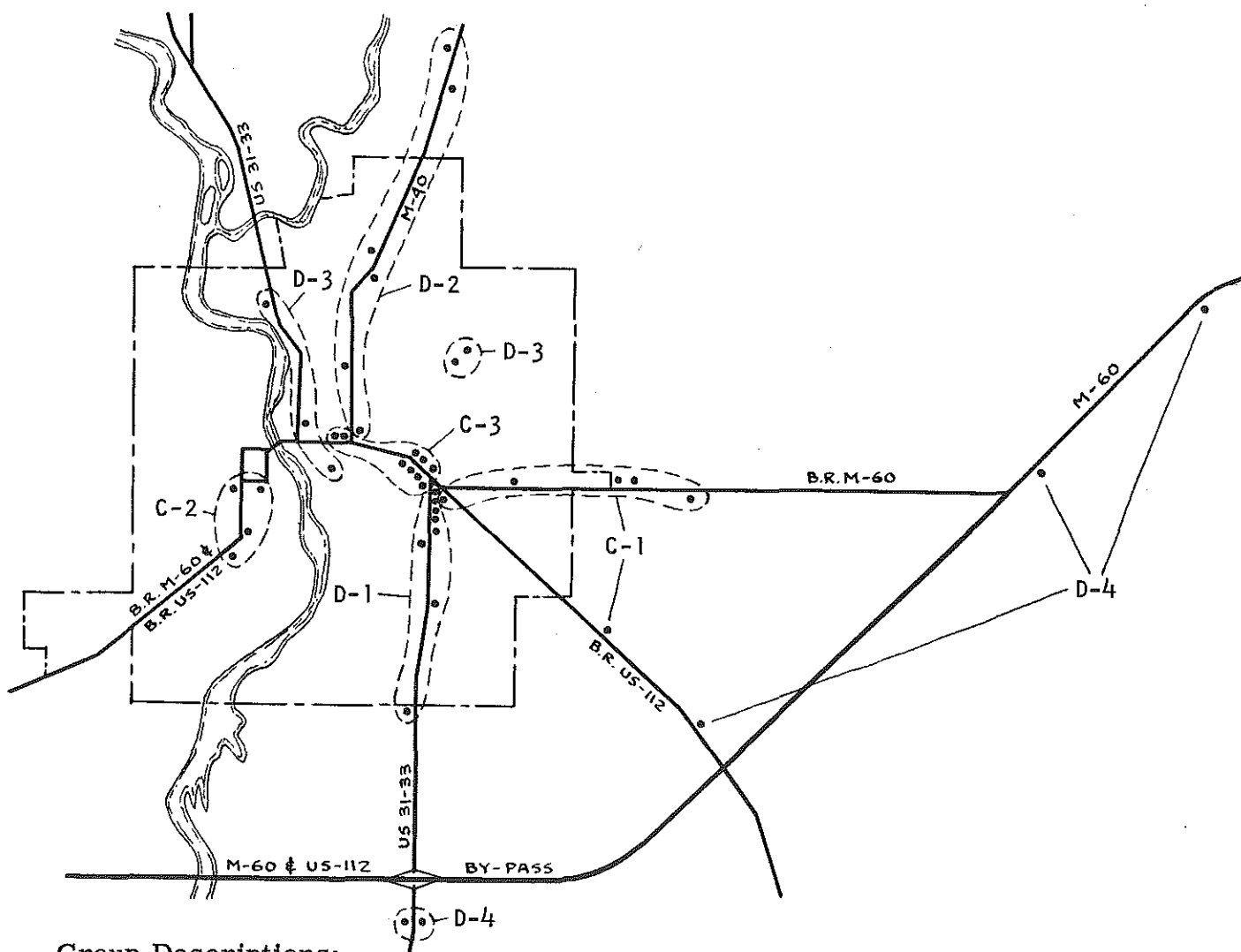
D. SUMMARY AND CONCLUSIONS

Because the opening of the M-60 by-pass so nearly coincided with the initial impact of the general business recession, it is difficult to arrive at definite and clear-cut conclusions on the effect of the by-pass on the basis of published sales tax data. Examination of the changes of various basic groups of businesses in Niles and comparison with like groups in the other areas lead to no definite conclusions as to the effect of the by-pass on the Niles central business district and provide no firm basis for concluding that that district suffered any adverse effects. Nor did the restaurants or other establishments for serving or selling foods show any adverse effects:

In contrast to the inconclusiveness of the majority of the analyses based on sales tax collections the detailed study of gas stations revealed quite clearly that gas stations located along the former routes of M-60 and U.S.-112 through Niles were adversely affected by the diversion of most of the through traffic to the by-pass. On the other hand, some groups of stations appear to have benefited from the changes in traffic patterns.

While it is obvious that Niles has benefited from the reduction of congestion resulting from the removal of much of the through traffic, especially heavy trucking, from its central business district and several major streets leading to it, there is no conclusive statistical evidence that this has caused either a decrease or an increase in the total business activity of the district or the city.

Figure 8: Location and Grouping of Gas Stations in the Niles Study



Group Descriptions:

- C-1: On Business Route M-60 or Business Route U. S. 112 between the eastern section of the by-pass and their junction east of the Niles central business district. (6 stations)
- C-2: On combined Business Route M-60 and Business Route U. S. 112 between their western junction with U. S. 31-33 and the western section of the by-pass. (4 stations)
- C-3: On combined Business Route M-60, Business Route U. S. 112, and U. S. 31-33 through the center of Niles. (9 stations)
- D-1: On U. S. 31-33, from its easterly junction with Business Routes M-60 and U. S. 112 south to the by-pass. (8 stations)
- D-2: On M-40, north from its terminus in the central business district. (6 stations)
- D-3: On U. S. 31-33 north from its westerly junction with Business Routes M-60 and U. S. 112, and other stations in Niles not on any trunkline. (5 stations)
- D-4: On M-60 northeast of the by-pass and on by-pass access roads but visible from the by-pass. (5 stations)

Figure 9: Retail Sales Taxes on Monthly Sales by Niles Gas Stations

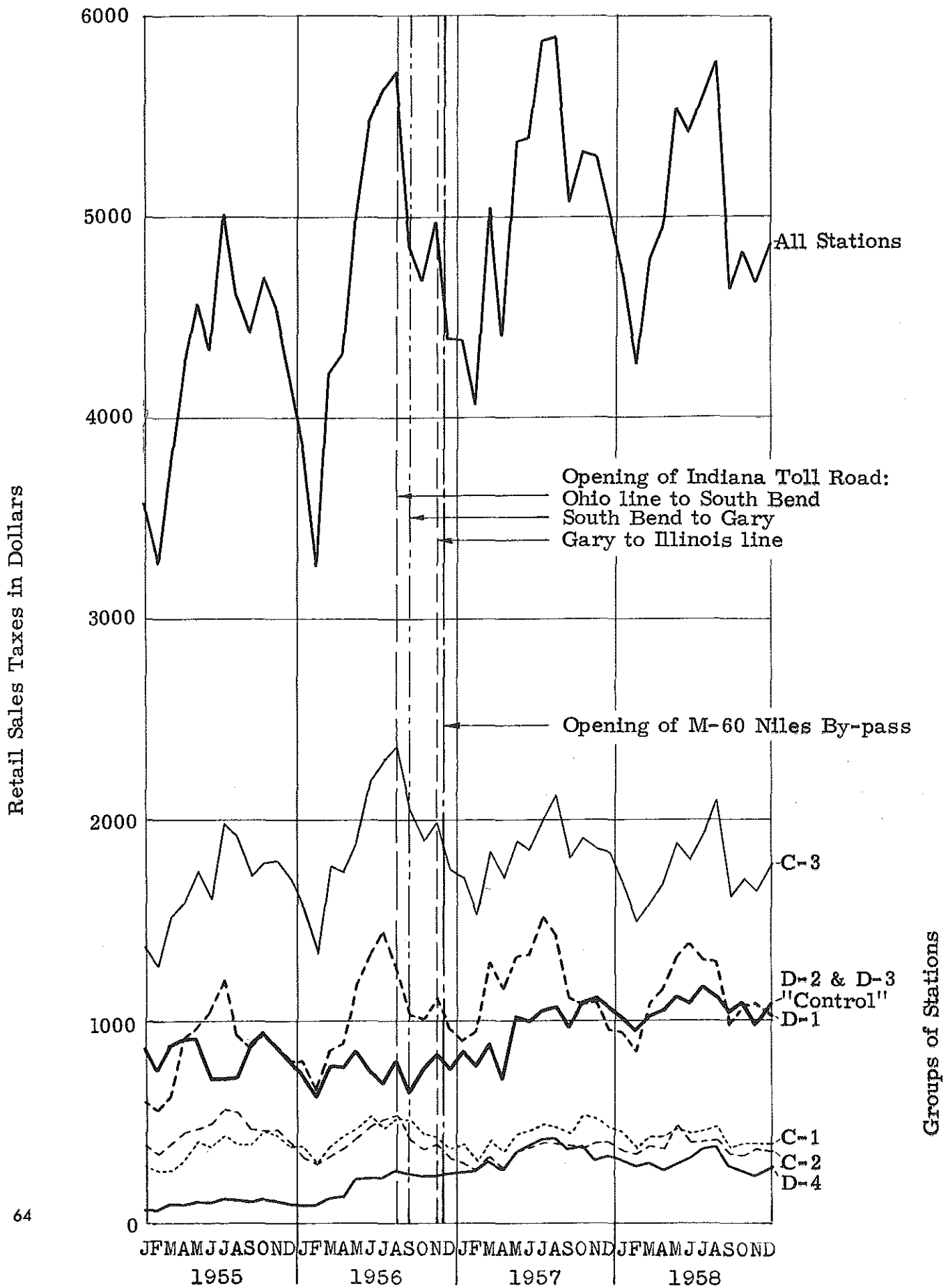


TABLE V

**CHANGES IN RETAIL SALES TAX COLLECTIONS FROM GAS STATIONS
NILES — BERRIEN COUNTY — CASS COUNTY — STATE OF MICHIGAN**

For sales from: December 1954 through November 1955 (1955) December 1956 through November 1957 (1957)
December 1955 through November 1956 (1956) December 1957 through November 1958 (1958)

Expressed in terms of Index Numbers with the 1956 Base Year = 100.0

	1955	1956	1957	1958	Approximate Change in Traffic Volumes past Stations (A.D.T.) 1955-1957*	Percentage Increase in Average Number of Returns 1956-1958
Michigan.....	94.9	100.0	108.3	109.4		3.7
Berrien Co.....	103.9	100.0	112.8	113.1		-3.2
Cass Co.....	96.6	100.0	120.8	131.0		16.0
Niles—All Stations.....	90.4	100.0	107.9	107.4		29.6
"C" Group Stations						
C-1.....	81.8	100.0	98.8	97.9	Down 30-50%	20.0
C-2.....	113.7	100.0	85.7	94.8	Down 50-70%	33.3
C-3.....	87.1	100.0	96.6	92.1	Down 20-25%	17.0
C-3a.....	101.8	100.0	92.5	84.1	Down 20-25%	0.0
"D" Group Stations						
D-1.....	82.3	100.0	114.7	109.2	Up 5-10%	38.8
D-2.....	103.3	100.0	117.2	127.7	No change	41.2
D-3.....	120.6	100.0	133.2	153.3	Up 5%	34.1
D-4.....	50.2	100.0	184.9	169.3	Little change in total volume on three highways	32.6
D-2 & D-3 (Control).....	112.2	100.0	125.5	141.0	Up slightly	37.9

*Estimated by author on basis of available information. Ranges in percentages indicate both the lack of accurate data and the fact that the percentage drop in volume past a particular station in a group will depend upon its distance from the center of the city.

Sources:

- State Data: Michigan Department of Revenue, *Research and Statistical Bulletin*, monthly issues for time period covered.
- County Data: Unpublished records of Michigan Department of Revenue.
- City Data: Sales tax information from Michigan Department of Revenue, based upon field survey and establishment grouping by project staff.

CHAPTER VI

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESSES IN THE CITY OF HOLLAND

A. INTRODUCTION

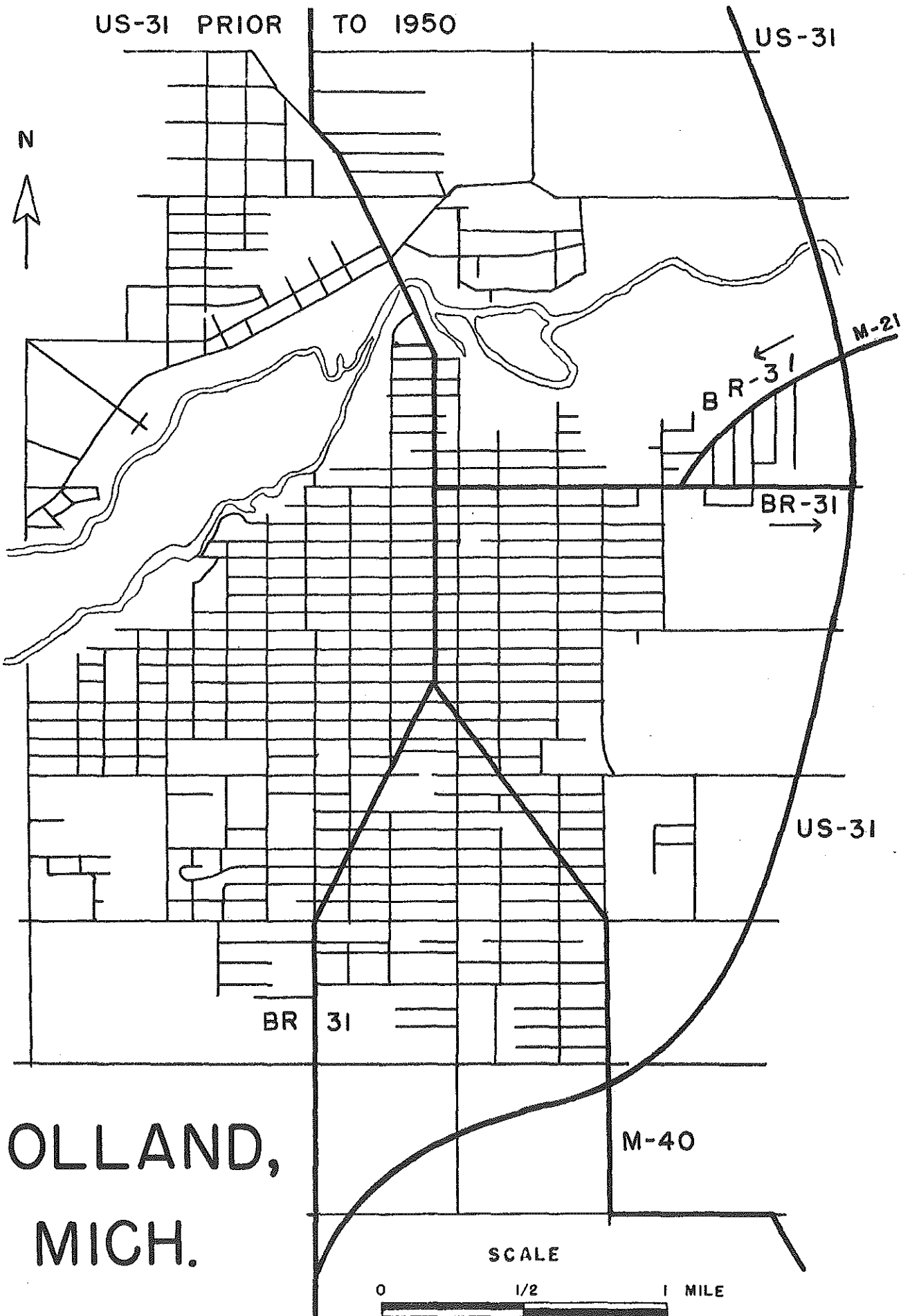
Holland is located in Ottawa County close to the shore of Lake Michigan and in the midst of popular resort areas along that lake's eastern shore. It has several important industrial plants and is the trading center for about half of Ottawa and Allegan Counties. In 1950 it had a population of 15,858; by 1960 this had increased, partially due to annexations, to 24,685. The city is served by two major state trunkline highways: U.S.-31, extending north and south along the Lake Michigan shore, affords connection with Chicago and northern Indiana, and M-21 extending east-west across the state and linking the city with Grand Rapids terminates at its

junction with U.S.-31 in the Holland area. U.S.-31 south and M-21 comprise part of the interstate system route between Chicago and Grand Rapids.

Prior to 1950, U.S.-31 was routed through the entire north-south length of the city. M-21 entering the city from the northeast, joined U.S.-31 in the heart of the central business district. However, in 1949 a first section of a by-pass for U.S.-31 was opened from north of Holland to a connection with M-21 just outside the northeast city limits. The north half of U.S.-31's urban route was abandoned as a trunkline and U.S.-31 traffic rerouted over this new connection, continued to traverse the central business district. In the following years the by-pass was extended around the eastern and south-

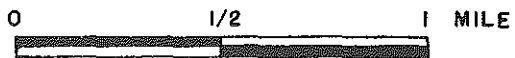
Figure 10

US-31 PRIOR TO 1950



HOLLAND,
66 MICH.

SCALE



eastern edges of the city to connect with U.S.-31 south. The completed by-pass was opened to traffic in 1954 at which time the urban sections of the trunkline became Business Route U.S.-31. (See Figure 10.)

The large volumes of trunkline traffic which were routed through Holland and its business district prior to 1955 and the changes in traffic volumes on the former urban route and on the by-pass are illustrated graphically in Figure 11. The sharp reductions in traffic on the former route after the by-pass opening are very noticeable. At Station B south of the central business district, there was a reduction of over 50 per cent from 1953 to 1957. The reduction south of the city (Station A) was only slightly smaller. These reductions took place during a period when traffic generally was increasing. Even more important was the reduction in commercial traffic which decreased 60 to 65 per cent after the opening of the by-pass.

B. BUSINESS ACTIVITY IN HOLLAND

Unfortunately, the effects of the by-pass opening could not be determined by an analysis of sales tax collections for various business groups for years before and after the new facility was opened to traffic because no tax data for years prior to 1955 were available for cities with population of over 10,000. The principal subjects for study in Holland were 22 gasoline stations.

1. The Study of 22 Gasoline Stations

Of all motorist-oriented businesses, gasoline stations are perhaps most susceptible to adverse effects from the diversion of through traffic. Holland offered an excellent opportunity to examine these effects. There are eleven stations located on the present business route of U.S.-31 whose business could be studied for two years prior to and for three years after the opening of the by-pass when this route ceased to be the main trunkline route. Then there were eleven other stations located on pre-1950 U.S.-31 which would be differently affected by the by-pass. These two groups of stations were each further divided and designated as follows:

- C-1: Seven stations on B.R. U.S.-31 some distance from central business district.
- C-2: Four stations on B.R. U.S.-31 close to central business district.
- D-1: Six stations *not* on B.R. U.S.-31, but on pre-1950 U.S.-31 and some distance from central business district.
- D-2: Five stations *not* on B.R. U.S.-31, but on pre-1950 U.S.31 and close to central business district.

While the "D" groups had been by-passed in 1949 and the "C" groups in 1954, examination of sales tax data for each of the groups for the years 1953-1957, inclusive, indicated the effects of by-passing on this type of business over a considerable range of time. Table VI presents the results of this analysis and compares them with similar data for Ottawa and Allegan Counties and the entire state.

All groups show an increase from 1953 to 1954. After a slight decline in taxable sales during the year after the opening of the by-pass, all groups except one resumed upward trends. The exception is Group C-2 which is close to the central business district and on the business route. While the other three groups all enjoyed a good increase, the two groups farthest from the central business district increased rather spectacularly.

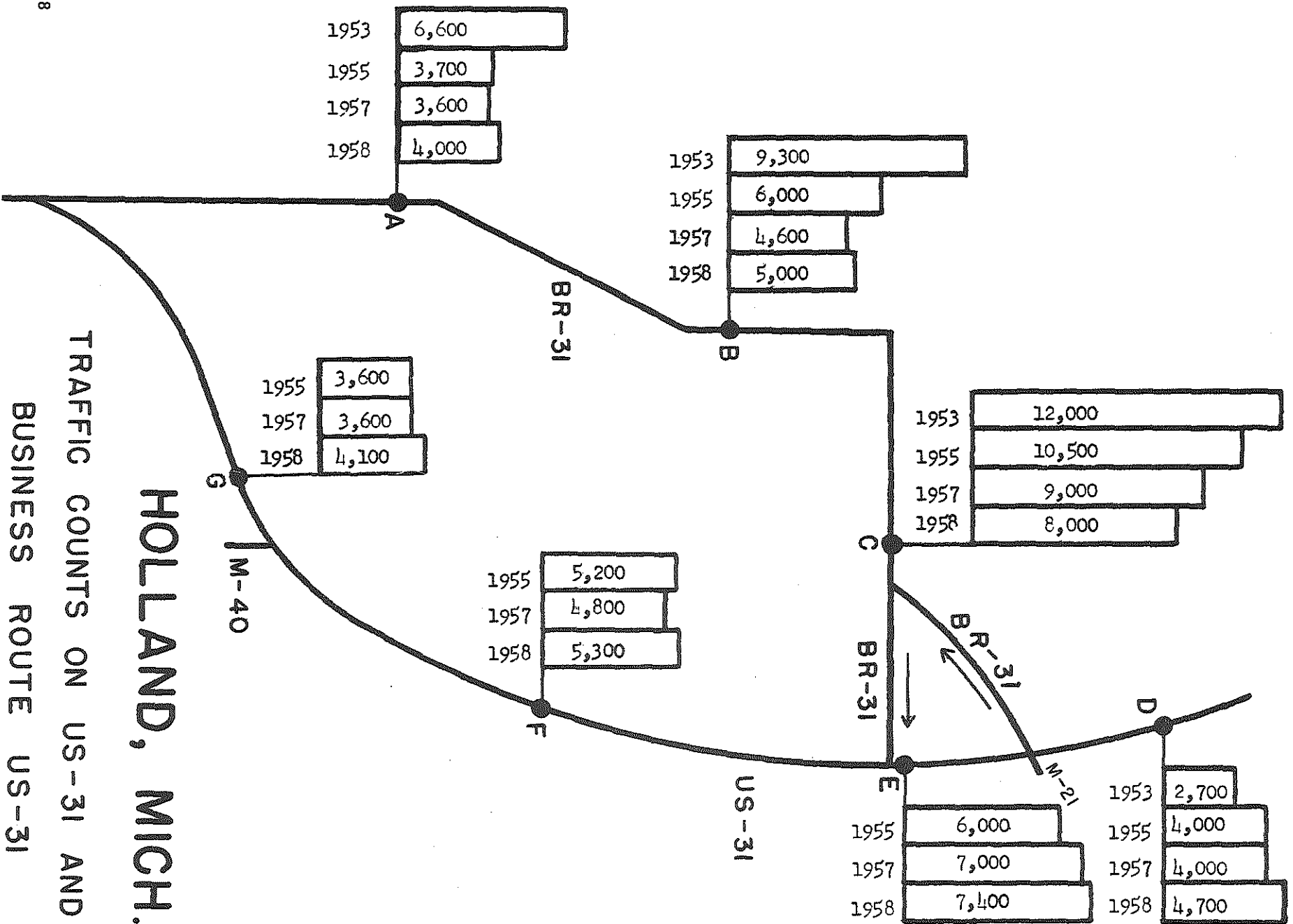
2. Sales Tax Study

As has been explained, sales tax information as reported by the Michigan Department of Revenue does not include group data for cities of more than 10,000 population for years prior to 1955. Therefore, the sales tax data for groups of businesses in Holland are only for the four years immediately following the opening of the by-pass in 1954. These data for Holland and for the balance of Ottawa County and for Michigan are shown in Table VII. Since the significance of this study lies in comparing business trends as reflected by the trends of sales tax payments, all dollar amounts have been expressed in terms of index numbers with 1955 as the base year.

Total sales tax collections in Holland increased slightly in 1956 and then declined in the two following years with the result that the index for 1958 was well below that for Ottawa County but slightly higher than that for the entire state. This may be the result of the gradual movement of retail trade from the center of cities to their periphery as most frequently seen in the form of suburban shopping centers.

The rising trends of sales tax payments in the food, miscellaneous retail and non-retail groups perhaps, reflect the increase of Holland's population after the 1950 census. However, the sales tax payments in the general merchandise, apparel and furniture groups have shown a steady decline over the same period. Since this trend was markedly contrary to that in Ottawa County, though more or less in step with the statewide trend, and inasmuch as these groups represent the core of central business district trade, it can be concluded that the Holland central business district generally experienced a sales trend analogous to that of the downtown gas stations. It is possible that out-of-city establishments gained at the expense of downtown just as the outlying gas stations gained at the expense of those close in.

Figure 11



Source: Traffic Survey Maps, Michigan State Highway Department

TABLE VI
Sales Taxes Paid by Gasoline Stations

Index Numbers, 1954 = 100

Years indicated are Study Years, December of previous year through November of year stated.

	1953	1954	1955	1956	1957
Michigan*	93.5	100.0	110.0	115.9	125.4
Ottawa Co.	92.3	100.0	106.1	118.6	128.4
Allegan Co.	88.7	100.0	110.1	117.2	132.1
Holland:					
C-1	76.6	100.0	95.7	120.1	140.5
C-2	92.4	100.0	96.8	97.8	96.7
D-1	96.9	100.0	99.2	105.1	114.1
D-2	89.2	100.0	106.1	119.9	143.2
Four Groups	88.6	100.0	98.6	118.1	133.9

*Michigan data are for calendar years.

Holland has shown that the retail sales trends of the four groups of stations did not exhibit a consistent influence of the by-pass. Rather, their business seemed more a factor of their location, the two groups close to the city's central business district faring much less well than the outlying groups. Significantly, however, all except one group made good gains during the balance of the study period.

Sales tax payment trends of the nine groups of businesses including all retail activity in Holland showed a decline for those businesses generally representative of downtown retail trade during the four years following the opening of the by-pass. Since the gasoline business, the one most oriented toward the motorist, did not,

TABLE VII
CHANGES IN SALES TAX COLLECTIONS

Calendar years 1955, 1956, 1957, 1958
(1955 Base year = 100)

	HOLLAND				BALANCE OF OTTAWA CO.				MICHIGAN			
	1955	1956	1957	1958	1955	1956	1957	1958	1955	1956	1957	1958
Total Tax	100	103.95	99.63	96.96	100	106.05	108.49	104.51	100	100.83	101.48	94.45
Automotive	100	103.32	93.38	83.06	100	94.76	100.79	88.62	100	88.58	92.20	78.09
Apparel	100	104.86	95.49	96.35	100	112.89	118.06	120.00	100	103.25	103.30	92.76
Bldg., Lumber, Hardware	100	95.49	83.57	81.94	100	124.22	110.81	102.92	100	104.05	90.45	82.12
Food	100	115.80	121.30	125.74	100	108.81	114.73	116.03	100	104.23	107.37	107.02
Furniture	100	106.57	95.73	84.97	100	97.20	131.61	147.54	100	105.84	105.12	89.62
General Merchandise	100	78.25	70.33	68.49	100	104.30	107.63	104.12	100	102.23	103.57	97.74
Specialty	100	105.35	105.89	109.25	100	118.60	122.48	121.55	100	104.96	105.69	101.27
Miscellaneous Retail	100	111.18	120.86	120.34	100	103.41	97.91	87.11	100	110.50	107.86	89.47
Non-Retail	100	121.98	122.48	130.01	100	90.64	88.68	86.26	100	112.87	112.12	113.22

Source: Michigan Department of Revenue: *Research and Statistical Bulletin*, monthly issues for the time period covered.

In the automotive, building-lumber-hardware groups, city sales tax trends were roughly similar to those in the balance of Ottawa County and in the state.

3. Summary and Conclusions

The analysis of the gasoline station sales tax data for

as a whole, suffer as a consequence of the by-pass, it seems unlikely that downtown business would be so affected. Hence the decline in business volume in the central business district can be attributed to causes, not here determined, other than the reduction in through traffic caused by the opening of the by-pass.

CHAPTER VII

EFFECTS OF A BY-PASS HIGHWAY ON BUSINESSES IN THE CITY OF ADRIAN

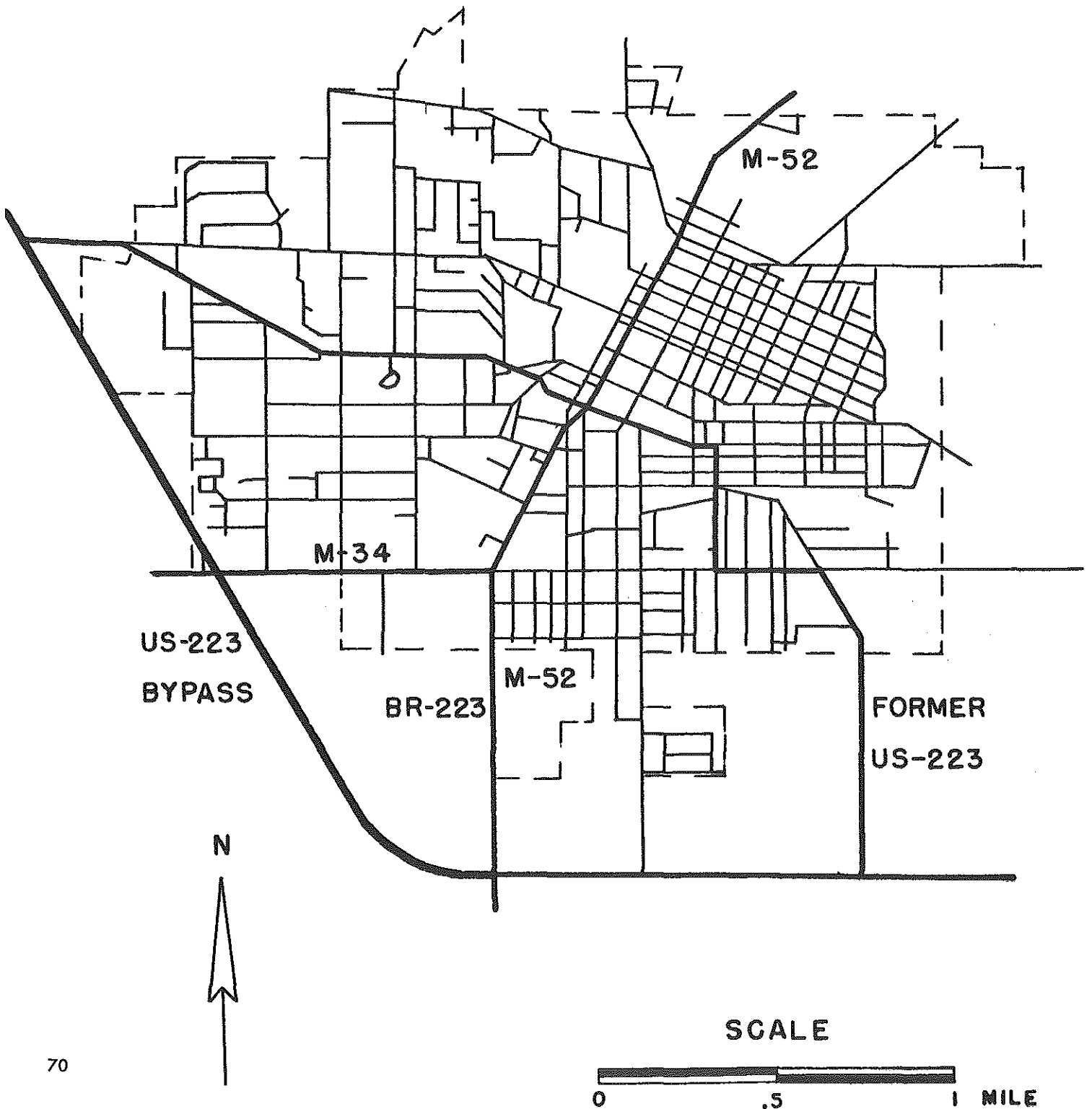
A. INTRODUCTION

Adrian is located in southeastern Michigan midway between Jackson, Michigan, and Toledo, Ohio. It is an industrial city with a 1950 population of 18,393 and is

the trade center for the notably productive farming area of Lenawee County of which it is the county seat. Highway M-52 passes through the city in a north-south direction and M-34 enters from the west and terminates in the city. U.S.-223, the shortest route between Jackson

Figure 12

ADRIAN



and Toledo, formerly passed through the center of the city where it intersected M-52, but on December 19, 1955, a by-pass around the west and south edges of the city was opened to traffic. On that date the former urban route became Business Route U.S.-223. See Figure 12.

The three-mile U.S.-223 by-pass at Adrian was built in stages. The first section, from U.S.-223 southeast of the city to a junction with M-52 south of the city, was not extended for several years and during that time U.S.-223 traffic was routed over M-52 from its intersection with the old route in the center of the city to the connection with the by-pass segment. It is this urban route which became Business Route U.S.-223 when the by-pass was completed to its junction with the trunkline west of Adrian in 1955.

B. TRAFFIC CHANGES

Precisely what effect the opening of the by-pass has had on traffic volumes is difficult to determine because of a lack of counts prior to the opening. On the basis of such data as are available, it is estimated that volume on the former route of U.S.-223 (now B.R. U.S.-223) dropped 13 per cent in the three-year period, 1954-1957. During the same period traffic on U.S.-223 just west of the by-pass apparently increased about 35 per cent. In addition, counts in 1957 indicate that the by-pass is carrying nearly 50 per cent of the traffic entering or leaving the city via U.S.-223 west of the city.

The attitude of Adrian residents toward the by-pass has been enthusiastically favorable. This has been due to other benefits than the rather modest drop in total traffic volume. In the first place, 1957 traffic counts reveal that the by-pass was carrying approximately 70 per cent of the large commercial vehicle component of the traffic approaching the city on U.S.-223 from both east and west. And not only does the by-pass eliminate the U.S.-223 through truck traffic from the center of Adrian, it also permits some interchange of traffic between that route and M-34 and M-52 to take place outside the city, instead of inside as formerly was the case.

C. THE SALES TAX STUDY OF BUSINESS ACTIVITY IN ADRIAN

This study of the effects of the U.S.-223 by-pass on retail businesses in Adrian is based on analyses of sales tax collections from various groups of businesses for one year preceding and for two years following the opening of the by-pass, and on comparisons of these results with similar data for Lenawee County (outside Adrian) and the entire state of Michigan. Dollar amounts are expressed in terms of index numbers, using 1955 collections as the base. See Table VIII.

1. General Business Activity

On the basis of information in Table VIII, it is concluded that in the two years following the opening of the U.S.-223 by-pass, general business activity in the Adrian area held its own and may have improved, but that at the same time some types of business apparently did suffer a decline in sales volume or had a smaller increase than like establishments in the county and state. The total tax shows that Adrian's overall business activity increased somewhat more than the state's and much more than that in the balance of the county.

2. Gas Stations

The seven stations studied are located along Business Route U.S.-223 west of the center of the city. In the first year after the by-pass opening they showed nearly as much increase as stations in the county and state, but their increase was less than that for the other areas in the year following. Because of their location in a developed urban area, these stations would be expected to get most of their business from local residents and have a small percentage of transient trade. This appears to be borne out by the fact that there is at most a small loss of business that could be attributed to the diversion of traffic to the by-pass.

3. General Merchandise, Apparel, and Furniture

These three groups of business constitute the real nucleus of major shopping centers. In Adrian, the general merchandise group of businesses experienced a slightly smaller increase of trade than did those in the state as a whole, and much less than like establishments in the balance of Lenawee County. However, the apparel group did rather better and the furniture group much better than like businesses in the other two areas.

On the basis of the performance of these three groups, it is concluded that the diversion of through traffic to the by-pass did not adversely affect business activity in Adrian's central business district.

4. Food

This group includes both eating places and food stores, the latter category accounting for about 75 per cent of the group's sales tax collections. Taken as a whole, the food group did very well in the two-year period following the opening of the by-pass. An analysis of restaurants alone might show some loss, but such a study was not possible with available data.

5. Other Groups

Sales tax collection figures obtained for the three other business groups shown — building, lumber and hard-

TABLE VIII
CHANGES IN SALES TAX COLLECTIONS
On sales during the calendar years 1955, 1956, and 1957

Index Numbers, 1955 Base Year

	SEVEN ADRIAN STATIONS			LENAWEE CO.			MICHIGAN		
	1955	1956	1957	1955	1956	1957	1955	1956	1957
Gas Stations.....	100.0	102.9	104.5	100.0	103.3	112.1(1)	100.0	103.6	114.9

GROUP	ADRIAN			BALANCE OF LENAWEE CO.			MICHIGAN		
	1955	1956	1957	1955	1956	1957	1955	1956	1957
Total Tax (2) (less Automotive and Misc. Retail Taxes).....	100.0	103.9	105.7	100.0	96.2	95.9	100.0	103.7	103.3
Apparel.....	100.0	103.5	102.5	100.0	93.9	98.9	100.0	101.3	100.6
Building, Lumber and Hardware.....	100.0	101.7	104.8	100.0	91.3	83.5	100.0	102.2	89.2
Food.....	100.0	107.9	113.3	100.0	97.3	98.0	100.0	103.1	106.5
Furniture.....	100.0	107.5	115.8	100.0	84.2	78.4	100.0	103.9	102.1
General Merchandise.....	100.0	101.5	101.7	100.0	102.6	111.8	100.0	101.9	102.9
Specialty.....	100.0	90.2	84.9	100.0	111.2	110.4	100.0	103.0	103.4
Non-Retail.....	100.0	106.3	96.8	100.0	94.2	109.1	100.0	111.8	110.9

- (1) This percentage is approximate. Due to errors in classification for the months February through May, 1957, it was necessary to estimate the sales taxes for these months on the basis of the available information.
- (2) The reasons for excluding the Automotive and Miscellaneous Retail group sales from the Total Tax percentages are explained in the text. The Total Tax percentages shown are based on the sales taxes paid by the seven groups listed separately.

Sources:

City, Balance of County, and State Data: Michigan Department of Revenue, *Research and Statistical Bulletin*, monthly issues for time periods covered.

Adrian Gas Station Data: Michigan Department of Revenue, based on field survey by Project Staff.

Lenawee Co. Gas Station Data: Unpublished records of Michigan Department of Revenue.

ware, specialty, and non-retail – do not produce index numbers from which any definite conclusions can be drawn, although the specialty group (including drugs, jewelry, sporting goods and flowers) suffered a significant drop that was more severe than and contrary to the trends for this group in the county and state.

6. Summary and Conclusions

On the basis of the statistical information available, it is concluded that the diversion of a large part of the

U.S.-223 through traffic to the by-pass did not adversely affect the general retail activity in Adrian nor prevent it from enjoying an increase in keeping with that in the state and better than that in the balance of the county. On the other hand, the analysis of tax data for the seven gas stations on the former route of U.S.-223 indicates that while they had increasing sales the two years following the by-pass opening, this increase would have been greater had it not been for the by-pass.

CHAPTER VIII

CONCLUSIONS OF THE BY-PASS STUDY SERIES

The objective of the entire Michigan By-Pass Study project was the determination of the impact felt by retail business in Michigan cities where through trunk-line traffic had been rerouted to a new highway bypassing the community. Those conclusions of the studies which arose in some similar form out of one or more of the study areas can be considered as having

application to small communities of generally similar characteristics.

The most basic and most important conclusion common to five of the six studies is that, based on sales tax collections, retail business made greater relative gains in these cities than it did in Michigan as a whole during each particular study period. If business increased,

it increased more in the city than in the state; if it declined, its decline was less in the city than in the state.

Thus the project emphatically refutes the oft-heard allegation that a by-pass will "kill" business in any small town. The smallest town of the ones studied — Hart — labored under the most serious economic handicaps during the study period and is also the city most reliant on tourist trade, yet its retail business rose 10 per cent more than the state's.

Another conclusion of more than usual import concerns gasoline stations and restaurants — the two kinds

operation even some whose business suffered expressed appreciation for its benefit to the community consequent to the removal of through traffic, especially trucks, from the main business streets and districts. This afforded the hometown shoppers more convenient access to the business places. In the smaller cities it is evident that the merchants' attention to this local trade has paid off.

The conclusion of this series of studies is that a basically healthy local retail economy is likely to benefit from a by-pass highway.

TABLE IX
INDEX NUMBERS OF SALES TAX PAYMENTS

	STUDY YEARS					
	1953	1954	1955	1956	1957	1958
Mason (Total Tax Less Autos).....	100	106.9				
Michigan (Total Tax Less Autos).....	100	104.0				
Adrian (Total Tax Less Automotive and Misc. Retail Group).....			100	103.9	105.7	
Michigan (Total Tax Less Automotive and Misc. Retail Group).....			100	103.7	103.3	
Hart (Total Tax Less Automotive Group).....			100	109.2	108.3	
Michigan (Total Tax Less Automotive Group).....			100	105.2	107.5	
Holland (Total Tax).....			100	103.95	99.63	96.96
Michigan (Total Tax).....			100	100.83	101.48	94.45
Niles (Total Tax).....			94.5	100	99.4	93.6
Michigan (Total Tax).....			99.2	100	100.6	93.7
Zeeland (Total Tax Less Automobiles).....				100	102.8	105.9
Michigan (Total Tax).....				100	100.6	93.7

of business presumed to be the most susceptible to any detrimental effects of rerouting traffic. The studies have shown that these establishments may suffer or that they may not depending on a number of conditions in addition to traffic diversion to a by-pass. Restaurants in Mason and Hart lost some, but different parts of their trade, while in Zeeland the business of these eating places increased after the by-pass opening.

There was a like diversity in the experience of gasoline stations following the diversion of through traffic to the by-pass. In all cities there seemed to be an effort on the part of the operators of by-passed stations to gain more local trade. The degree of their success is not fully shown by the sales tax data, since automotive services consist largely of non-taxable labor charges.

While some merchants viewed by-pass proposals with fear and suspicion, after the by-pass went into

Table X
THE 1960 CENSUS

At the time of editing, the preliminary 1960 census counts had just been made available:

	Population, 1950 Census	Population, Preliminary 1960 Census	Increase, 1950 to 1960	
			Number	Per Cent
Adrian	18,393	20,262	1,869	10.2
Hart	2,172	1,968	-204	-9.4
Holland	15,858	24,685	8,827	55.7
Mason	3,514	4,490	976	27.8
Niles	13,145	13,763	618	4.7
Zeeland	3,075	3,692	617	20.0

While these population data do not alter the conclusions of any of the studies, they do in some instances affect the magnitude of the changes of various economic indicators.

SECTION IV

Land and Property Values and Land Usage in Relation to Dort Highway Improvements*

INTRODUCTION

This study is closely related to two other research projects whose results are summarized in other sections of this report. Like the studies reported in Section III, it investigates the economic effects of a by-pass highway, but while they sought to determine how the diversion of through traffic to a highway by-passing the whole city area affects retail trade on the former route, the present study investigates the effects of an urban highway which by-passes the central area of a large city, on the value and usage of lands adjacent to or served by the new route. This latter objective is somewhat similar to that of some of the studies reported in

Section II, except that those studies are concerned with the effects of rural highway improvements on the values of adjacent farm lands, while this study is concerned with how a highway improvement in an urban area affects the use and value of the abutting and neighboring land.

Although knowledge of and methods for this field of inquiry have not been fully developed as yet, results of such a study should be helpful in the location of highway improvements relative to urban communities, in the appraisal of property for land acquisition, and in determining, on the basis of benefits, how a highway improvement program should be financed.

CHAPTER I

SCOPE AND METHODS OF THE STUDY

The specific objectives of this research study are:

1. To ascertain the changes in property values and uses which occur in
 - (a) the properties which abut a highway and
 - (b) the properties located in areas serviced by the highway;
2. To test certain hypotheses concerning the reasons for these changes;
3. To test methods of research and to develop, insofar as possible, new research methods applicable to such studies.

*Condensed from the technical research report, "Land and Property Values in Relation to Dort Highway Improvements" by Ronald Larson and Eric Schenker, Michigan State University Highway Traffic Safety Center, East Lansing, Michigan, June 1959.

A. THE STUDY AREA AND THE DORT HIGHWAY

An area comprising lands adjacent to a section of the Dort Highway at Flint, Michigan, was selected as the object of this study as representative of conditions subject to highway influence and because Dort Highway had been in operation long enough for its impact to have taken effect. The Dort Highway is a 15-mile by-pass highway, part of which lies within the Flint city limits. (See Figure 1.) Direct access to the highway has facilitated intensive commercial and industrial development in this as well as in other areas. The area along the highway selected for observation is 10 miles long, north and south, and one and a half miles wide.

The east-west boundaries were set on the basis of the growth of land usage in the study area and tend to approximate the sphere of the immediate influence of the highway on land use.

In 1926-27, the Dort Highway, previously called the Western Road, was paved and converted to a cutoff around the eastern edge of Flint for heavily traveled state trunkline U.S.-10. The initial construction of two lanes was completed in 1927 and the highway was widened to four lanes in 1934, 1938 and 1947. At present the by-pass is an undivided four-lane full access highway, except for a short stretch of three-lane pavement north of the study area.

What is now the Dort area was entirely farm land up to 1921 although there was some residential development on its western fringe toward Flint. However, in 1921 the land between Western Road and Franklin Avenue was platted for commercial and industrial development and in 1923 a railroad line was built parallel to Western Road and an industrial building now the AC Spark Plug plant, was put up near the intersection of Western and Davison Roads. Changes in land use continued over the years with the appearance of extensive commercial activity. In most cases it appears that paving of roads in the area has followed initial residential, commercial and industrial development.

Flint's growth from a lumbering town, to a commercial and manufacturing center, and then to a great automotive industrial complex has generated varying levels of economic activity which, with the alternations of the business cycle, are major factors associated with changing prices and uses of real property in the Dort area as well as in the city as a whole.

1. Land Uses in the Study Area

The land use patterns in the study area at four points in time during the past 30 years are portrayed on the maps in Figure 2. They indicate a good deal about the past development trends on Flint's east edge. When this information is combined with other facts about the city's physical history, they reveal some of the reasons for today's pattern.

The 1924 map shows no commercial development in the study area and that the only significant industry was the AC Spark Plug plant. Residential areas are quite solid.

The 1937 map reveals increasing residential development with some commercial uses mixed with it. There is no sign that the highway attracts development, although it had been built for 10 years.

The 1950 map shows that much strip commercial development has occurred and some industrial uses

have appeared. Residential development has jumped the Dort Highway although there still is ample space on the west (city) side. But the development is sporadic except around large existing residential clusters. However, there is evidence that residences shy away from the highway, although it is not yet a serious barrier.

By 1958, strip development is solid along Dort Highway and Davison Road. Residential development has continued to be spotty and about half the study area is still vacant. The tendency to fill in the vacancies in the residential area west of Dort Highway indicates that the highway with its heavy traffic has become a barrier to automobile and pedestrian cross traffic.

B. METHOD AND LIMITATIONS OF THE INQUIRY

To evaluate the impact of the Dort Highway improvements, indications of changes in land values were obtained by examining the prices of properties purchased in the period 1920 to 1957. To simplify the task of collecting and analyzing the data, transactions for five 4-year periods were used rather than for each of the 38 years. These periods are: 1930-1-3-4, 1926-7-9-30, 1932-3-5-6, 1940-1-5-6, and 1950-1-6-7; they were selected as representative of stages in the development of the by-pass, the area, and the basic economy. To facilitate comparisons between the periods, the prices involved in the transactions were reduced to a common denominator — dollars per square foot.

To show possible variations of the highway impact on different locations, the north-south length of the study area was arbitrarily subdivided, initially into 10 one-mile sections, but these were then grouped into three strata, each extending one-half mile west and one mile east of Dort Highway. Then, to aid in determining more directly the influence of location relative to the highway, the land within each strata was divided into three zones as follows (See Figure 1 and 1A):

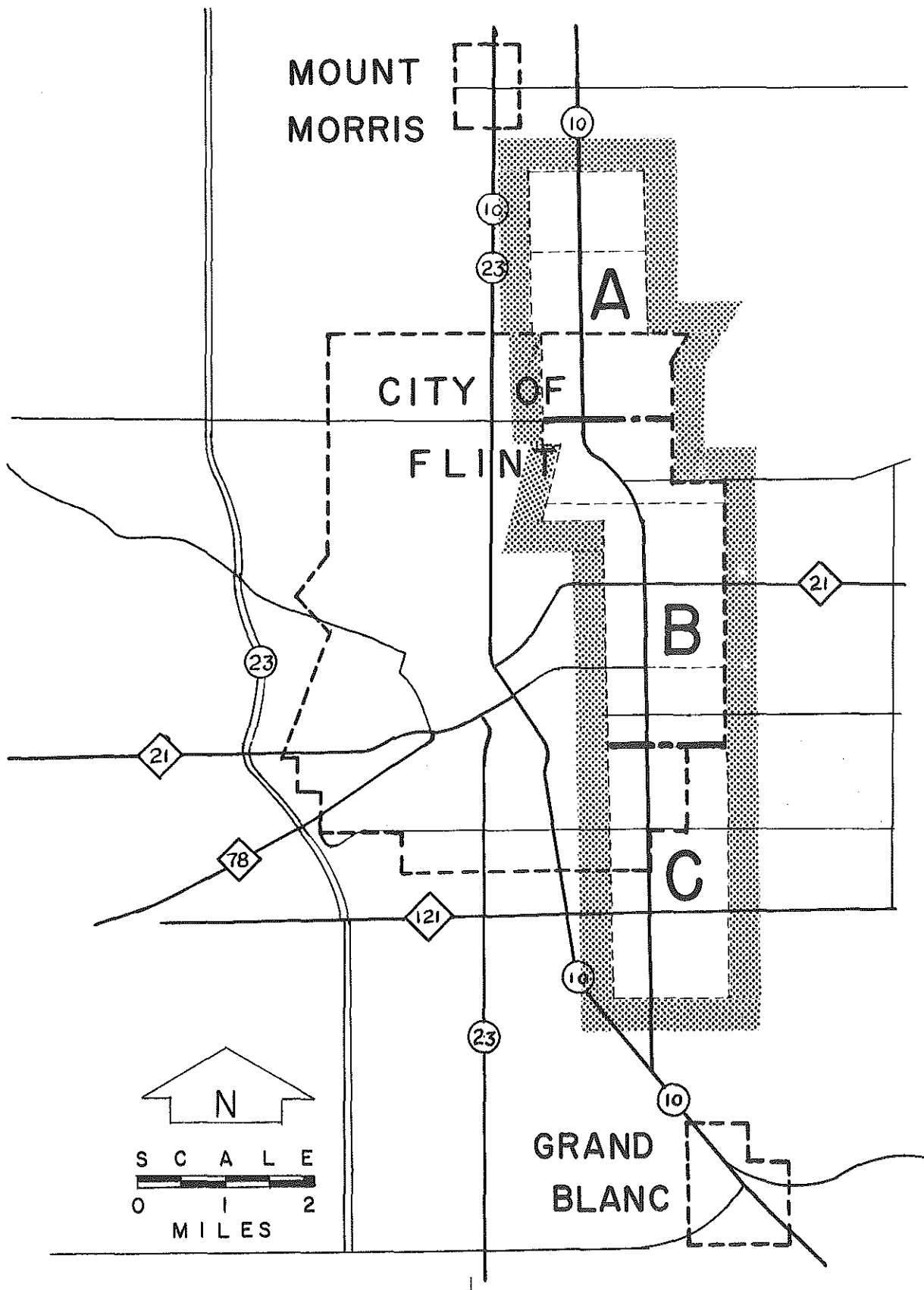
- Zone 1 — includes all properties that abut on the Dort Highway,
- Zone 2 — includes all properties within a half-mile of Dort Highway and adjacent to one of the 12 east-west intersecting through streets, and
- Zone 3 — includes all properties east of Dort Highway not abutting it and not adjacent to the intersecting through streets.

1. METHOD OF STUDY

Several methods of study were considered. Comparison with a "control area" (identical in every way, but not subject to the influence of the by-pass) perhaps would

Location of Study Area
(See Figure 1A for Key)

Figure 1



KEY FOR FIGURE 1

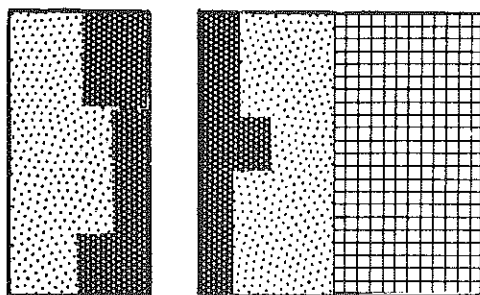


STUDY AREA BOUNDARY

STRATUM LETTERS

STRATUM BOUNDARIES

LOCATION OF STRATA ZONES



ZONE 1

FRONTAGE ON DORT HIGHWAY



ZONE 2

AREA WITHIN ONE-HALF MILE
OF DORT EXCLUDING ZONE A



ZONE 3

AREA ONE-HALF MILE TO ONE
MILE EAST OF DORT HIGHWAY

Figure 1A

have been easiest, except that it was not practicable because of the difficulty of selecting such an area. The "case history" method is possibly the most revealing, but it is time-consuming and costly. However, it was possible to include case histories of certain properties in this report. The basic method selected for the study was to determine and compare the changes of the value of properties in the various strata and zones which occurred in the successive time periods as indicated by prices paid for properties purchased in those periods.

The procedures for the selected method were designed and in some cases were modified in recognition of the difficulties and limitations presented by the conditions and data involved in the subject of inquiry.

a. Source of Land Price Data

Because many of the older records were no longer available sales price data were derived from the number of U.S. Documentary Stamps affixed to the deed representing the transfer of property in each transaction. There are limitations to this measure inasmuch as the stamps only applied to \$500 increments and sometimes are improperly used. However a detailed analysis of stamp usage in relation to known prices indicates that they provide an adequate measure of price changes.

b. Improved and Unimproved Lands

The respective contributions of the land and the improvements thereon to the value of a parcel of improved property are difficult to distinguish. This was an important factor in this study of the influence of the highway on the value of land inasmuch as the typical parcel of urban land has some type of improvement on it.

CHAPTER II

COLLECTION AND PROCESSING OF DATA^o

The total land included in the selected study area amounts to 15 square miles of which practically two-thirds are in the City of Flint and the rest in Genesee and Burton Townships. A pilot study was conducted to establish the size and general character of the subject matter to be studied. This study revealed that there were 15,509 platted parcels of land and 1,172 unplatted parcels of land, or a total of 16,681 parcels in the study

^oFor details see Larson, Ronald and Schenker, Eric, op. cit., Appendices A and B.

In this study there is no effort made to identify the relative contributions of land and improvements to the total value of improved parcels. Primary attention was given to changes in the values of unimproved or vacant lands; improved property was given secondary consideration. Since there seemed to be no practical way of identifying each element of value this procedure, although not entirely satisfactory, provides the purest available measure of land value.

c. Influence of Basic Economic Activities and Conditions

The level of economic and business activity is a major factor associated with changes in property values and uses. In Flint, the founding and growth of its automotive industry generated a great expansion of economic activity which continued through 1930, went into reverse during the depression years of the '30s, resumed an upward trend in the '40s, and was slowed down by the recession in the mid-50s.

Perhaps the basic problem in studying the effects of highways on land values and uses is that of divorcing, if possible, the effects of economic growth from those resulting from highway improvement. These two forces are probably inseparable because, while the highway influences land values through location benefits, it is itself a part of the process of economic expansion. In other words, the highway is both a cause and an effect of economic growth.

In this study an attempt is made to isolate the influence of the highway from that of basic economic activity by correlating the changes of land value with variations of an index representing such indicators of the economic trend as population, building permits, sales tax receipts, employment, assets of state banks, and number of deeds recorded.

area. On the basis of this information, it was decided to sample the transactions involving these parcels, rather than to take a census of all transactions for detailed study.

A. THE SAMPLING METHOD

After consideration of the problems involved and possible sampling methods, it was decided to make a list of all transactions of property within the study area and to take the sample from this list. This method provided

1958

1950

1937

LAND USE - SCHEMATIC VICINITY OF DORT HIGHWAY FLINT, MICHIGAN

1924

COLDWATER

CARPENTER

RICHFIELD

DAVISON

KEARSLEY

COURT

LAPEER

LIPPINCOTT

ATHERTON

BRISTOL

MAPLE

HILL

A

B

C

A

B





C

LAND USE SURVEY OF FLINT, 1924.



SCALE
1 MILE

KEY

-  RESIDENTIAL
-  COMMERCIAL
-  INDUSTRIAL
-  PUBLIC
-  VACANT

FIELD SURVEY OF CITY OF FLINT BY CLASS
IN URBAN PLANNING 410, M.S.U., 1958.

AERIAL SURVEY, 1950

AERIAL SURVEY, 1937

FIELD SURVEY OUTSIDE OF FLINT BY
PROJECT STAFF, 1958.

HIGHWAY TRAFFIC SAFETY CENTER, MICHIGAN STATE UNIVERSITY

RESEARCH PROJECT ON ECONOMIC AND SOCIAL EFFECTS OF HIGHWAY IMPROVEMENTS, AUGUST, 1958.

Figure 2

the basic sampling technique used. However, since it proved to be impractical to classify transactions into strata and zones from available records, this method was modified to include a systematic sampling of lots involved in sales transactions and to take from this sample a random sample for study data.

A systematic sample was taken of all lots from each zone and these were then checked for transactions in all time periods. This procedure was slightly different for Zones 1 and 2 than for Zone 3. In the former it was not necessary to take a systematic sample because the total number of parcels of land in these zones was so small that all lots were checked for transactions. In Zone 3, however, the abundance of properties required that a sample be taken.

The systematic sample of transactions obtained in this manner is representative of the study area in regard to numbers of lots. The individual transactions were grouped by the sampling process according to their location in strata and zones and in time periods of sale.

Procedures for taking the random sample from this universe were designed with great care to exclude any selective bias and to assure substantially proportionate representation as regards location and platting status. The total number of transactions obtained by the systematic sampling were then random sampled until four transactions were obtained for each zone in each time period.

The selling price of each parcel of property listed in the random sample was obtained, when possible, from

the records of realtors or participants in the transactions but, as has been explained, such records and information frequently were unattainable, particularly for transactions in the earlier periods, and prices then were derived from the number of U.S. Documentary Stamps on the deed. However, such prices as were found were correlated with those estimated from revenue stamps as a check on the accuracy of the latter.

Two additional steps completed this preliminary field work. The assessed value for each parcel of property at the time of sale was obtained for correlation with the market price to ascertain the feasibility of using assessed values as basic raw data. Then the land use of each property was determined in order to identify any variations in highway benefits between types of land use.

B. TABULATION OF DATA FOR ANALYSIS AND CORRELATION

For clarity of analysis and to facilitate identification of countervailing trends, the transactions involving unimproved property were grouped by all vacant parcels, and vacant parcels under 30,000 square feet (approximately three-quarters of an acre). The price data for the transactions in these groups were then arranged by time periods for each stratum and zone. The price data are reported in constant dollars per square foot in order to identify "real" changes in value but, in reporting the results, occasional reference is made to actual dollar prices.

CHAPTER III

CHANGES IN LAND VALUE IN THE STUDY AREA

Measurement of the highway influence presumes that a precise and accurate index of land values is available to identify and gauge land value changes. But, as was indicated earlier, a number of problems were encountered in obtaining data for the land value study which make the measures obtained rather unrefined instruments for examining the highway influence on land value. Nevertheless, it is still possible to detect central tendencies, to see trends, and to draw revealing conclusions.

The indicated changes in the value of lands in the various strata and zones during the successive time periods are presented in the following series of tables which, with the accompanying comment and explanation, present the initial findings of this study. In the tables, the time periods are designated as years number

1 to 5 as follows: Year 1 represents the period 1930-1-3-4; year 2 represents the period 1923-7-9-30; year 3 represents the period 1932-3-5-6; year 4 represents the period 1940-1-5-6; and year 5 represents the period 1950-1-6-7.

Perhaps the most surprising result shown in Table A was that the level of property values for this group was approximately the same in 1940-1946 and 1950-1957 as it was prior to the paving of the highway in 1926. Interim fluctuations had occurred and the actual price per square foot had risen from \$.10 to \$.15, but the real value was at the same level. There is some evidence that an increase in real value of approximately 65 per cent took place in the four or five years following the paving of the highway, but values subsided during the depression.

A. VACANT PARCELS UNDER 30,000 SQUARE FEET

**Table A
REAL AND ACTUAL VALUE PER SQUARE FOOT BY ZONES**

Year	Zone 1		Zone 2		Zone 3		All Zones			
	No.	Value		No.	Value		No.	Value		
		Real	Actual		Real	Actual		Real	Actual	
		\$	\$		\$	\$		\$	\$	
1.....	10	.193	.129	67	.170	16	.103	93	.156	.107
2.....	2	.163	.104	12	.427	8	.114	22	.254	.159
3.....	6	.327	.154	21	.126	13	.216	40	.182	.085
4.....	27	.207	.122	53	.262	27	.114	107	.156	.091
5.....	13	.363	.340	39	.151	23	.087	75	.154	.144
Total/Av...	58	.250		192	.170	87	.118	337	.164	

In contrast to the average value of all small parcels in the study area, land values of property abutting the highway (Zone 1) had doubled while land in the other two zones were at the same level or perhaps slightly lower. These differing trends are suggestive of the relative desirability of property abutting the highway. The average values of \$.25 per square foot in Zone 1, of \$.17 in Zone 2, and of \$.12 in Zone 3, suggest that proximity to the highway is also associated with the price level.

**Table B
REAL VALUE PER SQUARE FOOT BY STRATA**

Year	Stratum A		Stratum B		Stratum C		All Strata	
	No.	Value	No.	Value	No.	Value	No.	Value
1.....	14	.091	56	.212	23	.120	93	.156
2.....	1	.140	17	.294	4	.118	22	.254
3.....	5	.099	21	.177	14	.252	40	.182
4.....	12	.105	53	.175	42	.151	107	.156
5.....	10	.087	39	.206	26	.121	75	.154
Total/Av...	42	.096	186	.202	109	.145	337	.164

Table B, which presents the pattern of values in each stratum, showed similar trends. Land values in each stratum were found to be at the same level after World War II as they had been immediately prior to the paving of the highway. Here, too, there was some evidence of an appreciable rise in values following the paving of the highway, and a falling back during the economically inactive years of the '30s.

Even though the value levels in each stratum had not changed appreciably, there were distinct differences between the average values in each stratum. The most expensive land was found to correspond with the

center of economic activity in the area — Stratum B. The southern and northern strata ranked in that order, with a 4-3-2 ratio between the three strata. These values appeared to correlate with the relative intensity with which the different parts of the area were being used.

**Table C
REAL VALUE PER SQUARE FOOT STRATUM B BY ZONES**

Year	Zone 1		Zone 2		Zone 3		All Zones	
	No.	Value	No.	Value	No.	Value	No.	Value
1.....	8	.188	37	.244	11	.150	56	.212
2.....	2	.163	10	.488	5	.118	17	.294
3.....	3	.333	11	.117	7	.201	21	.177
4.....	18	.323	20	.170	15	.090	53	.175
5.....	9	.420	20	.196	10	.098	39	.206
Total/Av...	40	.317	98	.218	48	.119	186	.202

Trends similar to those for the whole study area were found in the individual strata with minor exceptions; values of land abutting the highway in both Strata B and C enjoyed a twofold increase. However, as is shown in Table C, Zones 2 and 3 in Stratum B appeared to decline. A possible explanation is that the residential property in these zones may have been too close proximity to the conglomerate of industrial and commercial activity in the area, since this condition seems to be most dominant in Stratum B.

It might have been expected that the small parcels in Zone 2 would benefit since they front on the important through cross streets several of which are important arteries leading to the Flint downtown area. But although there had been an average increase in the prices of these properties immediately following the Dort paving, a decline occurred in the succeeding years.

The property not abutting either on the Dort Highway or on the through intersecting streets (in Zone 3) showed different trends in the different strata over the whole study period, even though they enjoyed a relatively sharp rise just after the paving of the highway.

The significant fact about the data for parcels under 30,000 square feet is that, while there was a general rise in values immediately after the paving, they did not enjoy appreciation in terms of real value from pre-highway years to the 1950s. However, the data on these small parcels understates many changes in value that have taken place.

B. ALL VACANT PARCELS

When the frame of reference is expanded to include vacant property of all sizes, it is immediately apparent that land values have increased appreciably.

Table D
REAL AND ACTUAL VALUE PER SQUARE FOOT BY ZONES

Year	Zone 1		Zone 2		Zone 3		All Zones			
	No.	Value		No.	Value		No.	Value		
		Real	Actual		Real	Actual		Real	Actual	
1.....	13	.016	.010	81	.021	21	.007	115	.014	.010
2.....	5	.007	.004	17	.176	10	.136	32	.032	.020
3.....	9	.012	.006	28	.007	24	.041	61	.013	.006
4.....	52	.034	.020	75	.024	46	.016	173	.024	.014
5.....	26	.052	.047	55	.036	36	.016	117	.033	.031
Total/Av...	105	.024		256	.026	137	.015	498	.022	

It will be noted in Table D that, while land values both real and actual have increased, all values have not increased to the same degree. Average increases of two to three times in real prices and two to five times in actual prices appear to have taken place in most locations with Zone 1 tripling in value while Zones 2 and 3 increased 1.5 and 2 times respectively in dollar terms.

The wide differences between the square foot values in Table D from those in the three preceding tables is due to the inclusion in Table D of data concerning transactions that involved the purchase of acreage in tracts of considerable size.

Table E
REAL AND ACTUAL VALUE PER FRONT FOOT OF UNIMPROVED PROPERTY ABUTTING THE DORT HIGHWAY

Year	No. Parcels	No. Front Feet	Value Per Front Foot	
			Real \$	Actual \$
1.....	12	763	16	10
2.....	5	3225	8	5
3.....	8	2917	9	4
4.....	45	6696	20	12
5.....	25	5211	43	39

Appreciation of the value of property abutting the highway was even greater when measured, as in Table E, by the value per front foot — a measure frequently

Table F
REAL VALUE PER SQUARE FOOT OF ALL UNIMPROVED PROPERTY

Year	Stratum A		Stratum B		Stratum C		All Strata	
	No.	Value	No.	Value	No.	Value	No.	Value
1.....	21	.044	65	.019	29	.004	115	.014
2.....	4	.200	21	.042	7	.006	32	.032
3.....	10	.017	26	.095	25	.006	61	.013
4.....	37	.017	69	.028	67	.024	173	.024
5.....	25	.033	56	.036	36	.029	117	.033
Total/Av...	97	.030	237	.029	164	.013	498	.022

employed by appraisers. It shows that the average value per front foot increased three times — from \$16 to \$43. In actual dollars, this change represented a fourfold increase — from \$10 to \$39.

All strata and zones did not participate equally in the value increases. For instance, as shown by Table F, Stratum A apparently declined slightly in real value while Strata B and C increased by different proportions and amounts. Further analysis revealed that Zones 2 and 3 in Strata A and B did not appreciate in value, but that in Stratum C there were striking increases over the period studied.

C. CASE HISTORIES OF INDIVIDUAL PARCELS

Data in the foregoing tables hide some of the more extensive changes in land values that have occurred — namely, the changes in value that can accompany a change in land use — the change in value that can accompany a shift from farm land to residential, commercial, or industrial property. This type of change typically results in value increases of the greatest magnitude.

There is some evidence indicating that, for specific individual properties, the proportionate increases in

Table G
CHANGES IN REAL VALUE OF SPECIFIC LAND PARCELS IN AREA SERVED BY THE DORT HIGHWAY

Year	Data Involving Actual Prices* Size	Adjusted Price Per Sq. Ft. \$	Location	Change From 1920 Price
1920	115 acres		750' frontage on Dort near Western Rd.	—
	4,986,400 sq. ft. unplatted	.012	Industrial	
1950	2.87 acres		Part of above land	
	124,443 sq. ft. unplatted	.071	368' frontage on Dort Industrial	6X
1950	4,800 sq. ft. subdivided	.347-.463	One block south across Dort Highway Commercial	29-38X
1956	13,699 sq. ft. subdivided	.620	Across Dort Highway 105' frontage Commercial	51X
1920	135 acres		West of Center Rd. between Court and Kearsly	—
	5,853,600 sq. ft. unplatted	.006		
1926	45,000 sq. ft. subdivided	.279	Part of above land	46X
1926	13,400 sq. ft. subdivided	.189	Part of above land	32X
1940	27,000 sq. ft. subdivided	.079	Part of above land	13X
1950	27,000 sq. ft. subdivided	.021	Part of above land	4X

*Actual prices were estimated from U.S. Documentary Stamps affixed to deeds and were then adjusted to constant dollar values.

real land values between the early 1920s and the 1950s was substantially greater than the two or threefold increase shown by changes of average values. Specifically, the increases in real value were 10, 20, and 30 times or more. Available information is not sufficient to draw definite conclusions, but it is indicative of changes that have taken place in some instances.

The data in Table G give a thumbnail sketch of

CHAPTER IV

REASONS FOR LAND VALUE CHANGES

A definitive answer to the question of the influence of the Dort Highway on land values in the area served requires consideration and analyses of other major factors affecting land values. Some of these, such as the sizes of individual land parcels, their location relative to the highway, and the several stages in the process of land development, have been cited and their influence illustrated and discussed. However, a major factor which has a basic influence not only on land values, but on highway development, is economic growth and activity. This has been mentioned, but demands further analysis.

A. ECONOMIC GROWTH AND LAND VALUES

As noted in an earlier chapter, the level of economic activity in Genesee County has doubled since the early 1920s and the same pattern was observed for the City of Flint. This pattern, as shown in Figure 3, was characterized by substantially increased business activity in the late 1920s, decline in the 1930s, and extensive recovery during the 1940s and early 1950s.

CHAPTER V

SUMMARY AND CONCLUSIONS

Highways are intended to benefit a community. They are expected to contribute to the effective arrangement of land use patterns and thus to influence land values. This study of the Dort Highway's influence on land values supports many of the existing conclusions about the effects of a highway and suggests some new hypotheses.

The Dort Highway, like most other major arteries, has been a powerful force molding and developing the area which it serves. The net influence of the highway is not entirely clear, but trends, measures of central tendency, benefits and disbenefits are identified. Conclusions, impressions, and findings of this study are summarized in the following paragraphs.

some parcels of land sold in the early 1920s and of sales of parts of that land in later years. The later land sales were not always pieces of the original property. In some cases, adjacent land parcels, or lands in the immediate vicinity, were used to supplement the data. Needless to say, this information provides only partial insight into what happened to real values of specific land parcels in the study area.

Some increases in land values would be expected to take place in the study area as a result of this increase of economic activity in the community over the years and the resultant increase of the demand for land. Since much of the Dort area was undeveloped prior to the post World War II expansion, it would seem probable that this area might enjoy more than an "average" increase in demand and in prices.

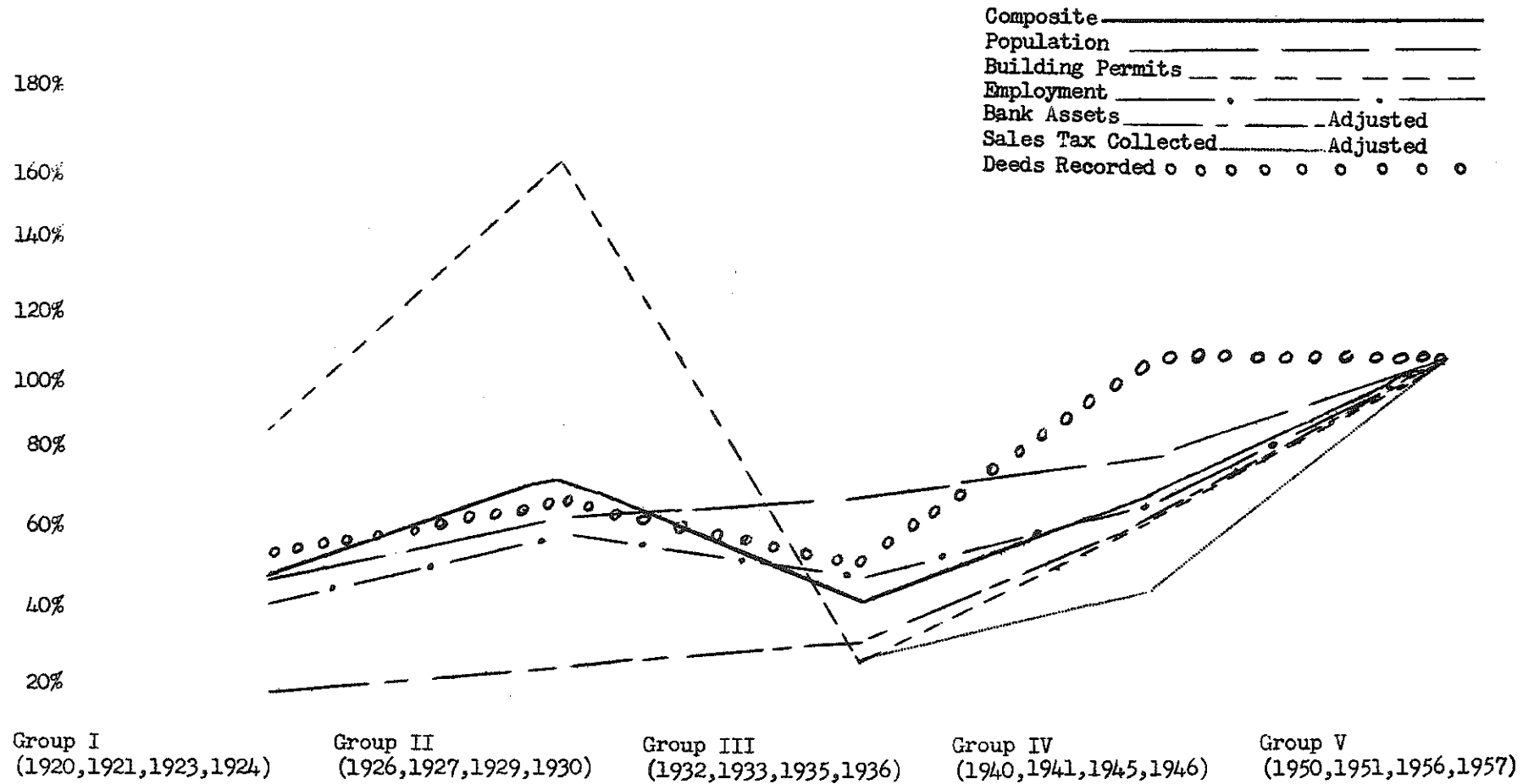
When the trends of general business activity in Genesee County are compared with the trends of values for all unimproved property in the area during the period covered by the study, it is found that there is a rather close correlation between the two trends. This correlation strongly suggests that the land value changes cannot be attributed entirely to the highway. Further, the relatively sharp rise in land values following the paving of the highway was not necessarily caused by that improvement because the level of economic activity in the community had increased in similar proportions during those years.

A. CONSIDERATION OF LIMITING FACTORS

Every highway does not have the same impact on land values. The nature and extent of the impact probably varies with the type of highway (two-lane, four-lane, controlled or uncontrolled access, etc.) and the kind of service it provides. A by-pass, such as the Dort, would not seem to yield the same benefits as a highway connecting the downtown area with the suburbs. Further, highways serving residential, industrial, commercial or farm areas would tend to create different kinds of benefits. Therefore, interstudy comparisons should be approached with an understanding of these different conditions, if results and conclusions in one study are to be assigned to other areas.

Figure 3

Indicators of Economic Activity of Genesee County for Selected Years as a Percentage of Group V



Economic growth and change are so closely allied with changing land values that the complete isolation of highway benefits cannot be achieved. A line cannot be precisely drawn between highway improvement and economic activity as causes of changes in land values because the highway is both a cause and effect of economic growth but nevertheless, approximations can be made.

In land value studies, data and the interpretation of data need to be tempered by the knowledge that close measurement of land value changes and the highway influence on these changes is difficult to obtain. Furthermore, methodological problems, such as scarcity of data in a narrowly defined area and the variability of data, combine to reduce conclusions to generalizations. The generalizations provide important information about trends, but their application to specific cases should be avoided.

B. SUMMARY OF FINDINGS

Changes of real (not actual, unless so identified) land values in the Dort Highway area are summarized as follows:

1. Land values in the various strata and zones did not change in the same amount, proportion, or direction.
2. Real values of *all* unimproved property abutting the highway increased threefold from the early 1920s (before the highway was paved) to the early 1950s. The full impact of the 1950s was not identified because few transactions along the highway were reported during 1956-1957.
3. The value of *small* parcels of property abutting the highway enjoyed a twofold increase during the same period.
4. Unimproved property *not* abutting the highway increased less than the highway property. Some areas showed no increase in real value and others actually gave evidence of a slight decline for the non-abutting parcels.
5. Land values appeared to rise sharply following the paving of the highway in 1926. This rise was followed by a decline in the 1930s.
6. Land values *appeared* to have increased ten, twenty, thirtyfold in individual cases. These phenomenal increases seemed to take place when the property was subdivided for more intensive use.
7. The level of economic activity in the community doubled between the 1920s and the early 1950s.
8. Measurement of land values in real terms understates the actual dollar changes that have taken place because of changes in the price level.

C. GENERAL CONCLUSIONS

The Dort Highway has clearly had a different impact on land values in various parts of the study area. Property abutting the highway exhibited substantially greater increases in value than other areas studied. Further, all land not abutting the highway showed mixed trends of value.

Land values increased sharply after the highway was paved in 1926-1927. The highway and rising economic activity in the community contributed strongly to this rapid increase. Further increases in land values were interrupted by the depression years of the 1930s. This interruption may have significantly curtailed the potential further expansion of land values in the area because otherwise industrial and commercial developments could probably have occurred in a more orderly fashion.

As it was, the manner in which commercial and industrial developments took place in the Dort area may have forestalled, to some extent, the normal areawide growth. The commercial-industrial complex that grew up has made the area relatively unattractive for residential purposes — the area is still about 50 per cent unimproved — and so repressed increases in land values.

Changes in land value — both the rate of change and the level of value — were directly affected by the distance of the property from the highway. That is, Zones 1, 2 and 3 ranked in that order in terms of value and rate of change.

The largest changes in land value took place when large tracts of land were subdivided for more intensive use. In this study, the highway seemed to have its greatest influence on land values when this subdividing of large parcels took place. There was relatively little change in the real value of smaller, or already subdividing parcels. It seems to be likely that the highway, by providing accessibility, makes it possible to subdivide large tracts for the more intensive uses demanded as a result of increasing economic activity and growth.

In conclusion, the highway seems to have had a twofold effect on land values in the study area. The benefits accruing from location on the highway have caused these properties to be more valuable. However, the highway and the developments accompanying it — commerce, industry, traffic congestion — have also had a restraining influence on the real values of the rest of the property in the study area, even though the actual prices paid for these properties have increased. In other words, the highway has had a varied effect on land values in the area as varying degrees of positive and negative benefits have been observed.

SECTION V

Geographical Patterns of Gross Land Uses in Relation to Major Highways in the Southern Half of the Lower Peninsula of Michigan*

It is a well known fact that the impact of the automobile is transforming the American countryside. Such terms as "urban sprawl," "land pollution," "megalopolis," and others are frequently used to refer to this circumstance. These terms attempt to describe aspects of the dramatic impact that a population "explosion" and the technological revolution of the mass produced automobile have had upon the geographical pattern of settlement that has developed within the past half century.

While the existence of this impact is obvious to anyone using the automobile as a means of transportation in the vicinity of our cities or in travel from city to city, neither the precise visualization on a map of the pattern of this impact nor the quantitative analysis of this spatial arrangement in relation to highways have been attempted over a large region such as the major portion of a state.

CHAPTER I

NATURE AND PURPOSE OF THE STUDY

It is the purpose of this report to record the findings of a twofold project of research regarding the process and pattern of highway impact. Both parts of the research were mapping projects, one in the field, and the other in the laboratory. This report states the basic concepts of each phase of the project, demonstrates the methods utilized, and records and interprets the findings.

*Condensed from the technical research report, "Analyses of the Geographical Patterns of Gross Land Uses and Changes in Numbers of Structures in Relation to Major Highways in the Lower Half of the Lower Peninsula of the State of Michigan," by Allen K. Philbrick, Associate Professor of Geography Michigan State University Highway Traffic Safety Center, and The Michigan State Highway Department, East Lansing, September 1960.

A. EXPANSION OF URBAN LAND USES AND STRUCTURES IN RELATION TO HIGHWAYS

A geographical analysis proceeds from the basis of the pattern of distribution of the phenomena to be analyzed. In the present case the primary phenomena of interest in each phase of the study are the wide range of non-agricultural establishments associated with the expansion of cities. These include non-farm residences and a wide variety of non-agricultural livelihood establishments. The latter may be grouped under the two major headings of commercial and non-agricultural industrial enterprise.

1. Background and Framework of Expansion

Most Americans are aware of the background of cultural heritage within which the present pattern of settlement is developing. Reference is here made to the township and range survey system by which the public lands of the great interior lowlands of the continent were made available for settlement. The provision of the Northwest Territorial Ordinance of 1789 for town roads every mile set the pattern of accessibility to the four 160-acre farms per square mile of land envisaged as the basic pattern of farm settlement. Within this pattern of square-mile sections of land, the people settled in horizon-reaching uniformity or checkerboard continuity on the agricultural lands of the humid east, of which Michigan is a substantial part.

This grid of square-mile section lines, within which farms and forest lands are distributed relatively uniformly, is interrupted by two other major types of land use which, by contrast, have an uneven or discontinuous distribution pattern. They are: (1) the land uses associated with urban type establishments, and (2) land uses associated with particularly localized natural resources other than the soil itself, i.e., mineral deposits and topographical features suited or attractive for recreational use.

This study is primarily concerned with the distribution of urban type uses of the land and urban-type structures. Answers are sought to the question: *To what degree is the expansion of urban land uses and structures within our pattern of settlement related to the pattern of major highways?*

2. The Dispersed City

The simple answer is that our many highways have become the streets of a dispersed city. They were designed to be bridges across the spaces between the cities, and as the means of connecting the city and the country. They have now become the alignments along which the impact of the city has penetrated unevenly, but far outward, into the more uniformly distributed agricultural and forested lands of the state. This new

pattern has not yet been recognized for what it actually is. It is an entirely new phenomenon of settlement. It is a new kind of city — the Dispersed City. The term “dispersed” is preferred over such words as “sprawl” or “pollution” since it does not imply the value-judgment that “dispersal” is in itself shameful or inherently bad. “Dispersal” is preferred to the term “megalopolis” since it is intended to be specifically descriptive of the pattern of land uses.

Highways have long been prime assets of our physical plant, providing accessibility to people and goods. No proof is needed that for decades individual decisions to locate residences, businesses, and industries have been made with reference to these assets. The present task is to examine the extent to which this process of growth and response on the part of the population to past highway improvements and technological advances in automobile transportation is fashioning an entirely new and bewilderingly complex pattern of human settlement. If the concept of the author is correct, the new patterns of the dispersed city require new concepts of planning and development, possibly including highway development, adequately to service and to guide the shape of things to come.

3. Two Phases of the Project and Organization of the Report

The two phases of this research project are (1) the geographical pattern of gross land uses in relation to highways, and (2) the geographical pattern of structures in relation to highways.

It is hoped that the quantitative analyses of a gross land-use map covering a major portion of the state and of the changes in numbers of structures recorded on highway maps between the 1930s and the 1950s can provide some of the perspective required for highway, urban, metropolitan, regional, state-wide and national planning for the future that is presaged by the development of the dispersed city.

The report will discuss the data and materials for, the methods used in, and the results of these two phases of the research study in the order named.

CHAPTER II

LAND USES IN RELATION TO HIGHWAYS

This phase of the study is based upon gross land-use maps of 47 counties made substantially in the field during the summers of 1958 and 1959. The difficulty of mapping land uses over very extensive areas of complex development is perhaps aptly illustrated by the fact that

to map the City of Chicago's 211 square miles on a parcel by parcel basis in 1939-42 cost approximately three million dollars and took three years' time by a considerable staff of people. To map land uses over 47 counties, comprising an area of some 29,364 square miles, cheaply,

relatively quickly, and with a minimum of staff, required a different technique than that usually employed for such a project. The technique, devised by the author for just such a purpose is described in a paper delivered before the International Geographical Union in 1952.*

A. THE METHOD FOR OBSERVING AND RECORDING LAND-USE DATA

It will be sufficient for the present purpose to point out that the essence of the technique is recognition in the field of land use association within previously defined unit areas and that the unit areas employed are the "quarter section" in the open country and the "city block" where a pattern of streets and blocks exists. The pattern of sections subdividable into quarter sections is provided by the township and range survey system referred to previously. Access for the purpose of observing land use associations is provided by the streets, section line roads, other roads, and major highways.

The recognition of land use associations within the unit areas is accomplished by making use of a classification designed at once to facilitate the recording of each association, using colored pencils, and at the same time to reveal the pattern of urban type land uses dispersed into the countryside. A separate color was used for each association or mixture of land uses. Accordingly, each unit area is recorded by a single color — the one standing for the particular type or combination of land uses observed within that unit. Observation was by automobile traverse.

1. Map of Land Uses in 47 Counties

The land use pattern resulting from the mapping of land use associations in 47 counties is shown in Figure 1. It is a composite generalization of more detailed information recorded on the original county land use maps made in the field. In the construction of this map all quarter sections outside the city-block patterns which contain non-farm land uses are inked in black. Each black quarter section contains in addition to agricultural or forest land at least two non-farm residences or at least one non-farm livelihood establishment. All city-block patterns, all purely agricultural and forested land, and Michigan and U.S. highways are left white.

On the map, city-block areas can be distinguished from the farm and forest lands by their position. The distinction between purely agricultural and forested quarter sections could have been made by use of a dis-

tinctive stipple pattern for forest land; but due to the reduction in size necessary to fit this map upon a single page, this distinction was omitted.

The most striking feature of the map is the great overall extent of black squares recording the presence of non-farm or urban-type land uses within the extensive farm and forested lands of the study area. It reveals the basic pattern of the new form of settlement, called the Dispersed City. The double association of such non-farm land-uses with urban centers on the one hand and with the major highways on the other, is clearly visible. It is this double association which is responsible for the map title — Highways and Urban Expansion.

B. ANALYSIS AND INTERPRETATION OF LAND USE DATA

From visual appraisal of the map in Figure 1, and from study of the original county maps from which it was derived, it is possible to define four major kinds of areas in terms of generalized dominance of land use associations. There are as follows:

(a) Areas predominantly agricultural with some admixture of non-farm uses.

(b) Areas predominantly forested with some admixture of non-farm land uses.

(c) Areas predominantly agricultural, but within which a combination of farm and non-farm uses of land occurs at sufficient frequency to characterize them as territory which is experiencing urban expansion or dispersal.

(d) Areas within city-block patterns or in rural areas from which agriculture has disappeared, which, although not subdivided into units as small as blocks, are predominantly urban.

The occurrence or urban dispersion, in terms of these different phases of expansion, was studied in relation to several variable pertinent conditions.

1. Statistical Comparison of Land-Use Associations Between Five Sample Areas

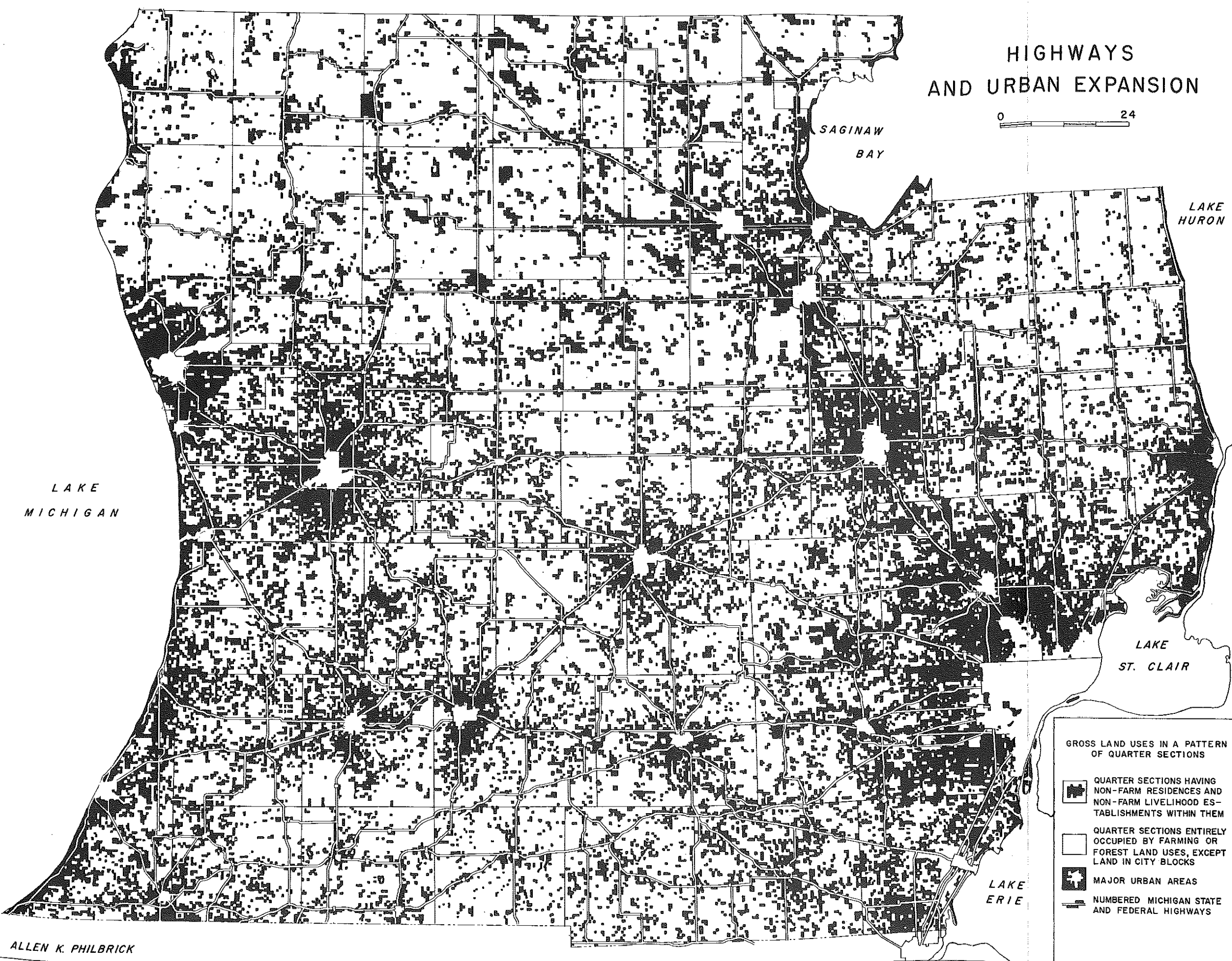
Four counties and one county-sized arbitrary area were used for analysis and comparison. The five areas were selected as representative of land use changes of the four major types listed above. A tri-county region comprising Eaton, Clinton, and Ingham Counties with Lansing as its major focus provides a sample of urban expansion perhaps midway in the range from the largest and most complex, the Detroit metropolitan area, and the smaller areas affected by cities smaller than Lansing.

At the same time, two of the counties in the region, Eaton and Clinton, are examples of the more homogeneously agricultural parts of the state. The region,





*Allen K. Philbrick, "A Unit Area Method of Mapping Land-Use Associations in Urban Regions." *Proceedings, Eighth General Assembly and Seventeenth International Congress, International Geographical Union, Washington, D. C., 1952*, pp. 758-764.

HIGHWAYS AND URBAN EXPANSION

0 24



GROSS LAND USES IN A PATTERN OF QUARTER SECTIONS

-  QUARTER SECTIONS HAVING NON-FARM RESIDENCES AND NON-FARM LIVELIHOOD ESTABLISHMENTS WITHIN THEM
-  QUARTER SECTIONS ENTIRELY OCCUPIED BY FARMING OR FOREST LAND USES, EXCEPT LAND IN CITY BLOCKS
-  MAJOR URBAN AREAS
-  NUMBERED MICHIGAN STATE AND FEDERAL HIGHWAYS

ALLEN K. PHILBRICK

Figure 1

therefore, provides examples of three (a, c, and d) of the four major types of land use dominance. A fourth county, Clare, is an example of forest land use. The fifth sample is designated as "County L". It is a county-size rectangular territory composed of townships of four actual counties, Ingham, Eaton, Clinton, and Shiawassee, and has Lansing at its center.

The statistical comparison for various categories of land use among the five sample areas is shown by number and per cent of quarter sections in Table 1. The categories of land use are in accordance with the classification employed in making the field observations on which the gross land use map is based.

As indicated by the data in the table, agriculture dominates most of the quarter sections in each of the counties except heavily forested Clare County. Ingham County, with 60 per cent of the quarter sections wholly devoted to farming, is the most urbanized of the four sample counties. With just under one-fourth its quarter sections in farms and slightly more than half of them

forested, Clare County is the least agricultural of the sample counties. Comparable figures for percentage of quarter sections in farms in Clinton and Eaton Counties are 77 and 78 per cent, respectively. As a further indication of the wide extent of agriculture, it may be noted — in line ten of the table — that in Clinton County 98 per cent of the total quarter sections, in Eaton County it is 96 per cent and in Ingham County 90 per cent, have farming within them. Even in Clare County, if forested land is counted with farmed land, the figure is 97 per cent. Moreover, Wayne County, the state's most urbanized county, has farming in just over 41 per cent of its quarter sections.

But, although the widespread agricultural and forested areas form the matrix over which the expanding urban centers are extending their characteristic land uses, it is the latter process which is shaping the dispersed city pattern of the future and is therefore, the phenomenon on which this study is focused.

In Ingham County, nearly 40 per cent of the quarter

Table 1
ANALYSIS OF SAMPLE COUNTIES BY QUARTER SECTIONS HAVING VARYING COMBINATIONS OF LAND USE IN THEM

Land Use Associations within Quarter Sections	INGHAM		CLINTON		EATON		CLARE		ARBITRARY "L"	
	Number	%	Number	%	Number	%	Number	%	Number	%
Area in square miles.....	559		571		567		572		622	
Number of quarter sections*.....	2238	100	2304	100	2304	100	2304	100	2490	100
Agriculture.....	1346	60.1	1773	76.9	1793	77.8	575	24.9	1300	52.2
Forest.....	—	—	1	.04	—	—	1163	50.5	—	—
Total non-farm mixed with farm and forest.....	654	29.2	486	21.1	425	18.4	473	20.5	903	36.3
Total non-farm mixed with forest.....	—	—	—	—	—	—	317	13.8	—	—
Total non-farm not combined with farm or forest..	238	10.6	44	1.91	86	3.7	68	2.9	287	11.4
Total all totals.....		99.9		99.95		99.9		98.8		99.9
Total Farm and Forest.....	1346	60.1	1774	77.3	1793	77.8	1765	77.6	1300	52.2
Total Farm and Forest and non-farm mixed with farm or forest (i.e., all units w/some farming or forest).....	2000	89.3	2269	98.0	2218	96.2	2236	97.1	2203	88.5
Total quarter sections with some non-farm land uses.	892	39.8	530	23.0	511	22.2	541	23.4	1190	47.8
Agriculture and non-farm residences.....	538	24.0	390	16.9	320	13.9	62	2.7	750	30.1
Agriculture and non-farm livelihood.....	40	1.8	41	1.8	47	2.0	58	2.5	59	2.4
Agr., non-farm residences and non-farm livelihood..	76	3.4	55	2.4	58	2.5	36	1.6	94	3.8
Non-farm residence.....	60	2.7	2	.1	16	.7	26	1.1	68	2.7
Non-farm livelihood.....	1	.04	4	.2	—	—	3	.1	5	.2
Non-farm residences and non-farm livelihood.....	13	.6	9	.4	19	.8	21	.9	32	1.3
City block pattern.....	164	7.3	29	1.3	51	2.2	18	.8	182	7.3
Forest & non-farm residences.....	—	—	—	—	—	—	167	7.3	—	—
Forest & non-farm livelihood.....	—	—	—	—	—	—	117	5.1	—	—
Forest, non-farm residences & forest, non-farm livelihood.....	—	—	—	—	—	—	33	1.4	—	—

*Theoretically square miles times 4 should equal the number of quarter sections. The square miles in this table do not include water area and are therefore not total area.

The data on which this table is based were collected at various times during the years 1957 through 1958.

sections have some admixture of non-farming activity within them. This is true in spite of the position of Lansing in the extreme northwestern township of the county where, as a glance at the map in Figure 1 will prove, at least half of the expanding city's dispersion has spilled over into the adjoining counties. Arbitrary "County L" was created to better measure this dispersion percentage in terms of a county-sized area with Lansing at its geometric center. As Table I shows, in this area about 49 per cent of the quarter sections have some non-farm land uses in them.

These percentages of 40 and 49 for Ingham and "L" counties are in relative contrast to the proportions (23, 22, and 23 per cent, respectively) of the quarter sections having some non-farm land uses within them in Clinton, Eaton and Clare Counties. It is suggestive of the considerable penetration of non-farming activities, that even in the more rural counties, more than one-fifth of

the quarter sections should have urbanized uses within them.

The data in Table I provide a numerical gauge with which to characterize and differentiate counties as regards their dominant land use associations. A moderately urban county will be one in which from 40 to 50 per cent of the quarter sections have urban type land uses within them. Perhaps 50 per cent or more of such quarter sections would indicate the urban character of the county. An agricultural county will have less than a quarter of its unit areas with such evidence of urban dispersal while 95 per cent of its quarter sections will contain some farming. A forest county may be defined as one in which 50 per cent or more of the total quarter sections are wholly devoted to forest land-use associations, while less than 25 per cent are wholly agricultural. A county with 25-40 per cent of the quarter sections exhibiting dispersion of urban-type land use might be designated as *sparsely-urbanized*.

CHAPTER III

DISTANCES FROM HIGHWAY FRONTAGE AND URBAN CENTERS AS FACTORS IN URBAN-TYPE USES OF LAND

Visual study of the map of gross land-use associations in Figure 1 demonstrates that land uses are related by position in respect to the state's urban areas, both large and small, and to the highways interconnecting them. In order to measure this relationship quantitatively, especially that regarding highways, a pattern of arbitrary strip areas of a constant one-mile width at successively increasing distances from major rural highways was created. Examples of such patterns are shown in Figure 2.

The problem in designing this type of unit area pattern was to achieve a balance between each frontage of a territory enclosed by highways. It was desired that each frontage have its share of strips at one, two, three, etc., miles depth from the highway in proportion to the length of each side. In effect, the resulting pattern divides each "cell" of territory created by the highway grid into concentric mile-wide bands or strips. The percentage of quarter sections within each strip having non-farm land uses was computed and is recorded on the maps.

Examination of the maps in Figure 2 reveals a rather pronounced progression of percentages with distance from cities as well as a similar progression with distance from the highways. It is clear that changes in proportions of non-farm land uses varies rather regularly with

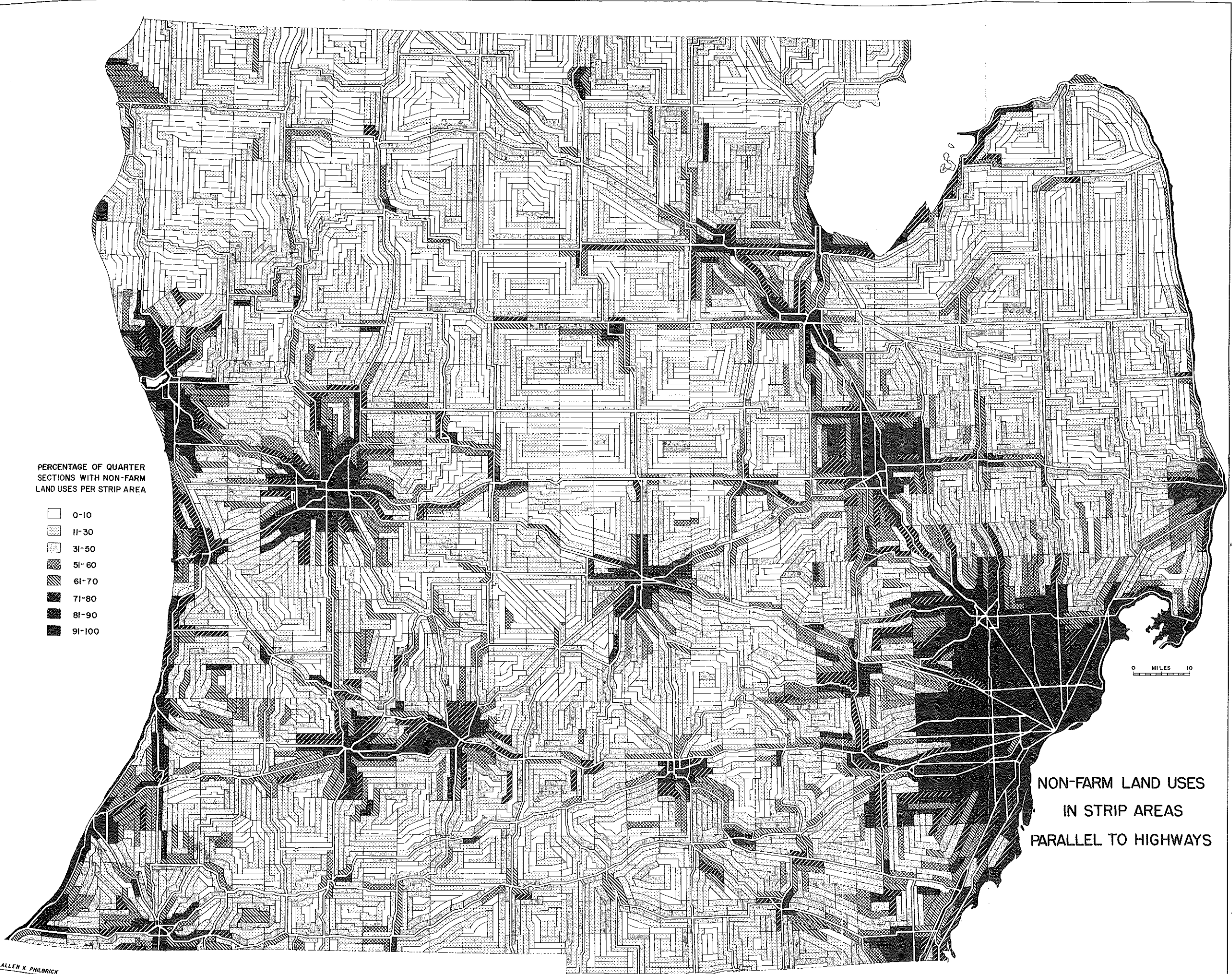
respect to both distance from cities and distance from highway frontage.

The significance of measurement of the force or forces involved in land-use development in accordance with these two directional variables can better be appreciated by more detailed examination of the data for selected areas or cells. There are many of these highway-bounded cells and they vary in size from very small units to areas larger than most counties. However, time was available for the analysis of only selected samples.

A. STATISTICAL COMPARISON OF DENSITY OF NON FARM LAND USE WITH DISTANCES FROM URBAN CENTERS AND HIGHWAY FRONTAGE

Each of the highway-bounded cells is geographically unique in the identity of its highway combinations and location and each requires careful examination and analysis. Two examples, shown in Figures 3 and 4, are used to illustrate the kinds of results obtainable from such detailed analyses.

The diagram and graphs presented in the first of these figures refer to the generally triangular cell just east of the Lansing-East Lansing urban area, bounded by highways M-78, U.S.-16, and M-47. The area of the



PERCENTAGE OF QUARTER
SECTIONS WITH NON-FARM
LAND USES PER STRIP AREA

- 0-10
- ▤ 11-30
- ▥ 31-50
- ▧ 51-60
- ▨ 61-70
- ▩ 71-80
- 81-90
- 91-100

0 MILES 10

NON-FARM LAND USES
IN STRIP AREAS
PARALLEL TO HIGHWAYS

Figure 2

cell is presented diagrammatically as files of mile-wide strips paralleling the highways. The approximate locations of the pertinent settlements are indicated by black dots within or adjacent to the principal unit within which each is located. The percentage of contained quarter sections having some non-farm uses is shown for each strip. The progression of percentages for unit areas along M-78 is 100 – 86 – 61 – 44. That along U.S.-16 is 100 – 63 – 69 – 54. The trend of this latter progression is interrupted by the concentration of non-farm uses associated with Williamston in the unit area showing the percentage 69. These two progressions are plotted as lines in the graph A of Figure 3 which shows the general similarity of their tendencies to lessen with greater distance from the junction of the two trunklines just west of East Lansing.

The percentages of quarter sections having non-farm uses in the unit areas in the second mile back from the highways show a similar declining progression away from the city. In the case of U.S.-16, the figures for the second mile back from the highway are 54 – 23 and 17 per cent respectively for the first, second, and third units counting from the second-mile zone nearest Lansing-East Lansing and moving toward the southeast. There is one significant difference, however. Each of these second-mile percentages is markedly lower than that of the corresponding unit in the first-mile row, although both units are approximately the same distance from the cities. In like manner, the second-mile progression along M-78 (83 – 33 – 18) is markedly lower, step by step, than the corresponding percentages for the frontage units.

These double progressions, related to the distances, respectively, along and back from the highway, are depicted linearly in graphs A to D in Figure 3. In reading these graphs, it should be realized that the unit areas paralleling the highways become less in number and length with each successive mile back from the highway. Also, it should be borne in mind that there are other factors than distance, such as the exploitation of mineral or scenic natural resources within the highway-bounded cell, which may affect the results.

The two diagrams in Figure 4 show further analyses of land use in the same cell. They represent averages of successively larger portions of the factual data and they focus examination more specifically on the highway influence. In diagram A, the average percentage is shown for each of the successive mile-deep strips that parallel each of the three highways that bound the triangular cell.

The percentage figures for the successive strips back from U.S.-16 are 74 – 34 – 23 and 24, and the like trend back from M-78 shows 72 – 50 – 23 and 24 per cent.

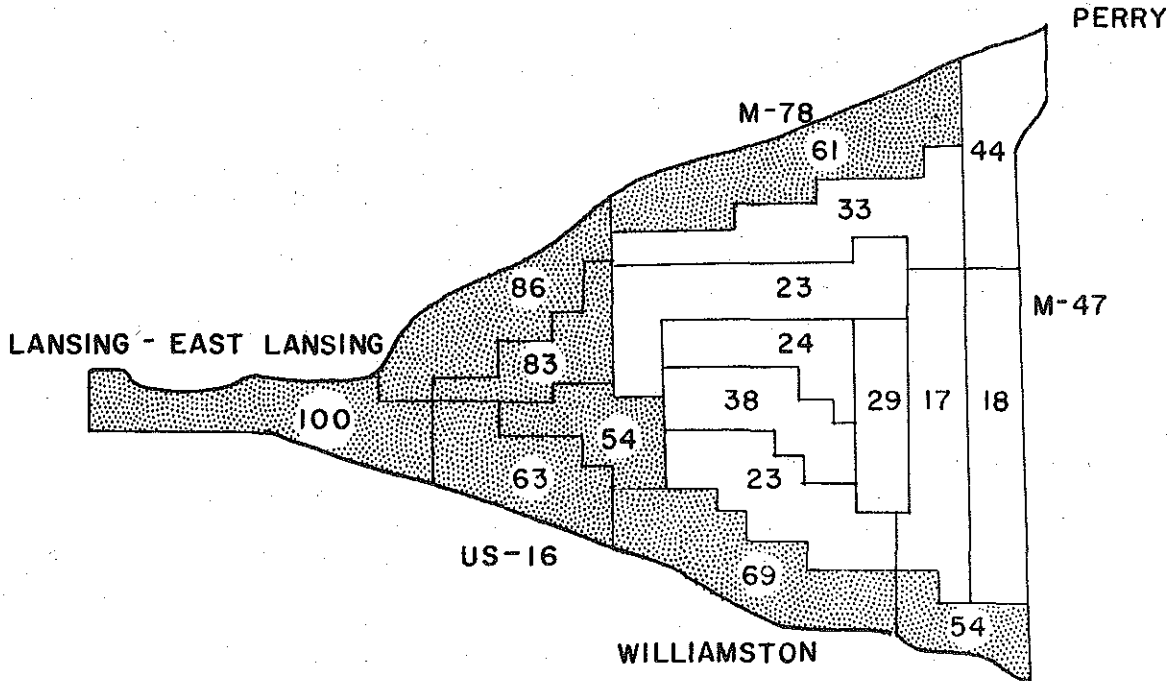
The small increase in the last mile in both cases is not significant. The changes back from M-47 show very little trend significance. The percentages are: 30 – 17 – 29 and 24; and one might think the drop from the first to the second mile of from 30 to 17 was significant. However, if one turns back to Figure 3, it becomes clear that the data do not justify that conclusion. The first unit of frontage along M-57 north of the junction with U.S.-16 shows a percentage of 18. The second strip back from M-47 shows an almost identical percentage of 17, which shows no significant trend. The next unit northward along M-47 shows a much larger spread since it reflects the localized non-farm land uses in the vicinity of Perry, but when this short section is averaged with the whole length of M-47 from Perry to U.S.-16, it is not enough to be statistically significant.

Diagram B in Figure 4 presents the whole ratio of highway impact in terms of percentage for each concentric mile frontage for the whole cell. In this instance, where all the quarter sections in each concentric band are used, interruptions to the trend are masked and the progression reads 63 – 36 – 28 and 24. This means, of course, that 63 per cent of the quarter sections within one mile of the three highways bounding this area have non-farm uses in them and that this percentage declines to an average of 36 per cent for all the property between mile one and mile two, etc. The average for this entire territory, regardless of distance, is 48 per cent.

On the basis of this analysis, it is possible to formulate the hypothesis from diagram A in Figure 4 that the impact of people using the highway for access to land back from the edges of this triangular cell is demonstrable to a depth of from one to two miles back of the frontage along highways U.S.-16 and M-78, but not at all back from the frontage along M-47. It is further possible to formulate an hypothesis in the same vein from more detailed information in the diagram of Figure 3 that the impact of the highways is probable up to two miles back from U.S.-16 within a distance of a dozen miles southeast of Lansing-East Lansing, but before Williamston is reached the depth of impact declines to one mile. Along M-78, the depth of impact is perhaps two miles for the first half of the distance from Lansing-East Lansing to the junction with M-47. Thereafter it is from zero to one mile. Along M-47 south of Perry, impact is less than one mile and within a short distance falls well below the average for the cell.

These hypotheses are partially confirmed by one further step of graphical analysis. If all unit areas having a percentage of quarter sections with some non-farm use within them that is larger than the 48 per cent average for the cell are regarded as showing the impact of highways on land use, then the results are exactly the

STATISTICAL AND MAP ANALYSIS BY HIGHWAY ORIENTED UNIT AREAS OF
TERRITORY BOUNDED BY HIGHWAYS - US-16 - M-78 - M-47



GRAPHS OF PERCENTAGE PROGRESSIONS BY DISTANCE FROM HIGHWAYS
AND DISTANCE FROM LANSING-EAST LANSING

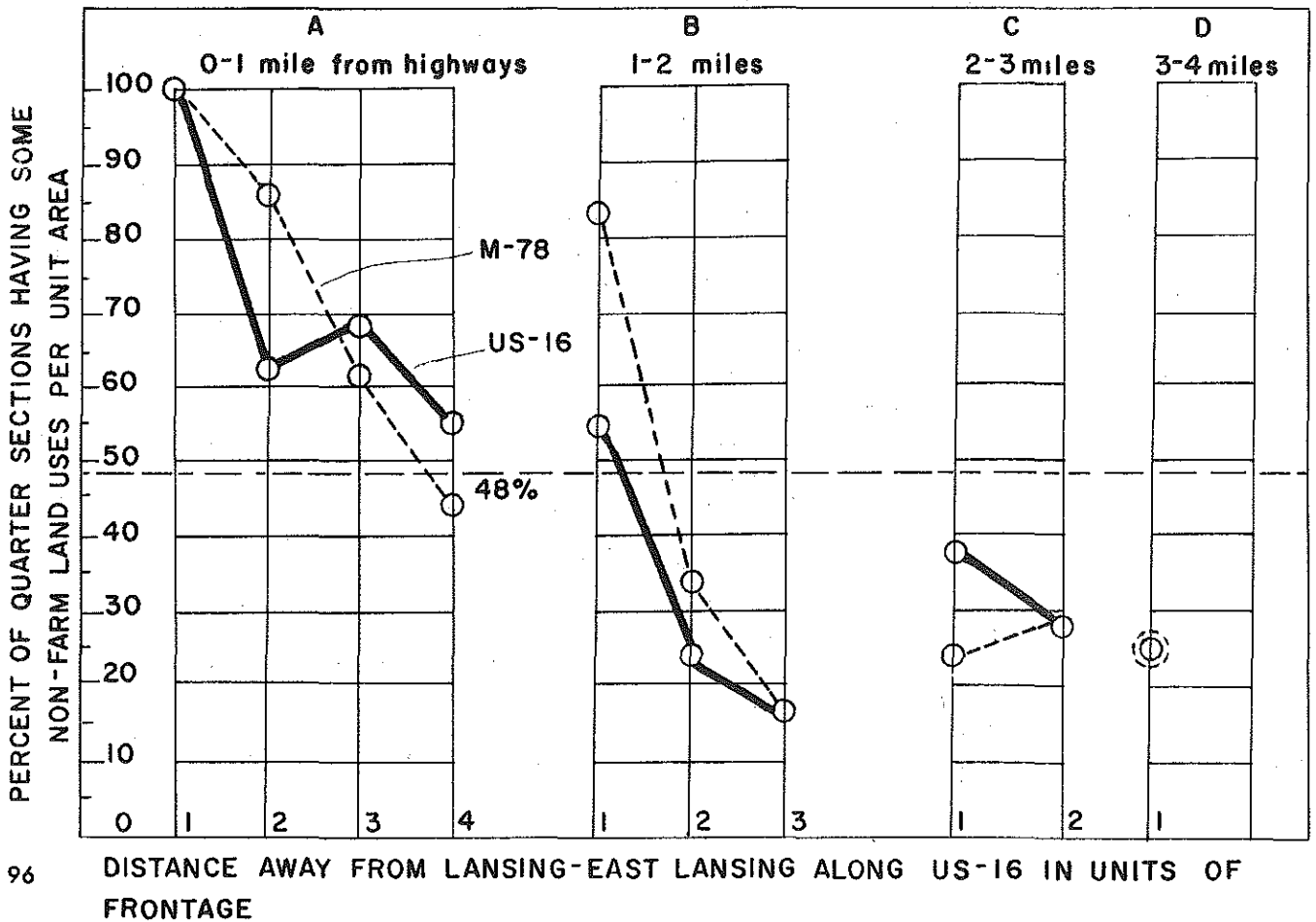


Figure 3

PERCENT OF QUARTER SECTIONS HAVING SOME NON-FARM LAND USES
 BY FRONTAGE ORIENTED STRIPS AT ONE MILE INCREMENTS AND
 BY CONCENTRIC ZONES AT ONE MILE INCREMENTS IN THE TERRITORY
 BOUNDED BY HIGHWAYS US-16 M-78 M-47

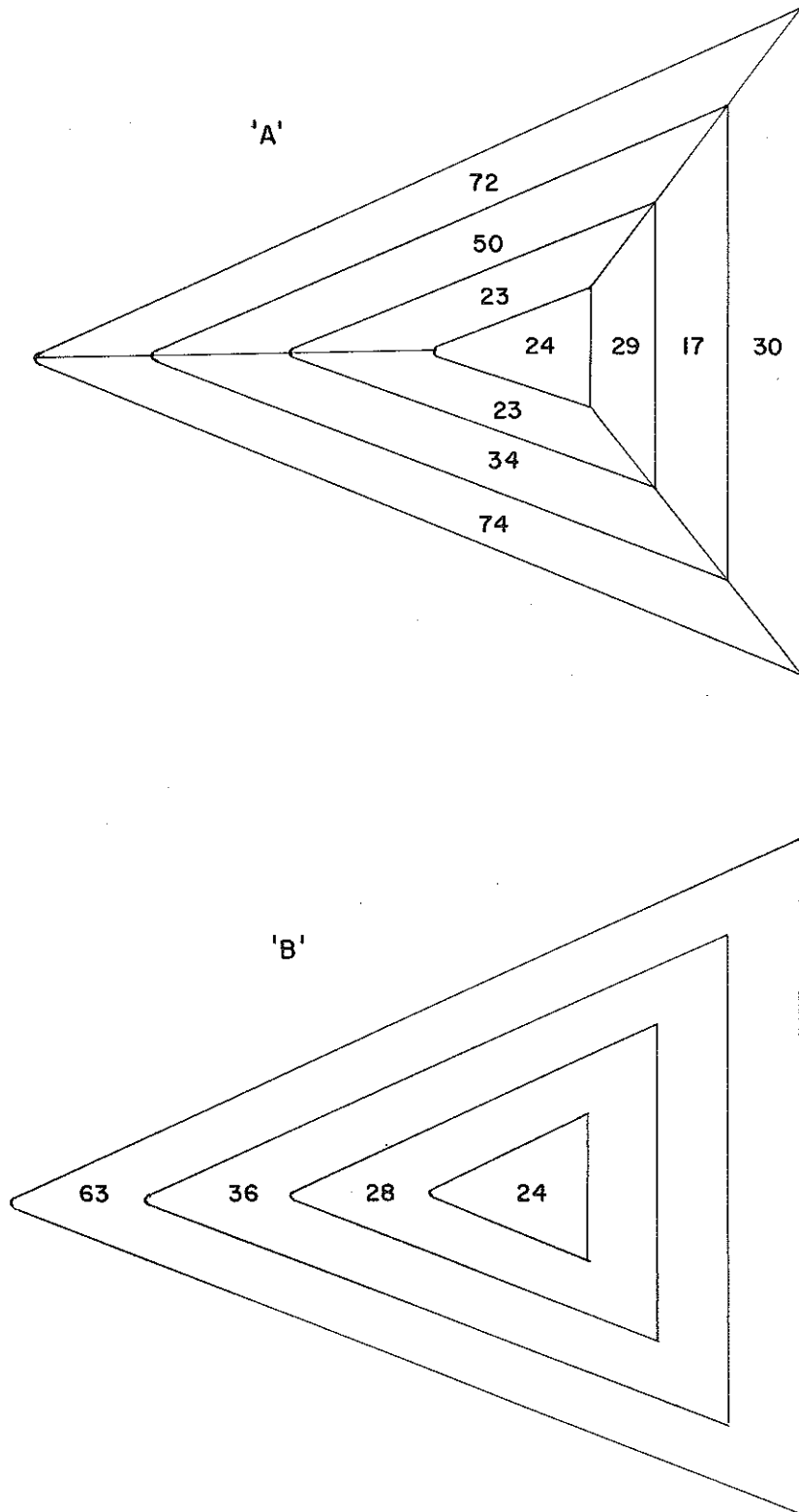


Figure 4

same as shown above. These results are shown graphically by the shading on the unit areas in Figure 3. It must be remembered, of course, that "highway impact" referred to in this relationship is not a direct cause and effect relationship but one of complex associations between highways and people who use land for non-farm purposes.

The same approach used in the foregoing analysis was applied to the larger highway-bounded territory shown in Figure 5. This cell enclosed by U.S.-27, M-21, M-47, and M-78 is roughly quadrangular with Lansing, St. Johns, Owosso and Perry at the four corners. There are seven tiers or rows of unit areas each one mile deep paralleling each highway frontage. The percentages of non-farm land uses by quarter sections are again plotted in the respective units and, as will be seen, analogous progressions occur as related to distance both from the urban centers and from the highways.

The first mile of frontage along U.S.-27 from Lansing to St. Johns shows a progression from 100 - 81 - 46 - 33 per cent; the progression in the adjoining two-mile row of units is from 83 - 41 - 29 - 13. Along the north side of the cell from St. Johns to Owosso along M-21 the progression starts from 54 per cent, declines to 38, and then rises to 44 and then 63 per cent approaching Owosso. Is the difference between 54 per cent leaving

St. Johns and 63 per cent approaching Owosso representative of the relative impacts of smaller St. Johns and larger Owosso? It is perhaps suggestive that the low point of the data (38 per cent) occurs closer to the smaller place. The second mile along this route shows a progression from 13 to 4 to 0.

The graphs in Figure 6, one graph for each mile of depth, show the progressions by unit areas along each of the four highways. A heavy horizontal line is drawn across the graphs at 28 per cent which is the proportion of the total quarter sections in this larger highway-bounded cell which have some non-farm land use within them. Such units are shown on the diagrammatic map (Figure 5) by shading. The averages of percentages for entire frontages combining the total for all units areas paralleling each highway at successive mile intervals and averages of the percentages of each of the concentric bands representing successive one-mile depths from all of the highway frontages are shown in the diagrams in Figure 7.

Again, it is possible to hypothesize that for a dozen miles north and northeast of Lansing on U.S.-27 and M-78 the impact through the highway into the back country is from three to four miles in depth. All the rest of the way around the highway-bounded territory the impact is from 0 - 1 mile.

CHAPTER IV

THE WEB OF HIGHWAY IMPACT AND THE DISPERSED CITY

Although lack of time, personnel and funds made it impossible to make like analyses of each of the 254 highway-bounded cells in the study area, a tabulation was made for each cell to ascertain the percentage of the total quarter sections having land uses other than agriculture and forest. These variable factors were used to establish for each of the cells the zone or depth of highway impact according to the hypothesis discussed above. All those unit areas having percentages of non-farm land uses higher than the average for the cell in which each is located and which form a compact group contiguous to one of the highway frontages were shaded on a map of the study area. This map was designated "The Web of Highway Impact."

At the same time, however, it was ascertained that the average percentage for the entire study area was 34 per cent. This means that approximately one third of the quarter sections in the study area as a whole are urbanized or have some mixture of land uses other than agriculture or forest. A second "web of highway im-

part" map was made employing this constant area-wide factor rather than the variable factors for each of the 254 cells into which the grid of state and U.S. highways divide the study area. To conserve space, a combination of these two research webs is presented as a single map in Figure 8.

Examination of the composite map of "The Web of Highway Impact" in Figure 8 will reveal the extent of the web patterns as developed by each of the two criteria separately and in combination. There are three patterns of grey, A, B, and C. Patterns A and B together comprise the web of impact defined in terms of the variable criteria for each cell. It is more extensive in the rural areas at some distance from the larger cities because the lower percentages for the less populated cells enhance the relative significance of non-farm land uses found there, and conversely, because the higher percentages in the cells near cities decreased the relative significance of the less densely infiltrated unit areas in these more highly populated cells. The map shows

STATISTICAL AND MAP ANALYSIS BY HIGHWAY-ORIENTED UNIT AREAS
 OF TERRITORY BOUNDED BY HIGHWAYS US-27, M-21, M-47, M-78

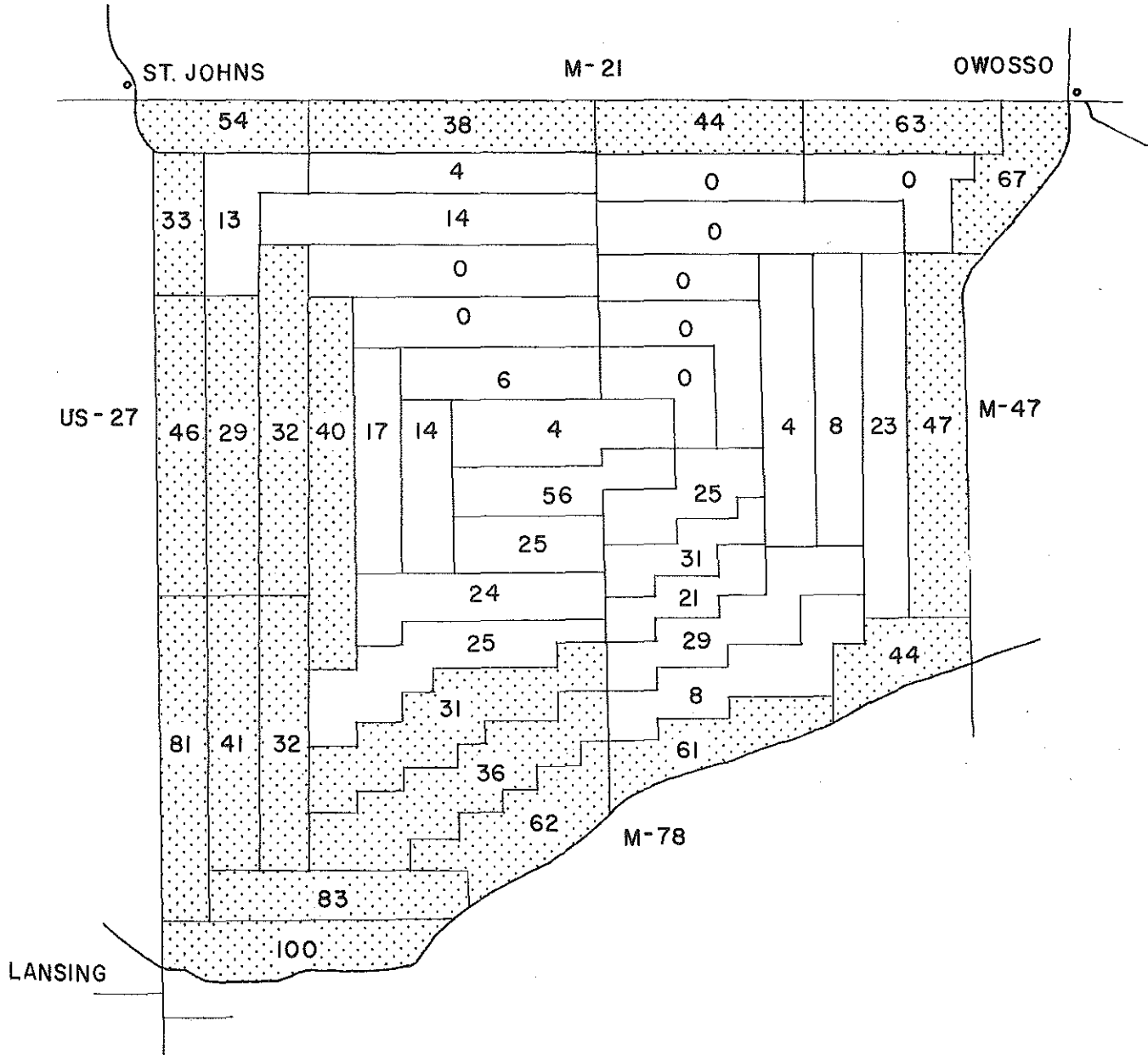


Figure 5

GRAPHS OF PERCENTAGE PROGRESSIONS BY DISTANCE FROM HIGHWAYS AND
DISTANCE FROM LANSING, ST. JOHNS, AND OWOSSO

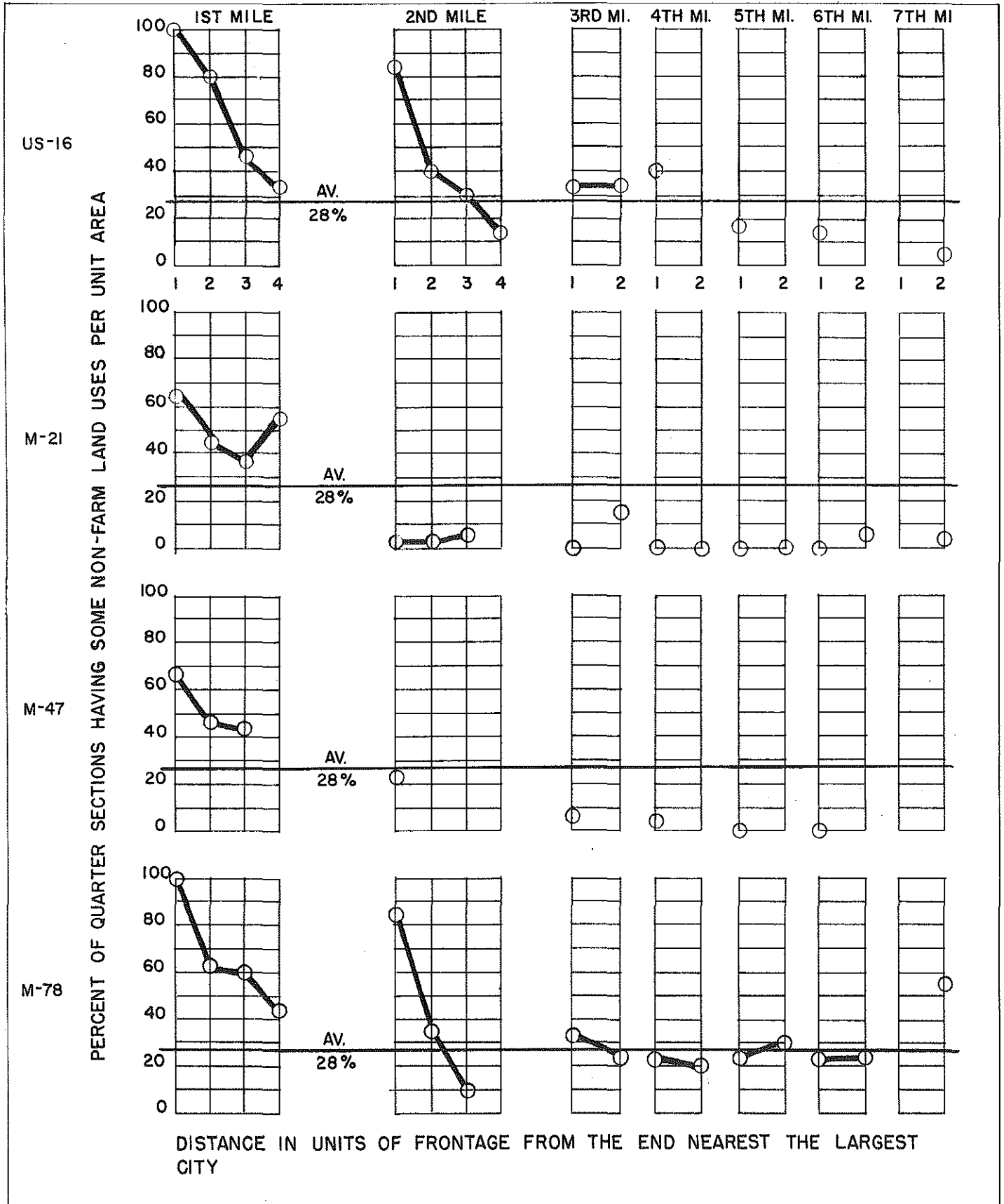
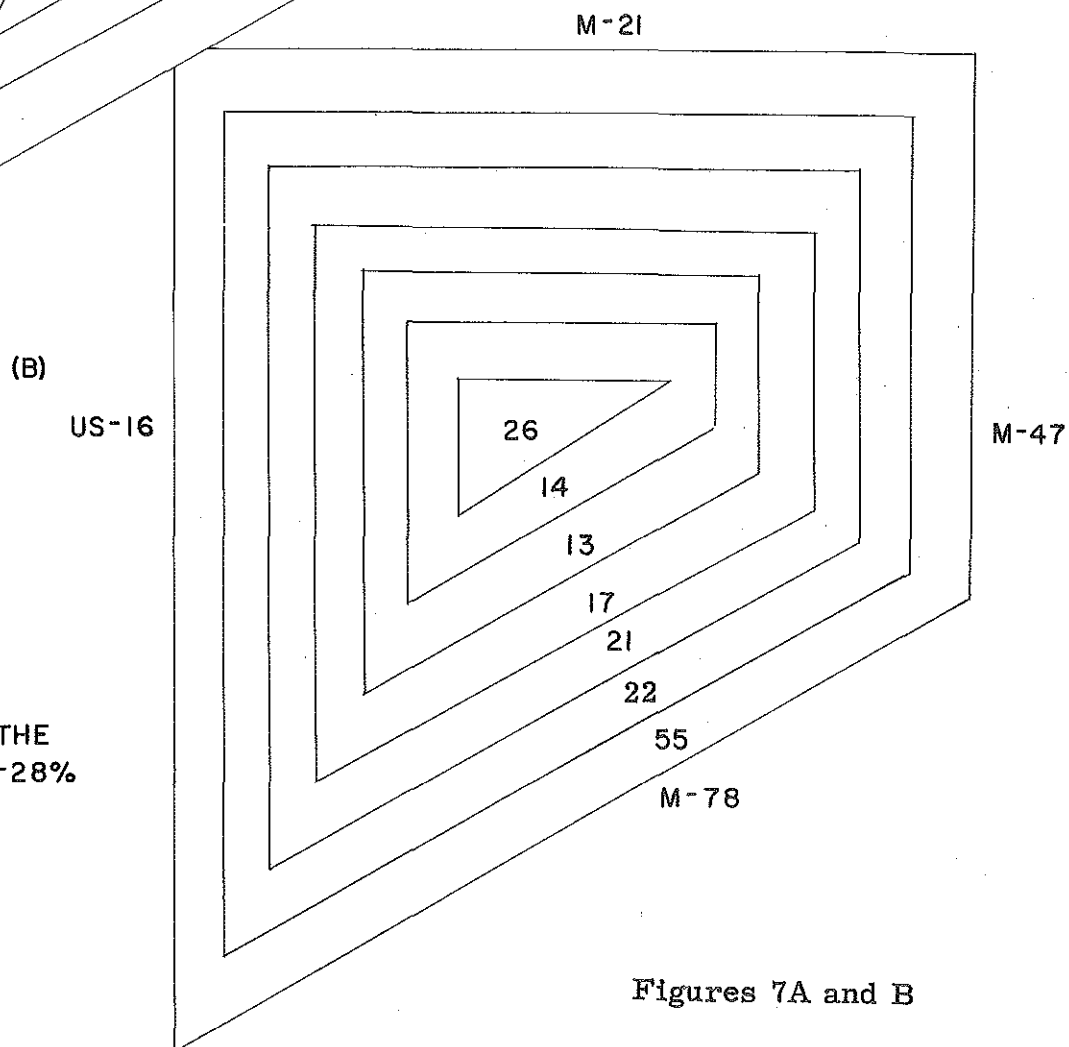
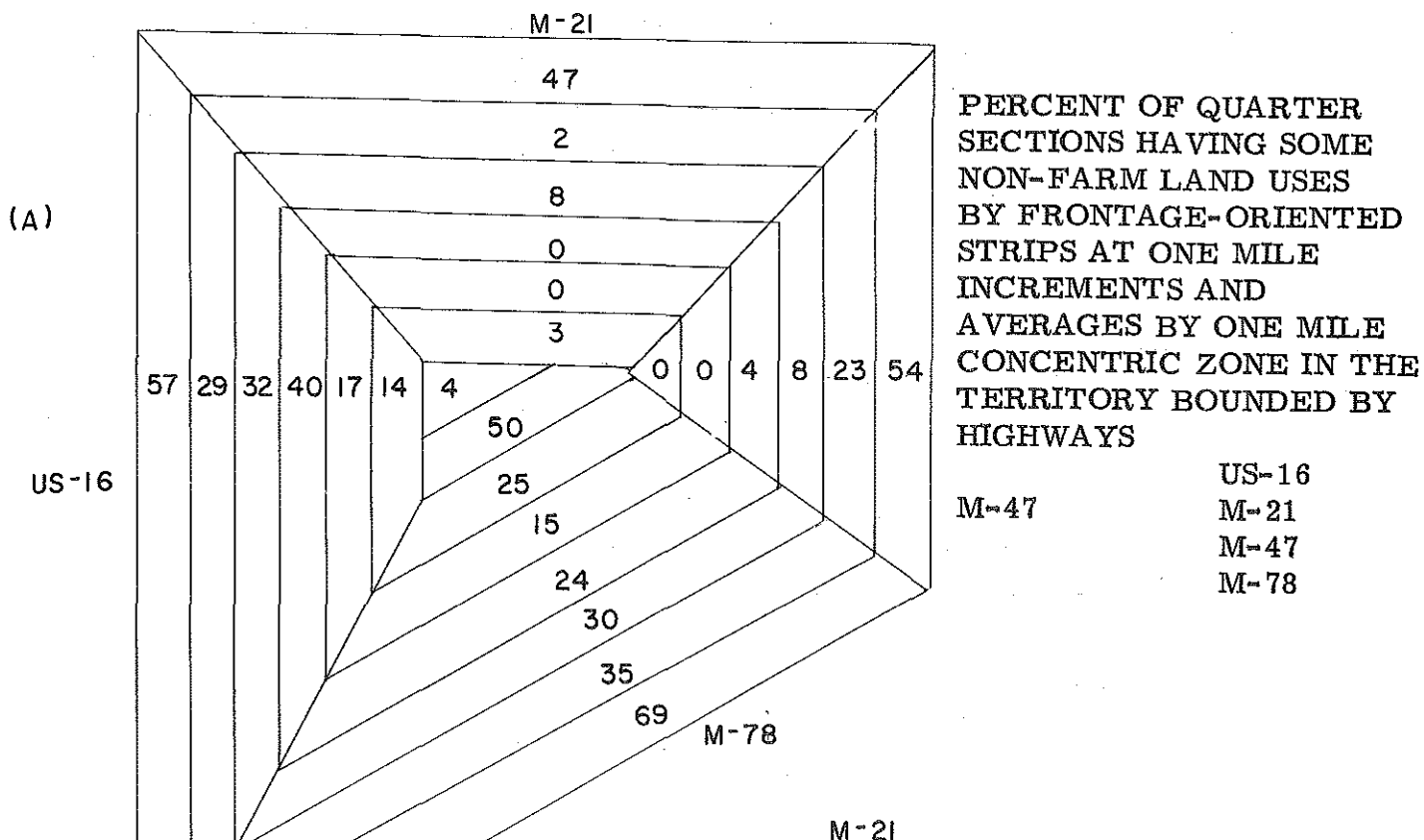


Figure 6



AVERAGE FOR THE WHOLE "CELL" -28%

Figures 7A and B

the variable factors for each cell which range from 13 per cent for the largest cell in the study area to 100 per cent for cells included in the metropolitan areas. Patterns B and C comprise the web of impact defined in terms of the constant factor of the average percentage (34 per cent) of quarter sections with non-farm land uses in the study area as a whole. The constant factor had the effect of extending the web of impact near the cities and reducing its coverage in the areas for the most part far away from the cities, particularly in those areas north of an east-west line above Grand Rapids and Flint.

The composite web of highway impact in Figure 8 is presented as one of the major findings of this report. It clearly and unequivocally demonstrates the relationship between the dispersed city in Michigan and the major highways of the state. It illustrates that "the highways have become the streets of the dispersed cities."

A. DEPTH OF IMPACT AND HIGHWAY MILEAGES

There are 5,457 miles of state and U.S. highways in the study area. These highways have 10,914 miles of highway frontage. One of the more interesting facts coming from this report is the small proportion (less than 20 per cent) of this frontage which fails to show impact through highways upon the pattern of land use in non-agricultural ways. The exact figure is 17.9 per cent. This means that 8,960 miles of highway frontage show some evidence of impact to a depth of one mile or more. If one calculates on the basis of miles of road rather than the miles of frontage on both sides of the road, only 7.2 per cent of the 5,457 miles of highway in the study area are without impact of one mile or more. This is a total highway mileage of 5,107 with at least one mile of impact. Total miles and miles of highway frontage in the study area, with various depths of impact are shown in Table 2 on the following page.

In reading this table it should be noted that depth back from the highways by frontage involves each side of the highway, one side at a time. Accordingly, the totals for one mile of impact through highway frontage are considerably greater than one mile of impact through highway considering both sides together. This is so because the category is the sum of one mile of impact either side, one mile on both sides, and one mile of impact on one side with any mileage depth of impact on the other side. That explains why, in Table 2, on a frontage basis, one mile of impact accounts for 56.1 per cent of total frontage, while on a highway basis (both sides) the corresponding percentage is only 23.7

Formulating some of the major findings from Table 2, the following important points should be noted. The proportion of frontage and highway mileage with an

impact of two or more miles in depth is significant because it indicates that impact is more than the initial roadside clutter of houses and highway-oriented businesses. More than one-fourth of all frontage, 2,829 miles of it, has an impact two or more miles in depth. In terms of miles of highway (both sides considered together), 2,049 miles, or 37.6 per cent, show impact to a depth of three miles or more. Three miles is quoted in this category because, on a both-sides-of-the-highway basis, one mile of impact on both sides would be counted as two miles of impact. The negative cumulative items in the table show that over 90 per cent of the state and U.S. highway mileage has an impact of a mile or more, that three-fourths or more have two miles of impact, that well over a third have impact of three miles, and that nearly one-fifth has impact four miles in depth.

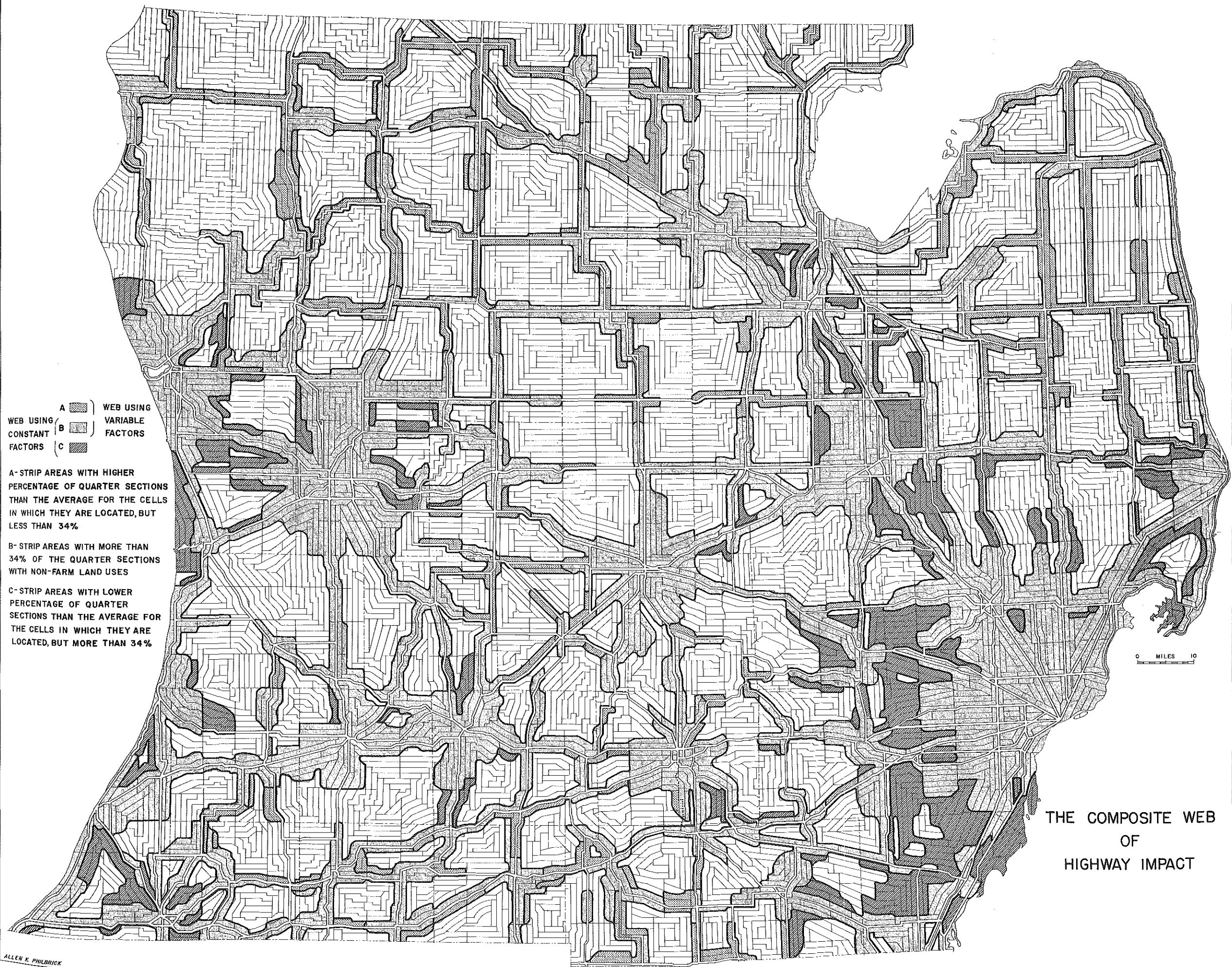
A number of additional observations should be made regarding the map of the Composite Web of Highway Impact in Figure 8.

It will be seen that the urban dispersal from the state's major cities is absorbed in two principal regions of great highway impact: the eastern urban axis through Detroit to the Tri-Cities of the Saginaw-Bay City-Midland area, and the cities of western Michigan. These two regions, where the web of impact is denser, bracket the Lansing region in the center of the study area. This central area around the capitol city, where depth of impact is less well developed, might be described as "the hole in the doughnut." Nevertheless, it should be observed how effectively and relatively evenly the web of impact covers the portion of the state included in the study area.

B. RELATION OF THE WEB OF IMPACT TO THE DISPERSED CITY CONCEPT

What is the relationship between the pattern of the web of impact and the concept of the dispersed city? An answer to this question may be found in the proportion of the quarter sections having non-farm land uses as shown on the map in Figure 1 which are accounted for in the highway oriented territories of the web of impact. An analysis of this relationship demonstrated that when the web of impact is superimposed over the map in Figure 1, nearly three-fourths (73.7 per cent) of all the black squares fall within the web.

That relationship gives rise to the question: *Just how much of the total 47-county study area is included in the web of impact?* For the significance of having nearly three-fourths of the dispersal of urban-type land uses within the web depends in part upon whether this coincidence is by chance alone. The improbability of



A WEB USING VARIABLE
 CONSTANT FACTORS
 B FACTORS
 C

A-STRIP AREAS WITH HIGHER
 PERCENTAGE OF QUARTER SECTIONS
 THAN THE AVERAGE FOR THE CELLS
 IN WHICH THEY ARE LOCATED, BUT
 LESS THAN 34%

B-STRIP AREAS WITH MORE THAN
 34% OF THE QUARTER SECTIONS
 WITH NON-FARM LAND USES

C-STRIP AREAS WITH LOWER
 PERCENTAGE OF QUARTER
 SECTIONS THAN THE AVERAGE FOR
 THE CELLS IN WHICH THEY ARE
 LOCATED, BUT MORE THAN 34%

0 MILES 10

THE COMPOSITE WEB
 OF
 HIGHWAY IMPACT

Figure 8

Table 2

IMPACT ON LAND USE THROUGH HIGHWAYS
Miles of Frontage and of Highway at Successive Mile Depths Back From the Highway

Depth of Impact in Miles	0	1	2	3	4	5	6	7†
Miles Frontage.....	1958	6127	1963	576	199	50	27	14
% Frontage.....	17.9	56.1	18.0	5.3	1.8	.5	.3	.1
Cumulative.....	1958	8085	10048	10624	10823	10873	10900	10914
Total & %.....	17.9	74.0	92.0	97.3	99.1	99.6	99.9	100.0
Negative Cumulative*.....	10914	8956	2829	866	290	91	41	14
Total & %.....	100.0	82.1	26.0	8.0	2.7	.9	.4	.1
Miles of Highway both sides.....	394	900	2114	987	626	224	149	63
Per Cent Highway.....	7.2	16.5	38.7	18.1	11.5	4.1	2.7	1.2
Cumulative.....	394	1294	3408	4395	5021	5245	5394	5457
Total & %.....	7.2	23.7	62.4	80.5	92.0	96.1	98.8	100.0
Negative Cumulative*.....	5457	5063	4163	2049	1062	436	212	63
Total & %.....	100.0	92.8	76.3	37.6	19.5	8.0	3.9	1.2

*Negative cumulative total means for each depth, the total of that depth and over.

†The category 7 miles includes short stretches of highway with impact at 8 and 9 miles.

such a chance coincidence is strongly indicated by the fact that whereas only about 43 per cent of the total study area is within the web of impact, in this 43 per cent of the area are concentrated nearly three-quarters of the dispersed urban-type land uses.

It may be concluded, therefore, that the composite web of impact is a reasonable measure both of the geographical distribution of the dispersed city, and of the role of principal highways as the arteries which make its development possible.

If the reader will refer back to the map in Figure 1 it is apparent that to a marked degree the quarter sections with some urban, or non-farm type land uses in them, are scattered outward from the borders of the major and also the minor cities. Analyses by strip areas have already revealed the regular manner in which this pattern diminishes numerically along, or parallel to and also perpendicularly to the major highways that radiate from these urban centers. This pattern of decreasing numbers of urbanized quarter sections outward from major cities can be used to define the outlines of the outer boundaries of the areas primarily focusing upon each city as far as commuting and general movement into and out from the central city are concerned.

The ten maps in Figures 9 to 18 show for ten major urban areas an hypothesis of the extent of each as a dispersed city region. Determination of the limits of these regions is based on visual analysis of the gross land use map and was guided by two criteria. The first of these criteria is continuity, which means the unbroken contact of successive urbanized quarter sections all the way back to the central built-up city. The second criterion was "substantial coverage of whole townships". Defining the regions in terms of townships made it

easier to relate these dispersed-city regions to U.S. census statistics and to the existing governmental framework. Accordingly, the outlines of the dispersed city regions in the following maps are those parts of the pattern in the gross land uses map in Figure 1 around the major cities which substantially covered whole townships. In the majority of the townships in each case, such dispersed urbanized quarter sections are contiguous back to the areas of the central cities shown in white.

Data for each of the ten dispersed city regions for 1940 and 1950 are presented in Table 3 for comparison purposes. Not all of the same type of information was available from the preliminary figures for 1960. However, in the cases where this information was available for certain of the cities, the data are shown in Table 4.

Table 3 shows that, as of 1950, 81.6 per cent of the population of the study area was concentrated in the dispersed city regions. The table separates the population of each dispersed city region into two components, those living within the nucleated settlements and those living in dispersed settlement. In the several regions, the percentage of dispersed settlement to total regional population varies from 22.3 per cent for the Detroit complex to 52.9 per cent in the case of the Benton Harbor-St. Joseph complex. Nucleated settlement means all incorporated places and all unincorporated places listed in the census of 1940 and of 1950.

The total population in dispersed settlement within the dispersed-city regions, as defined on the map in Figure 1, was well under one million (835,441) in 1940 and in 1950 was well over a million and a quarter (1,293,114). Thus, a sizeable proportion of the state's population lives within what may be called an urban-

Table 3
POPULATION OF DISPERSED CITY REGIONS 1940-1950

REGION	Area in Sq. Mi. (Density per Sq. Mi.)	POPULATION									
		1940			1950			Change			
		a. Total	b. Nucleated	Per Cent Dispersed	a. Total	b. Nucleated	Per Cent Dispersed	a. Total	b. Nucleated	Per Cent Dispersed	
DETROIT	2453.3 (1302.7)	a. 2,468,260 b. 2,045,236 c. 423,024		17.1	a. 3,172,570 b. 2,466,560 c. 706,010		22.3	a. 704,310 b. 421,324 c. 282,986		40.2	28.5 20.6 66.9
GRAND RAPIDS	1262.9 (252.7)	a. 271,668 b. 187,171 c. 84,497		31.1	a. 319,104 b. 204,629 c. 114,475		35.9	a. 47,436 b. 17,458 c. 29,978		63.2	17.5 9.3 35.5
FLINT	683.9 (402.9)	a. 232,034 b. 167,417 c. 64,617		27.8	a. 275,566 b. 182,316 c. 73,250		33.8	a. 43,532 b. 14,899 c. 28,633		65.8	18.8 8.9 44.3
TRI-CITY	719.3 (325.1)	a. 192,887 b. 144,496 c. 48,391		25.1	a. 233,835 b. 164,116 c. 69,719		29.8	a. 40,948 b. 19,620 c. 21,328		52.1	21.2 13.6 45.1
KALAMAZOO-BATTLE CREEK	790.9 (282.4)	a. 174,087 b. 108,747 c. 65,340		37.5	a. 223,312 b. 119,281 c. 104,031		46.6	a. 49,225 b. 10,534 c. 38,691		78.6	28.3 9.7 59.2
LANSING	521.9 (343.1)	a. 134,599 b. 90,418 c. 44,181		32.8	a. 179,088 b. 119,617 c. 59,471		33.2	a. 44,489 b. 29,199 c. 15,290		34.3	33.1 32.3 34.6
MUSKEGON	429.6 (302.8)	a. 101,742 b. 68,402 c. 33,340		32.8	a. 130,098 b. 86,049 c. 44,049		33.9	a. 28,356 b. 17,647 c. 10,709		37.8	27.8 25.8 32.1
JACKSON	372.8 (258.2)	a. 82,890 b. 50,740 c. 32,150		38.8	a. 96,256 b. 52,280 c. 43,976		45.7	a. 13,366 b. 1,540 c. 11,826		88.5	16.1 3.0 36.8
BENTON HARBOR-ST. JOSEPH	237.4 (288.4)	a. 54,023 b. 28,274 c. 25,749		47.7	a. 68,457 b. 32,225 c. 36,232		52.9	a. 14,434 b. 3,951 c. 20,483		72.6	26.7 14.0 40.7
PORT HURON	259.7 (247.4)	a. 52,159 b. 38,007 c. 14,152		27.1	a. 64,258 b. 42,357 c. 21,901		34.1	a. 12,099 b. 4,350 c. 7,749		64.0	23.2 11.4 54.8
TOTAL, ALL TEN REGIONS	7713.7 (617.4)	a. 3,764,349 b. 2,928,908 c. 835,441		22.2	a. 4,762,544 b. 3,469,430 c. 1,293,114		27.2	a. 998,195 b. 540,522 c. 457,673		45.9	26.5 18.4 54.8
BALANCE OUTSIDE	49,308 (21.7)	a. 950,136			a. 1,073,692			a. 123,556			13.0
DIS. CITY REGIONS STATE TOTALS AND AVERAGES	57,022 (111.7)	a. 5,256,106			a. 6,371,766			a. 1,115,660			21.2

peripheral environment with its activities focused inside the major urban centers. This portion of the population was only slightly more than a fifth (22.2 per cent) of the total study area population in 1940; it was more than a fourth (27.2 per cent) in 1950; and it is probably approaching one-third in 1960. In the decade, 1940 to 1950, the population of the ten dispersed-city regions increased by almost one million (998,195) persons, while the increase for the entire study area was only 1,121,751. In other words, population growth in the ten cities accounted for 89 per cent of the increase for the

entire study area. Since the net population change in the whole state was less than that in the study area, it may be said that the change in the dispersed-city regions accounted for 90 per cent of the population growth during the 1940s in the entire state.

C. MEASURES OF THE DISPERSED-CITY CONCEPT IN THE STUDY AREA

On the basis of the previous discussion, it may be concluded that the southern half of the lower peninsula of



0 MILES 6

THE DETROIT DISPERSED-CITY REGION

Figure 9

THE GRAND RAPIDS DISPERSED-CITY REGION

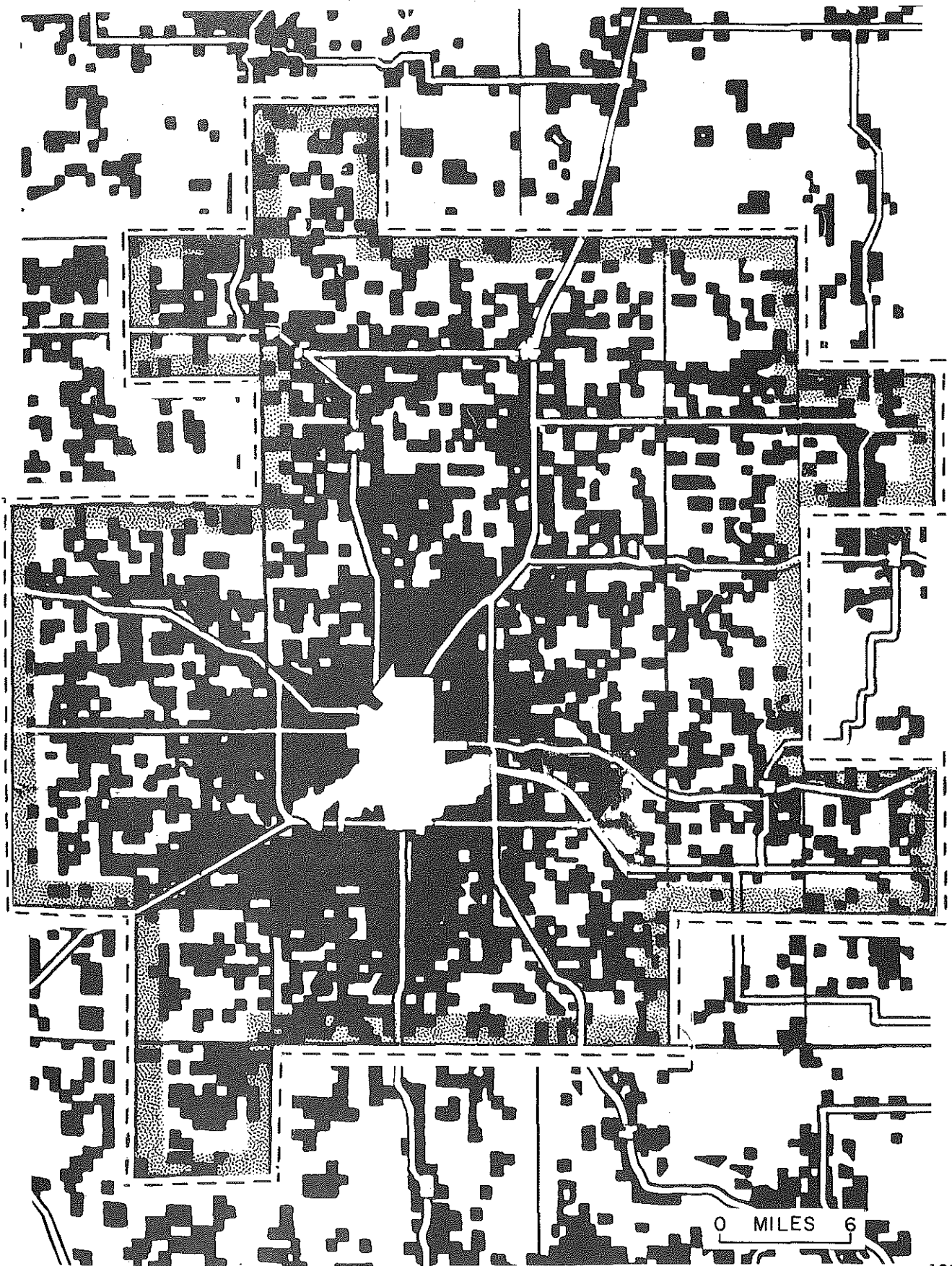


Figure 10

THE FLINT DISPERSED-CITY REGION

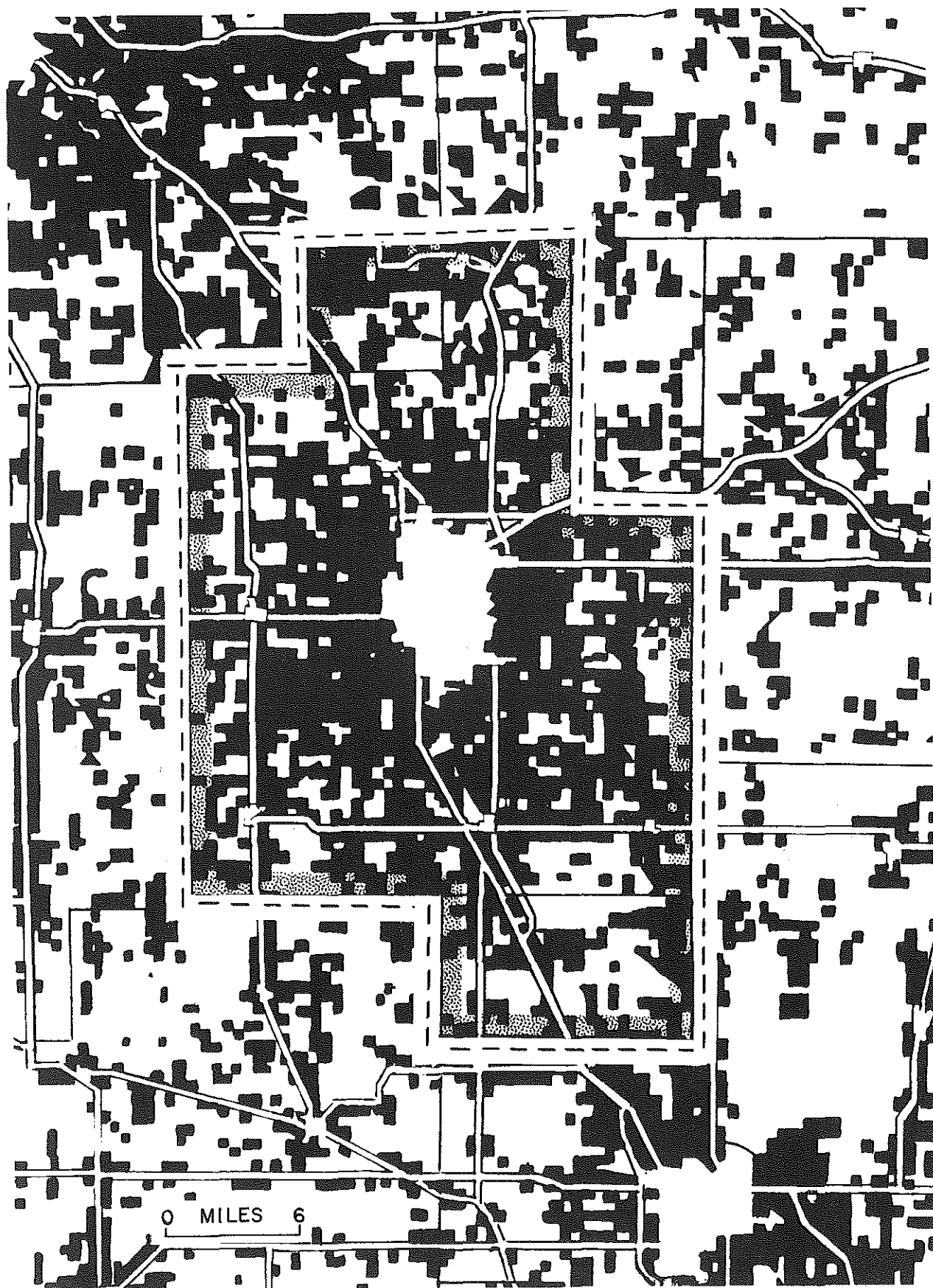


Figure 11

THE TRI-CITY DISPERSED-CITY REGION

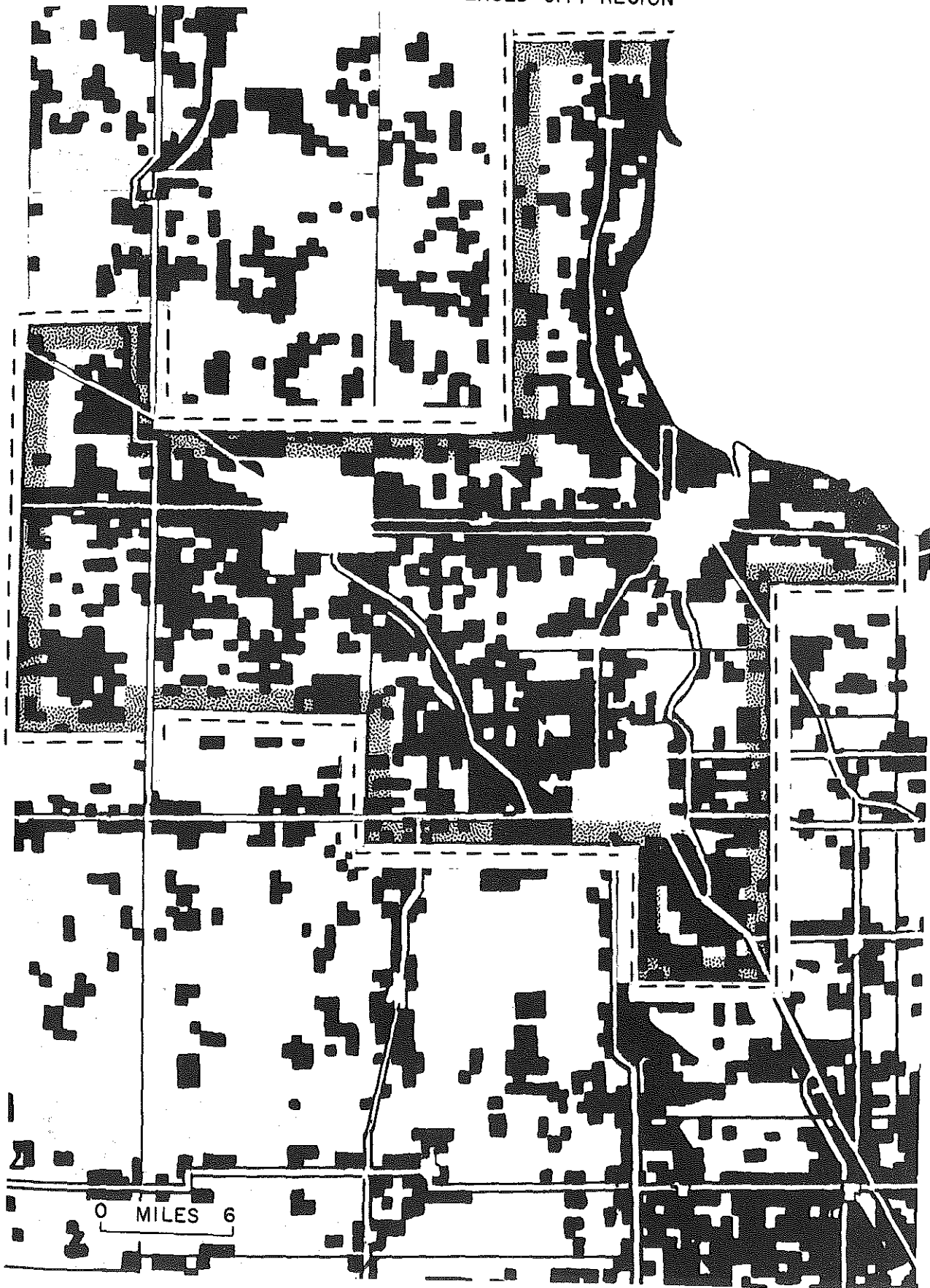


Figure 12

THE KALAMAZOO-BATTLE CREEK DISPERSED-CITY REGION

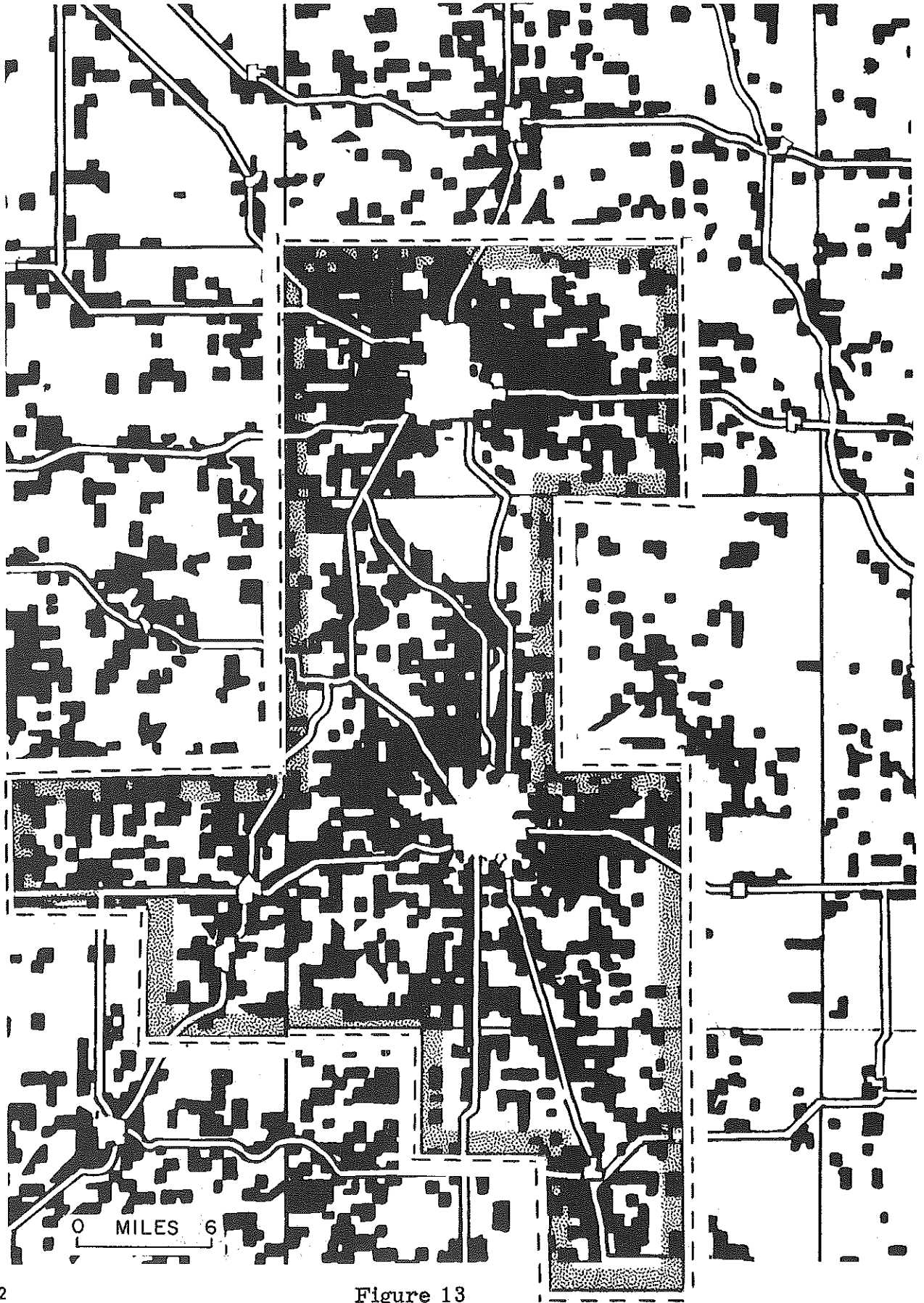


Figure 13

THE LANSING DISPERSED-CITY REGION

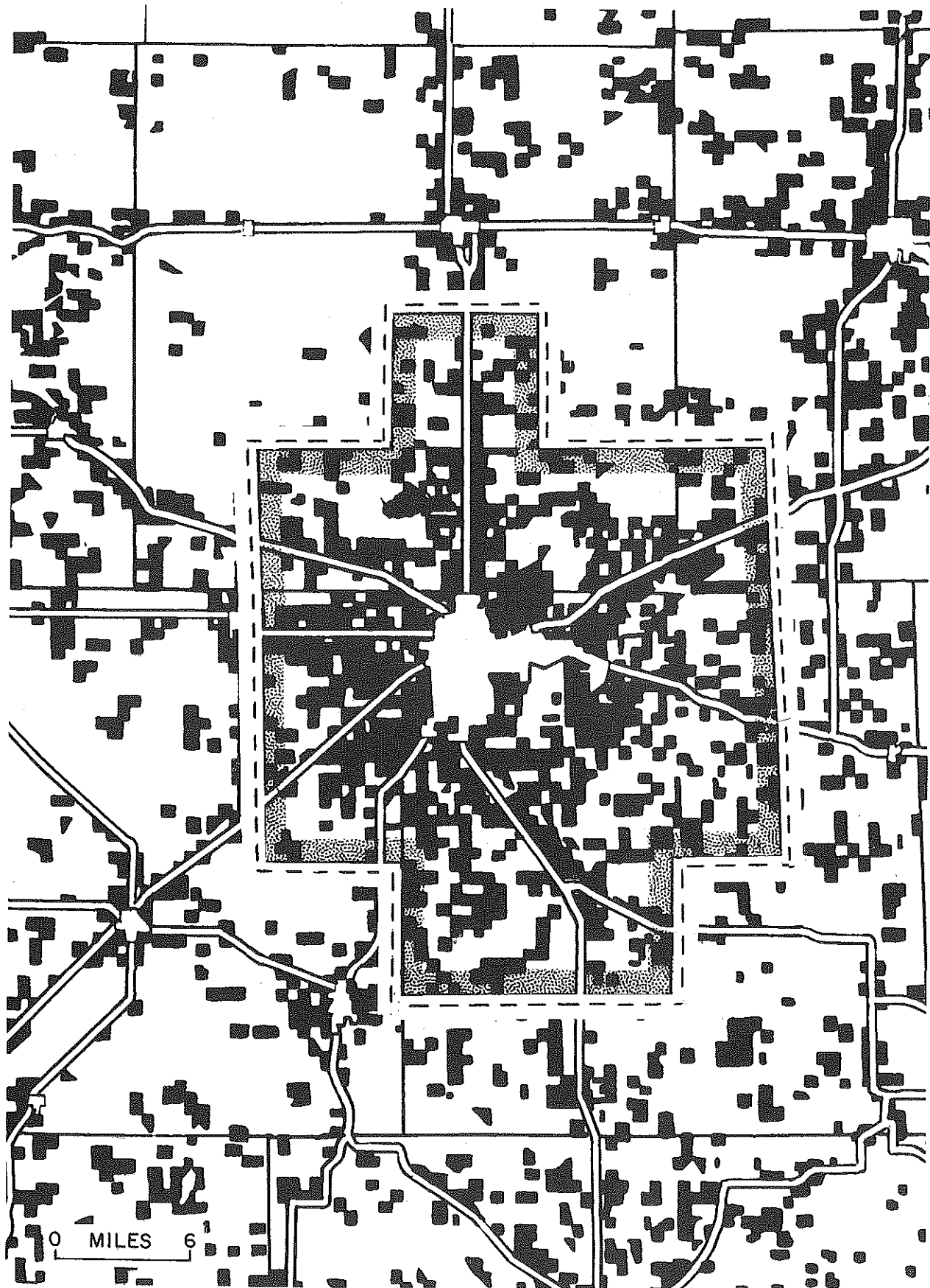


Figure 14

THE MUSKEGON DISPERSED-CITY REGION



Figure 15

THE JACKSON DISPERSED-CITY REGION

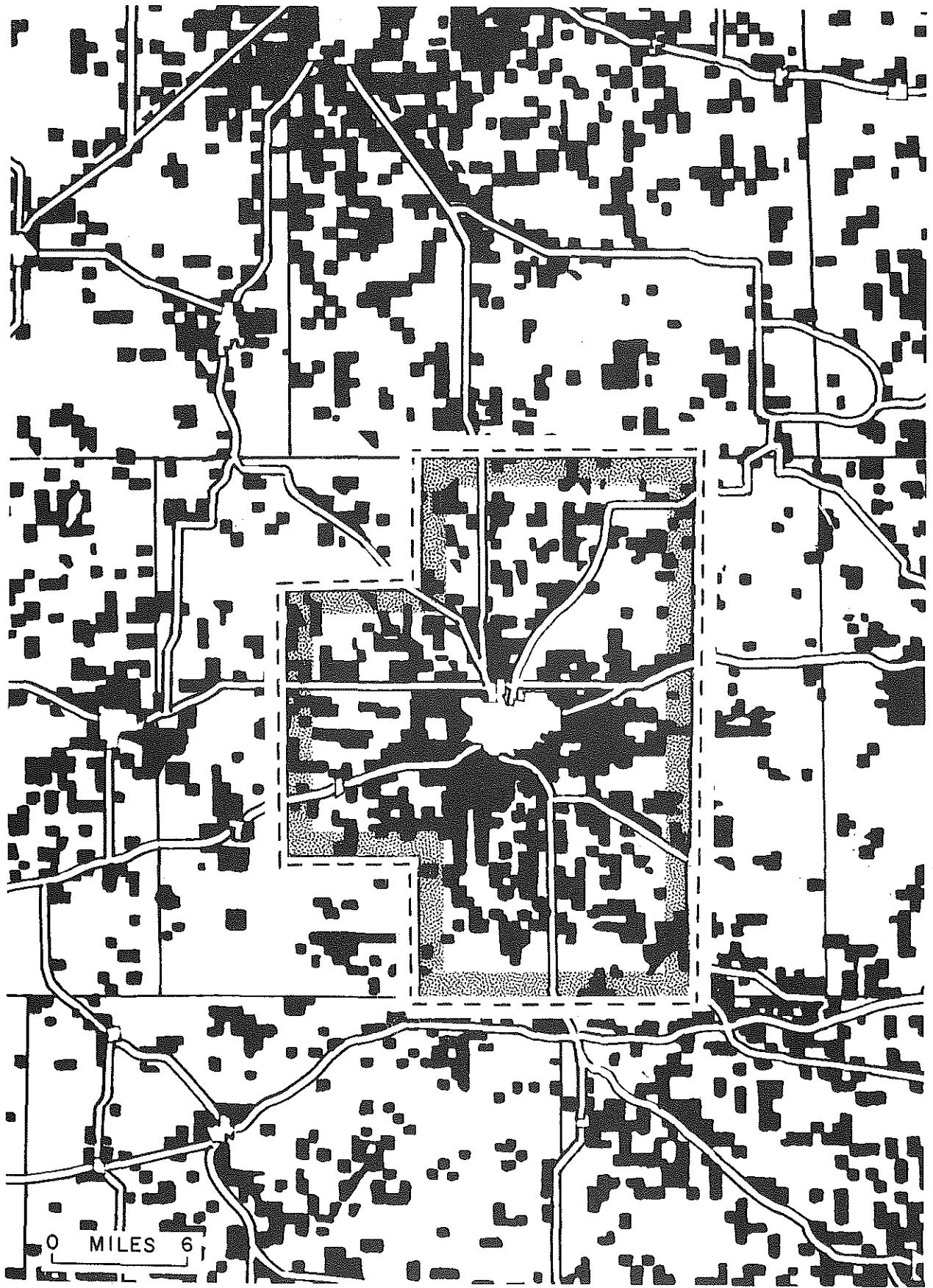


Figure 16

THE BENTON HARBOR - ST. JOSEPH DISPERSED-CITY REGION



Figure 17

THE PORT HURON DISPERSED-CITY REGION

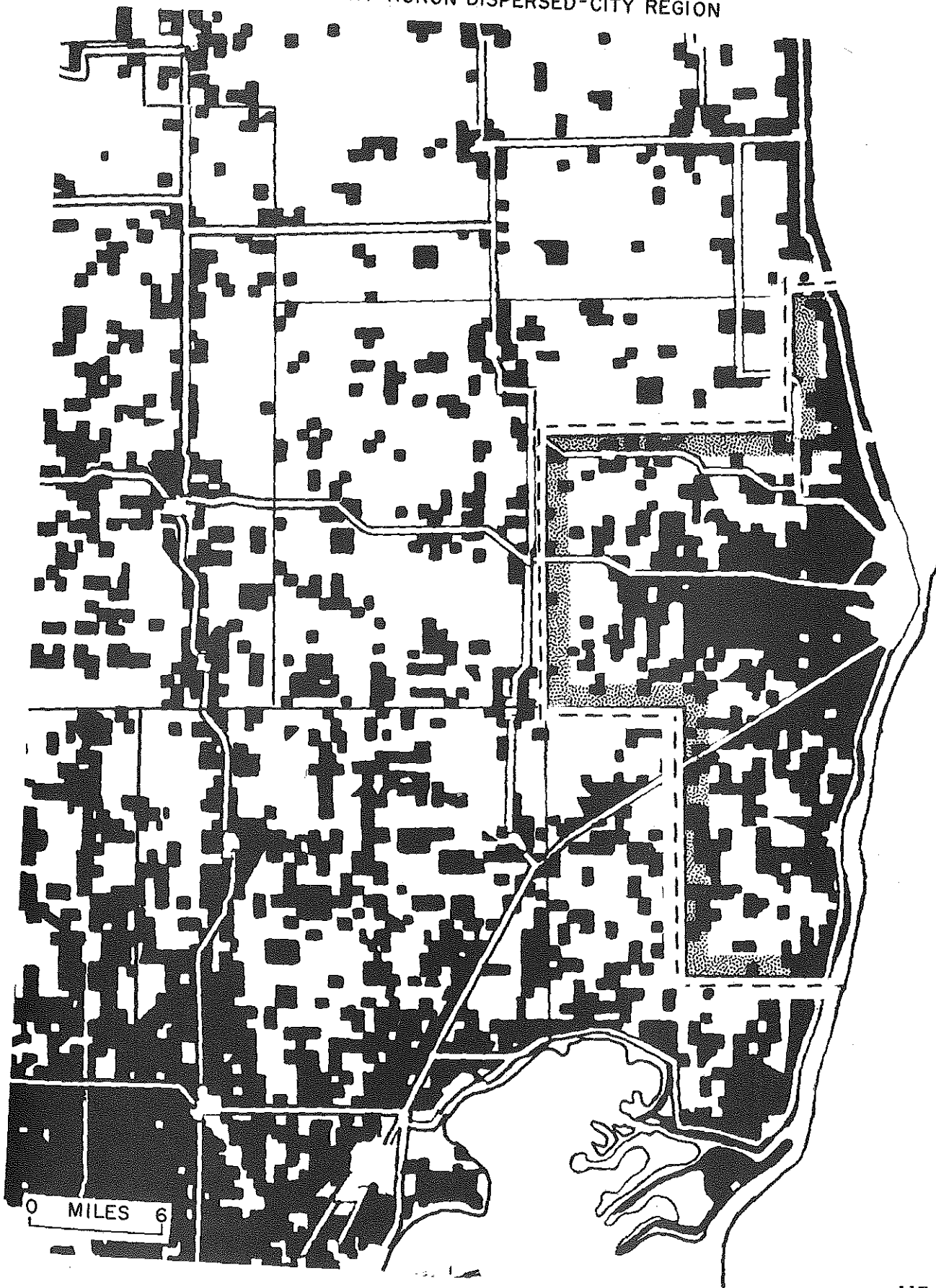


Figure 18

Table 4
THE MICHIGAN DISPERSED-CITY REALM

CATEGORY	1950 POPULATION				AREA			DENSITY	
	Number	Per Cent	Cumulative	Per Cent	Square Miles	Per Cent	Sq. Miles Cumulative	Per Cent	Pop. per Sq. Mile
In Study Area	5,836,236	1000	5,836,236	100	29,364	100	29,364	100	199
In Nucleated Areas in dispersed-city regions	3,469,430	59.4	3,469,236	59.4	610	2.1	610	2.1	5,688
In Dispersed Area in dispersed-city regions including some farmers	1,293,114	22.2	4,762,544	81.6	7,104	24.2	7,714	26.3	182
Areas Outside dispersed-city regions—partly non-farm use within web of impact and partly farmers	1,073,692	18.4	5,836,236	100.0	21,650	73.7	29,364	100	50

Michigan is, in reality, one great dispersed-city realm comprising ten or more major dispersed city regions and a composite web of highway impact interconnecting them.

Table 4 and the map, "Michigan's Dispersed-City Realm," in Figure 19 both show the regular progression of diminishing concentrations of population within the study area. These are the patterns of population which go with the patterns of land use in Figure 1. The different categories in the table and on the map measure the number of people involved, the size of the territory they occupy as a category, and the average density of population per square mile within each area. The categories quantify the land use map indirectly, and at the same time make more specific the description of the dispersed city.

Starting in the nucleated centers, the most concentrated population in the cities and villages accounts for roughly 60 per cent of the total.

Occupying only a little over two per cent of the area, it is settled at a density of more than 5,500 per square mile.

Dispersed settlement within the territories defined as dispersed-city regions brings the total to more than three-fourths of the entire study area population in a little more than a quarter of the area.

Available data from the 1960 census, as recorded in Table 5, shows that the process of growth of the urban dispersal pattern has been continuing since the 1950 census. In another decade, the Grand Rapids dispersed-city region, if it keeps up the present rate, will have passed the half million mark; it passed 400,000 in 1960. In 1960 the Lansing area passed the 200,000 level. It is probable that the ten dispersed-city regions, as described in this report, are approaching a total population of six million.

The 1960 population of the study area is 7,237,535, based upon preliminary figures. This is 92.8 per cent of the state total. In 1950 this percentage was 91.6, indicating a continuation of the trend of population to become increasingly concentrated in the southern half of the lower peninsula.

CHAPTER V

NEW STRUCTURES (1930s to 1940s) IN RELATION TO HIGHWAYS

Still another means of observing and measuring the growth and geographical dispersal of our cities is through the data made available by the second phase of this research project. It will be recalled that this phase of the study dealt with the enumeration of change in the number of structures shown by culture symbols on the general highways maps of each county. These maps are in two series, one dated 1940 which reflects condi-

tions in the late 1930s, the other series, variously dated from 1951-1958, reflects conditions in the early 1950s.

The tabulated results for 28 counties within the study area are interpreted. These cover, as shown by the map in Figure 20, all counties except Lenawee south of a line from Muskegon, north of Grand Rapids and Flint, to Port Huron. This territory includes all of the dispersed-city regions except the Saginaw-Bay City-

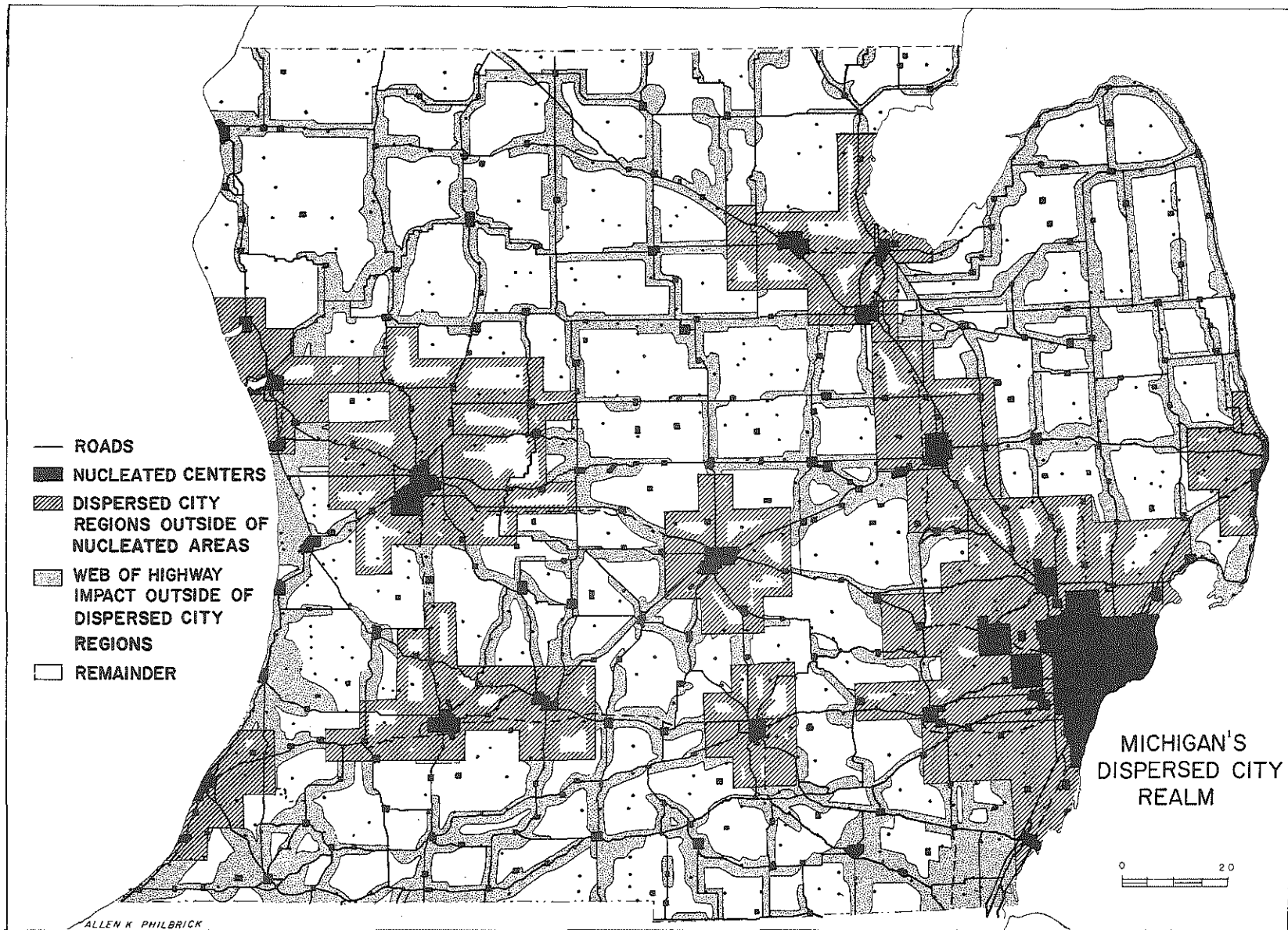


Figure 19

Table 5
POPULATION OF SELECTED DISPERSED-CITY REGIONS

1950—1960							
City Regions	Area	1950 Population	Density per sq. mi.	1960 Population	Density per sq. mi.	Per Cent Change	
						40-50	50-60
Grand Rapids.....	1262.9	319,104	252.7	402,040	318.3	17.4	25.9
Flint.....	683.9	275,566	402.9	377,009	551.3	18.7	36.8
Lansing.....	521.9	179,088	343.1	225,112	431.3	33.0	25.7
Port Huron.....	259.7	64,258	247.4	72,524	279.3	23.1	12.8

Midland tri-city complex. The map shows by strip areas the pattern of non-farm dwelling construction between the late 1930s and the early 1950s within this 28-county territory. Comparison of this map with those shown in Figures 1 and 8 reveals that the patterns are substantially similar in outline. The pattern of the areas of greatest building activity again confirms the existence of an eastern and a western urban concentration and again emphasizes the relatively less density of such structures in the central area around Lansing.

Before proceeding with a discussion and interpretation of the data, the following observations should be made regarding the limitations and presentation of the data. The white areas on the maps, except for Lenawee County which was not inventoried, are the congested or most built-up areas where no culture symbols are shown in the 1950 map series. These include not only the city and village areas of nucleated settlement but considerable territory immediately surrounding the corporate limits, usually thought of as the "urban fringe". Therefore, no exact count of the non-farm dwellings constructed within the dispersed-city regions is possible from the data gathered. However, relative comparisons of the numbers of structure involved and their locations with respect to highways can be analyzed.

A. CHANGE IN NUMBER OF NON-FARM STRUCTURES

The change in number of non-farm dwellings in the 28 counties analyzed totals 39,211 houses. If one assumes an average of 3.5 persons per family, these non-farm dwellings were occupied by roughly 140,000 (137,237) persons. It is estimated, although not with statistical precision, that there were approximately 1,164,068 persons living in these rural areas of the 28 counties in 1950. The corresponding figure for 1940 cannot be calculated in the same way because the census definition of urban did not include fringe population in that year. However, since it can be assumed that the 1950 population had increased at the same rate (by 26.2 per cent) as the state's total rural population, the 1940 figure can be

estimated to be in the neighborhood of 922,399 persons.

The inventory of the 1940 county highway maps enumerated 9,529 non-farm dwellings within the rural areas of the 28 counties included in Study Area No. 2. At the same rate of 3.5 persons per family, this means 33,352 persons, or 3.6 per cent of the estimated 1940 rural total. The number of houses counted for the 1950's map series was 48,740, accounting for 170,590 people. That figure is 14.6 per cent of the estimated 1950 population of the rural parts of this study area. Even more striking than this indicated nearly fivefold increase in the proportion of the non-farm component of rural population is the contrast between the 26.2 per cent increase in total rural population and the 411.5 per cent increase in the number of non-farm dwellings. It may be concluded that the very high rate of increase of these dwellings, which are very markedly highway oriented, dramatically underscores the dispersion of urban land uses and urban population since World War II.

It must be remembered, of course, that the above comparisons cannot be statistically accurate in absolute terms. The rural population does not necessarily correspond with the population of the areas for which culture symbols are included on the maps and, as already mentioned, the urban definition differed in the two census periods. Nevertheless, the number of persons indicated in new non-farm occupancy represents the dispersal within the countryside of these 28 counties of a population equal to that of a fair-sized metropolitan area, and this movement can be expected to continue to increase rapidly.

B. NEW DWELLING CONSTRUCTION IN RELATION TO WEB OF HIGHWAY IMPACT

The comparison of the change in number of non-farm structures with the change in rural population is very striking, but the analysis of the geographical pattern of the change with respect to highway orientation is

INCREASE IN NUMBER OF NON-FARM DWELLINGS BY STRIP AREAS
FROM THE LATE 1930'S TO THE LATE 1950'S

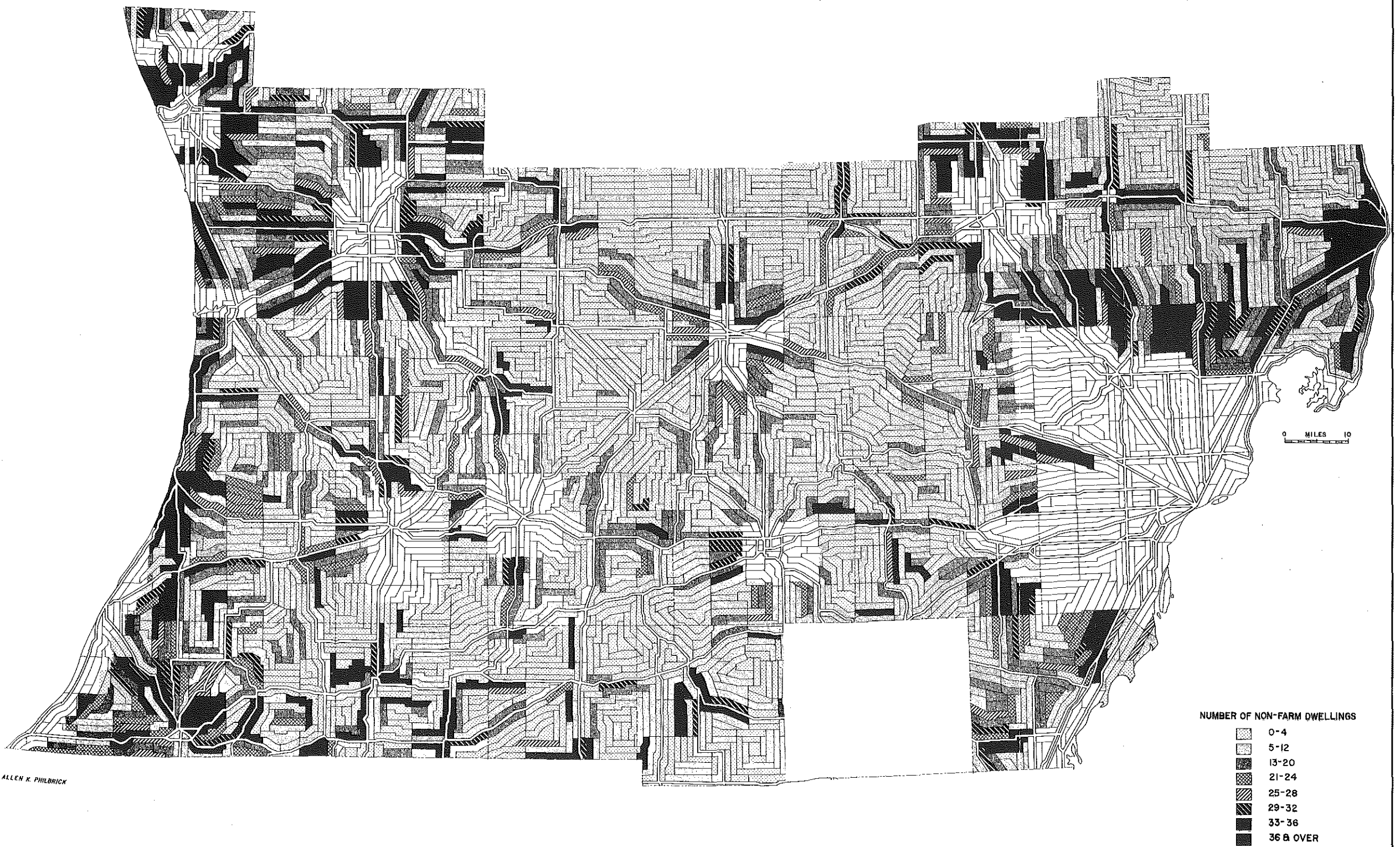


Figure 20

equally revealing. The number of non-farm dwellings constructed within the web of impact and outside it were calculated. The results of the count showed that 28,943 were within the web. This number is 73.8 per cent of the total of such dwellings, which is practically identical with the 73.7 per cent of quarter sections having some non-farm land use within them as found in the first study area. This correspondence of percentages is not a mere coincidence, but it should be noted that the study area in one case is 28 counties and in the other 47 counties.

In order to visualize this comparison better, the maps in Figure 21 should be examined. Map A shows the percentage of houses constructed in the period, 1930s to early 1950s, within the web of impact for each region within the second study area. Map B shows the

percentage of quarter sections with some non-farm land uses within the web of impact for each of the same regions. The patterns of percentages in the two maps are strikingly similar with the exception of the second region from the right on the bottom row, which includes Lenawee County, for which data regarding structures was lacking for 1950. The agreement revealed by this visual comparison simply underscores the fact that the gross land-use map and the map of non-farm dwellings represent common geographical measures in different terms of the same statistical population. The contrast between the numbers of non-farm dwellings constructed within and outside the web of highway impact reveals sharply the continuing influence of the major highways in shaping the pattern of urban dispersal in rural areas.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

This section of the report has summarized the findings from two phases of a single project of research. The objective was to examine the impact which people have exerted through their use of the major state and federal highways upon the uses of land and the number of structures built upon the land within a stated interval of time.

A. SUMMARY OF CONCLUSIONS

The findings of the studies are principally summarized on a series of maps showing the distribution of non-farm or urban type land uses in relation to urban centers and major highways. These maps strikingly reveal the expansion of the populations and forms of settlement of the urban centers into the surrounding countryside. More detailed analyses of these maps and data show very clearly that there are two different but simultaneous trends of variation of the incidence and intensity of these urban-type land uses according to the distance out from the urban centers and the distance back from the major highways that radiate from those centers. The resultants of these two trends demonstrate conclusively that highways are the major means through which the processes of this urban expansion have exerted their impact upon the land uses in the 47-county study area.

Measurements of the depth back from the highway of evidences of impact showed that a very large proportion of the miles of highway and highway frontage have afforded access for the dispersal of urban phenomena over rural lands in the study area. Within this area,

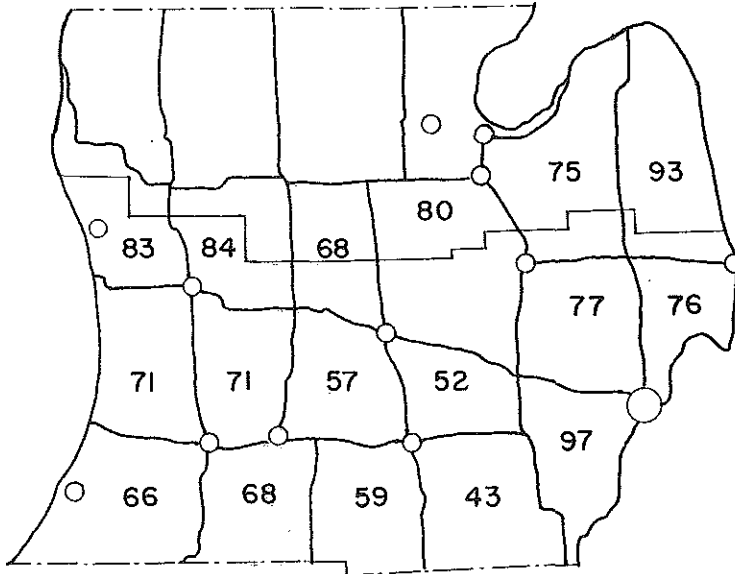
over 92 per cent of the highway mileage and slightly more than 82 per cent of the highway frontage have at least one mile depth of impact. Identification of these areas along the highways where there is evidence of the effects of urban infiltration defined the extent and pattern of a "web of highway impact" within which urban expansion has made its mark on the rural lands. This web occupies about 43 per cent of the total surface of the study area, but it encompasses 74 per cent of the quarter sections in that area which have some non-farm land uses.

These evidences of the expansion of urban phenomena lead to the conclusion that Michigan in its most populous districts, south of Town Line 16, is rapidly becoming dominated geographically by the diffusion and dispersion of its cities. What these data recorded, then, is the process of the automobile-induced replacement and dispersal of the mid-century "population explosion", which is introducing an entirely new type of settlement — the "dispersed city." Ten dispersed-city regions were defined and presented. Together, these dispersed city regions and the web of highway impact which interconnects them form an extensive unified area which may be called Michigan's "Dispersed-City Realm".

Analyses of the data concerning the numbers and locations of non-farm dwellings built between the 1930s and the early 1950s make clear that the process of urban expansion, which is producing the dispersed-city pattern of settlement, is continuing into the present time.

(A) PERCENT OF NON-FARM DWELLINGS CONSTRUCTED
BETWEEN THE 1930'S AND MID-1950'S BY REGIONS

AVERAGE FOR STUDY AREA NUMBER 2 - 73.8



(B) PERCENT OF NON-FARM QUARTER SECTIONS
IN WEB OF IMPACT BY REGIONS

AVERAGE FOR STUDY AREA NUMBER 1 - 73.7

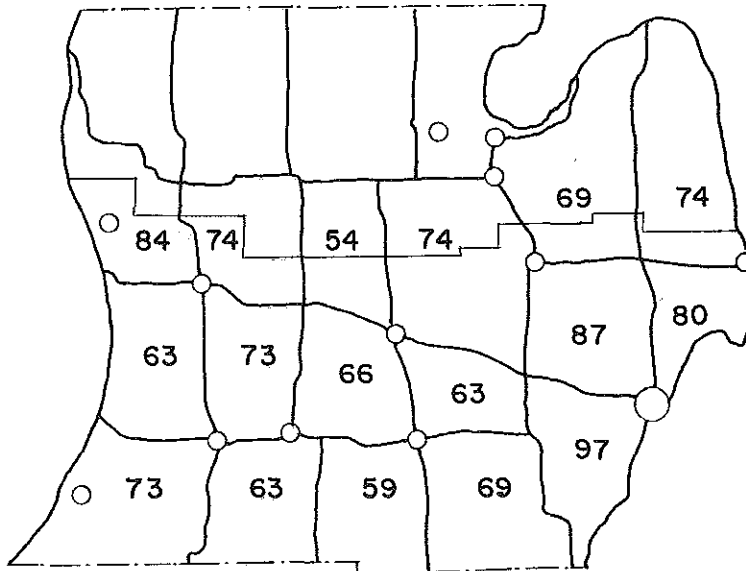


Figure 21

B. INTERPRETATIONS AND RECOMMENDATIONS

We are wont to think that our cities rank in their importance to our economy in terms of their population. The growth in numbers and in importance of activities in Detroit, for example, certainly cannot be ignored. Yet the people of the study area, the most populous and urbanized region of the state, have created and apparently are going to continue to develop a pattern of location and dispersal of their activities in which not one but a dozen or more cities are important. This development has occurred as a result of the increased facility of movement inherent in the use of the automobile and truck and has taken place within a generally radial and grid pattern of major highways. The resulting pattern of urbanized settlement has two major characteristics. First, there is the dispersal of urban people and facilities outward from many urban centers to form dispersed-city regions much larger in area than most people generally are aware. Second, there is the emergence of an interconnected pattern of these dispersed-city regions into what has been called, in this report, Michigan's Dispersed-City Realm.

The author is of the opinion that, on the basis of the preceding summary of the findings of these studies, this report places the study area in a somewhat different perspective and that this difference has a bearing on accepted concepts of highway service and planning. General recommendations appropriate to such findings will be cast in the form of questions which this new perspective raises.

The urban pattern of the study area is mainly an integrated and interconnected circle of dispersed-city regions. The circuit runs from Battle Creek-Kalamazoo in a clockwise direction to Grand Rapids, to the Tri Cities, to Flint, Pontiac, Detroit, to Jackson, and on to the starting point. Figure 22 shows diagrammatically the urban ring, the "hole in the doughnut", and the Capitol City region within the "hole."

It was indicated at the beginning of this report and has been documented by the observations and analysis in the report findings that highways are more than bridges across the spaces intervening between urban centers. Although they still serve that function, they are also not only means for interconnecting the city and the country, but are used and will continue to be used as the streets and boulevards of one great dispersed city.

In the process of urban dispersion, highways have proved to be major agency and channels for the growth and expansion of urban activities. This dispersion undoubtedly has reduced the pressure for growth and change within the central cities. Thus highways have provided avenues of escape for this internal pressure.

The consequent dispersal pattern of urban settlement which is evolving creates a host of additional short- and long-range problems. While this report cannot be expected to solve or even to enumerate such problems, the perspective provided by the accurate visualization, quantification, and analysis of existing conditions is a prerequisite to their recognition and eventual solution.

Inasmuch as the pre-existing highways have become the streets and boulevards of the new urban conformation, the limited access highways now in course of development must assume the traditional highway function of inter-communication. To what extent have we planned our new alignments of limited access highways so that all parts of the Michigan Dispersed-City Realm have, as nearly as possible, the same degree of access to one another?

There are three types of access important to this discussion: local access which gets people and goods in and out within each dispersed-city region, interstate access which takes care of those internal alignments which carry beyond the limits of the state, and intra-"urban realm" access which provides communication between the dispersed-city regions. The basic highway grid serves the local access needs and the pattern of Interstate routes radiating from Detroit serves the traffic for which it was designed. From the standpoint of intra-"urban realm" access however, should not all of the major secondary dispersed-city regions as well as Detroit have equal access to one another? It is the perspective of looking at the pattern of cities as a whole which suggests this question. The least number of major lines of movement capable of approximating the interconnection of all points on a circle is a triangle. Such a triangle is indicated by continuous and dashed lines on the diagram in Figure 22. Only one alignment, that shown by the dashed line, is not already in existence.

The findings of this report concerning the impact through highways upon land use indicate a pattern in which each city reaches out beyond its borders to every other one of its kind. The development of the region as a whole is best served by understanding and perspective which can give each part of the region the maximum opportunity to have access to every other part.

The patterns shown by the maps in Figures 1, 3, 9, 19, and 20 show a vast intermittent web of urban type establishments. This weblike pattern follows faithfully the alignments and interconnections provided by the highways. This is the pattern of a future Michigan, much more widely urbanized than at present. The important significance of the gross pattern of land uses in Figure 1 is that it predicts the trend of the future pattern of settlement within our state.

Locally, urban population will become more dis-

DIAGRAM OF MICHIGAN'S DISPERSED-CITY REALM

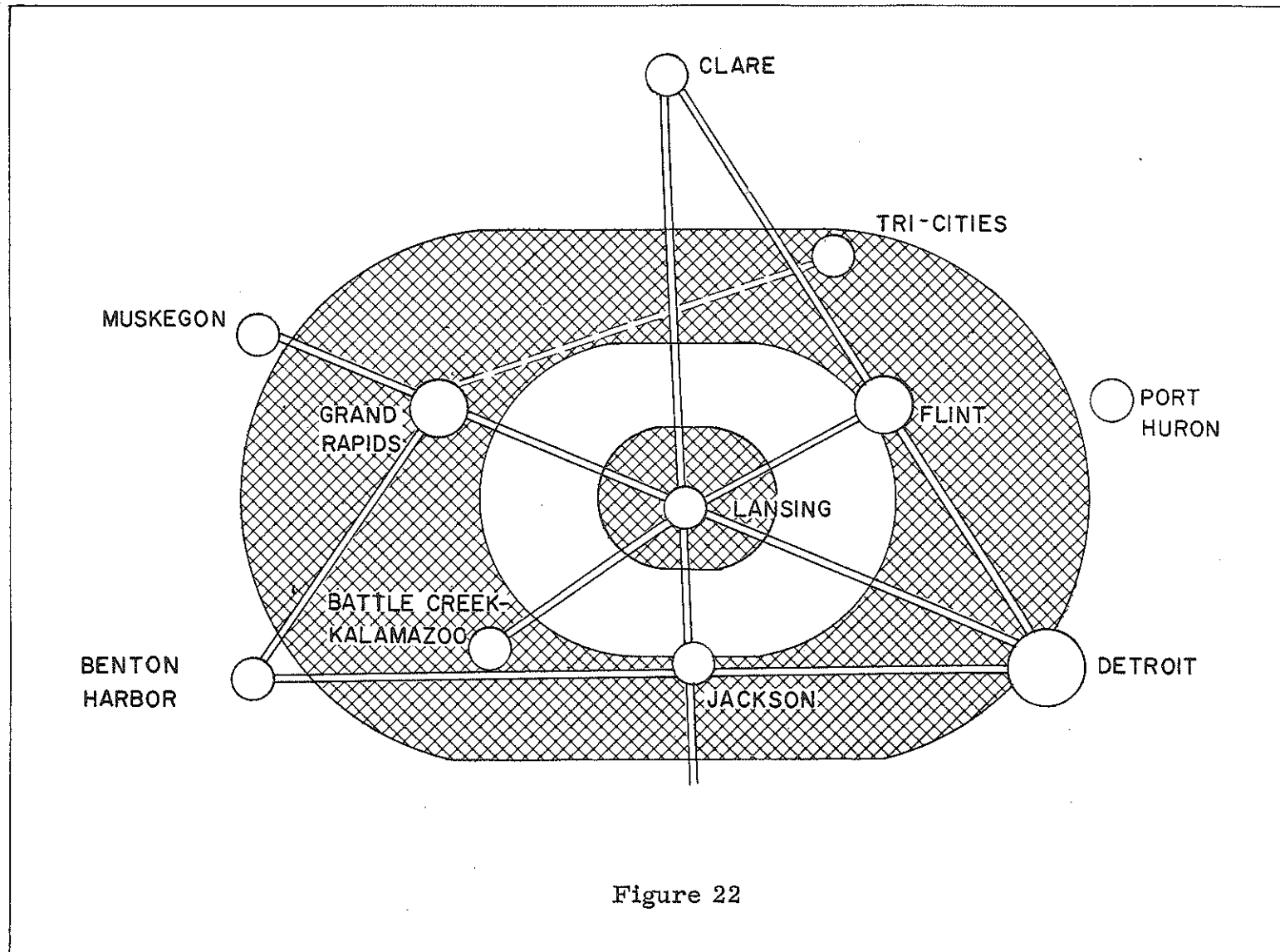


Figure 22

persed, but on a statewide basis it will become more concentrated within the areas of the present dispersed-city realm, both within the dispersed-city regions and within the composite web of highway impact. The territories now occupied by these categories of settlement

will be extended outward from the urban concentrations and further back into the agricultural and forested areas at even greater distances from the highways which are the major agencies and channels of population dispersal.

Summary of Findings and Conclusions Regarding the Economic Effects of Highway Improvements

An initial survey of the significance of a highway improvement program as a factor in the economic field revealed that there are several kinds of impact that such a program has on the national economy. First, the operation of the program is itself an economic activity and as such it affects current economic trends. Secondly, a highway improvement program is a productive process which, long range, produces a better and/or extended highway facility or system which improves the highway transportation service and so increases the efficiency of enterprises using that service. Affording access to land is also a basic service of highways; therefore, improvement or extension of this access service tends to influence the utilization and value of the lands served. Highway improvement programs are the responsibility of government which can employ them as instruments of economic and social policy to stimulate business activity, to increase national productive efficiency, or to encourage or direct the development of lands.

This series of studies has analyzed and determined the kind and extent of the effects of certain types of highway improvements on land uses, land values, retail trade, community growth, and the development and patterns of settlement over large areas of the state.

Highway Improvements and the Uses and Value of Land

These studies have found that highway improvements influence the value of lands through their effect on the possible uses of the lands served. If the improvements make it possible to devote the land to a higher type of use or if they make the existing use more profitable, the land value will be increased. However, the degree of improvement and several other factors affect the results.

The Dort Highway study (See Section IV) found that the paving of that artery in 1926-27 had different effects on land values in different parts of the affected area. Abutting property, which afforded potential frontage sites for mercantile or industrial use, exhibited substantially greater price increases than other areas, which showed mixed trends. But the largest changes in land value took place when large tracts of the original farm land were subdivided for residential or other more intensive use. There was relatively little change in the smaller, or already subdivided, parcels. Moreover, the early industrial and commercial developments made the area less attractive for residential use. In other words the highway had varied effects, depending on the phase of the improvement process and the stage of development of the affected area.

The study of the effect of highway improvement on farm land values (See Section II) found strong indications that farm-to-market roads in southern Michigan have been so well developed that increasing the density of the grid of all-weather roads does not serve to increase the per acre value of farm lands in the service area of the improvement. Thus, it is clear that in such areas, proximity to a hard surface road is not a sound basis for determining non-user benefits or land values in right-of-way acquisition.

The more massive influence on land use exerted by development of a system of major highways is described and illustrated in Section V.

Effects of Highway Relocations and By-Passes on Retail Businesses

Several studies investigated the degree that retail businesses, particularly those catering to motor vehicle and

motorist needs, are dependent on immediate proximity to major highway routes. This was done by analyzing sales of such establishments before and after through traffic on such a route had been diverted to a relocated or by-pass highway. Although the coincidence of most of these studies with the 1957-58 recession made it difficult to isolate the highway influence, useful and enlightening results were obtained.

On the section of Grand River Road in Oakland County abandoned as a state trunkline with the opening of the new section of Interstate 96, the relocation appeared to intensify the effects of the recession in the case of such highway-oriented establishments as gas stations and restaurants. However long-range effects appear to be constructive in promoting industrial and other local economic activity in the area. (See Section II.)

The studies of retail business in by-passed towns and cities (See Section II and III) found that only gas stations and other highway-oriented businesses were adversely affected and that most businesses including some of these are dependent on local trade for stable activity. The most basic and important finding of these studies is that retail business in most of the by-passed cities made relatively greater gains than in Michigan as a whole. If business gained, it increased more than the state average; if it declined, the decline was less. In each case, the degree of gain was inverse to the size of the city.

Therefore, results emphatically refute the allegation that a by-pass will "kill" business in a small town. The clear conclusion is that a basically healthy local retail economy can only benefit from having through traffic diverted from the main business streets and district to a by-pass highway.

Nevertheless, relocation of a major highway or the opening of a by-pass around a small city makes fundamental changes in patterns of movement which have basic importance to the business of the community which may require adjustments of methods and outlook. Local businesses and people should be assisted in this process by providing them with accurate information regarding the plans for and probable effects of such changes.

Effects of Highway Improvements on Community Growth and Patterns of Settlement

As stated in the Foreword, studies of the whole range of impacts made by the creation of the major highway network were not within the scope of this research project. Anything like a complete study of those im-

pacts, which represent the most profound and permanent effects of highways, would have had to include investigations of a long list of complex processes and relationships. The following paragraphs merely suggest the variety and character of the fields and problems involved.

The growth and redesign of urban communities and changes in the relationships between such communities and between them and their rural environment.

Changes in the character, methods and organization of the manufacturing industry and of retail and wholesale trade.

Changes in the methods, patterns of life, and the economics of agricultural areas, and in the educational organization and plant.

Shifts of utilization and emphasis among the various established and new services in the total field of transportation.

Development of a new recreational industry and of areas for its activities.

Most of these changes, motivated by powerful new attitudes and habits regarding spatial relationships which resulted from the universal utilization of motor vehicles and the highways developed for their service, are at least hinted at in the discussion of economic factors in Section I. Certainly as important as these phases of economic and civic change are the accompanying and possibly motivating shifts in social attitudes, organization and impulses.

While the effects of highways in these several fields were not investigated separately and in detail, the maps, charts and discussion of the "Geographical Pattern of Gross Land Uses" in Section V of this report may be said to present the overall summation of the gross impact of all these various effects in their respective fields as they have left and are still making their mark on the patterns of settlement in the most populous major area of the state. What the data in that section record is the process of the automobile-induced replacement or dispersal of the mid-century "population explosion" to create an entirely new type of settlement — "the dispersed city." The findings indicate a pattern in which each city reaches out beyond its borders to form a web-like pattern which follows faithfully the alignments and inter-connections provided by the major highways. The important significance of this gross pattern of land uses is that it predicts the shape of the future pattern of settlement within our state. Locally, urban population will become more dispersed, but on a statewide basis it will become more concentrated within the area in the southern half of the Lower Peninsula which is becoming dominated, geographically, by the diffusion and dispersion of its cities.