

469
HE
356.5
.M87
S7
1950

THE STATE TRUNKLINE SYSTEM
for **GREATER**
MUSKEGON

MICHIGAN STATE HIGHWAY DEPARTMENT
CHARLES M. ZIEGLER, STATE HIGHWAY COMMISSIONER

HIGHWAY
LIBRARY
MICHIGAN STATE HIGHWAY
DEPARTMENT — LANSING

65-3469

MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

THE STATE TRUNKLINE SYSTEM
FOR GREATER MUSKEGON

Cooperating Agencies:
Cities of Muskegon and Muskegon Heights,
U.S. Department of Commerce,
Bureau of Public Roads

August 1950

LIST OF PLATES AND TABLES

<u>Plates</u>	<u>Page</u>
I. State Trunkline Routes and Traffic in West Central Michigan	7
II. Traffic to the Muskegon Area on State Trunklines	8
III. 24-Hour Daily Traffic on State Trunkline Streets	12
IV. Interchange of Through Traffic	15
V. Major Thoroughfare Plan	16
VI. Objective Destinations of Passenger Car Trips	18
VII. Origins and Destinations of Commercial Vehicle Trips	20
VIII. Desire Patterns of North-South Traffic Movements	22
IX. Desire Patterns of East-West Traffic Movements	23
X. State Trunkline Trips in Muskegon Area Assigned to Major Thoroughfares	26
XI. State Trunkline Truck Trips in Muskegon Area Assigned to Major Thoroughfares	30
XII. Distribution and Termini of Traffic in Central District Entering and Leaving on US-31-North and on US-16--US-31-South	34
XIII. Distribution and Termini of Traffic in Central District Entering and Leaving on M-46 and Interchange of Traffic Through Central District	35
XIV. State Trunkline Trips to and from Industrial Districts Assigned to Major Thoroughfares	36
XV. Trips Between Industrial Districts Assigned to Major Thoroughfares	38
XVI. Selected State Trunkline Routes in the Muskegon Area	42
XVII. Total Traffic Usage of Selected Trunkline Routes and Other Major Thoroughfares	43
 <u>Tables</u>	
1. Types and External Terminals of Trips Entering Study Area on State Trunklines	10
2. Destinations of Passenger Cars Entering Area on State Trunklines	28
3. Destinations of Trucks Entering Area on State Trunklines	29

STATE TRUNKLINE ROUTES
IN THE MUSKEGON URBAN AREA

This report presents the results of studies of state trunkline route requirements in Muskegon and Muskegon Heights. It is based on pertinent data from the Muskegon-Muskegon Heights Metropolitan Area Traffic Study. It reports the selection of urban routes for all of the state trunklines serving the area.

This study and the resulting selections were made on the theory that, since adequate urban trunkline arteries are costly to build, they should be planned to deliver the greatest possible benefits to all traffic. They should connect the rural trunklines with those city areas which are the major origins and destinations of trunkline traffic; they should also serve, to the full extent consistent with their primary function, the major movements of local traffic.

BACKGROUND AND BASIS OF STUDY

For some years the state trunkline street pattern in the Muskegon area has been studied and has been changed without securing improved streets adequate for traffic on these routes. During this period, covering the long depression and World War II, local government agencies and the State Highway Department frequently were unable to agree as to what improvements were needed or for what purposes the meager construction funds should be used. The fundamental cause of these differences was the lack of factual information about traffic and its requirements.

The need for remedying this situation was recognized, and in 1946 the Cities of Muskegon and Muskegon Heights, the Department, and the Bureau of Public Roads agreed to co-operate in a metropolitan area traffic study. The results of this study became available in the following year and provided the planning officials of the municipalities and the Department with the information essential for their task. Since that time, they have worked together in substantial agreement.

Muskegon Major Thoroughfare Plan

The first result achieved in the solution of the area's traffic problem was the production of a plan for a network of principal arteries. In May, 1947, the Muskegon City Planning Commission submitted a comprehensive Major Thoroughfare Plan to the Mayor and City Commission. The Plan was the result of investigations undertaken by the Planning Commission in co-operation with the City of Muskegon Heights, surrounding townships, the Muskegon County Road Commission, and the State Highway Department. The Plan was based on the results of traffic surveys made under the Commission's direction and on such data from the 1946 Metropolitan Area Traffic Study as were then available.

In general, the Plan provides for arterial thoroughfares spaced a mile apart with secondary arteries at the half-mile intervals. The planned thoroughfares and secondaries are on existing streets although several of these streets will need to be opened across rail lines and other obstacles in order to fulfill their thoroughfare function.

Inasmuch as the Plan contemplated the transfer of the route of US-16 and US-31 Business Route from Peck Street to a location on Norton, Glade, and 19th Streets, the Department made a detailed examination and analysis of this proposal. In a report, published in May, 1949, the Department directly approved the Norton-Glade Route except for the section in the Central Business district on which judgment was reserved pending further investigation, and gave implied approval to the whole Major Thoroughfare Plan.

The Department has continued its studies of the Major Thoroughfare Plan. Mass traffic desire patterns have been plotted and analyzed. Traffic volumes have been estimated by block sections. Turning movements have been determined for all quadrants of each of the 73 major intersections of the thoroughfare system.

The soundness of the Major Thoroughfare Plan has been demonstrated by testing the service it would provide for the principal movements of industrial, central business, and summer tourist traffic. There remained the task of selecting from this planned and approved arterial network, the major thoroughfares

which will provide the best routes between the rural state trunklines and the city areas of major interest to trunkline traffic. That was the purpose of this study that is here reported.

Method of the Study

The method adopted for determining the urban routes of the trunklines serving the Muskegon area was to analyze for this purpose the trips which had been assigned to the Major Thoroughfare Plan as a part of the Muskegon-Muskegon Heights Metropolitan Area Traffic Study. This assignment of traffic was accomplished by routing each trip, according to known characteristics of drivers, by streets which involve fewest turns and make most direct approach to the desired destinations. The current state of improvement of these streets was disregarded.

The first step in the analysis for this study was to examine the trips to, from, and through the area on the state trunklines. The logical and most efficient routes for urban trunklines are indicated as those thoroughfares to which the preponderant amount of this trunkline traffic was assigned.

The second step in this method, was to test the utility of the selected trunkline thoroughfares to local traffic. This was done by examining trips within the city area assigned to the major thoroughfares. Because of the characteristics of truck traffic, particularly trailer-combinations, trips of this type, both local and trunkline, were given special consideration.

This whole process revealed the routes which are of primary utility to trunkline traffic, and then showed the relative usefulness of these selected routes to the most important streams of the purely local movement. This method results in a truly representative determination of the relative service of each of the major thoroughfares as trunkline and local arterial routes.

PRESENTATION OF DATA

The following plates, tables, and text, display and explain the successive steps by which the recommended trunkline routes were selected.

In the first place, the nature of the problem is presented by showing the quantities, type, and origins of traffic on the trunklines serving the

Muskegon area, and the present routes of this traffic on existing trunkline streets.

Secondly, the Major Thoroughfare Plan is presented as the basic arterial network from which the trunkline routes must be selected, and the adequacy of this Plan is established by testing it against the known demands and habits of traffic.

Finally, the actual process of determining which major thoroughfares would best serve trunkline traffic and the principal local arterial movements is shown and described, together with the urban trunkline system which is recommended.

PLATE I -- Muskegon's Connecting Trunklines and Their Traffic

The trunkline serving the Muskegon area link it either directly or through convenient connections with all parts of the state. Muskegon is the western terminus in Michigan of US-16 which is a major Interstate Highway from Detroit through Lansing and Grand Rapids to Muskegon, and from Milwaukee to the West. Paralleling the shore of Lake Michigan, US-31 leads through the city's market area south to Holland, Benton Harbor, and Chicago, and north to Ludington, Manistee, Traverse City, Petoskey, and the Straits of Mackinac. Two other state highways, M-20 and M-46, link the city with towns in Muskegon and Newaygo Counties and more distant points east and northeast.

Plate I shows how these routes stretch north, south, and east through the length and breadth of the Lower Peninsula. It also reveals the usage of these trunklines in a considerable section of the state surrounding the Muskegon area. This flow map indicates the service rendered by all of the routes in the Muskegon market area, and the special importance of US-16 in providing a connection with Grand Rapids and Detroit, and of US-31 in connecting with the great regional center of Chicago.

STATE TRUNKLINE ROUTES AND TRAFFIC IN WEST CENTRAL MICHIGAN

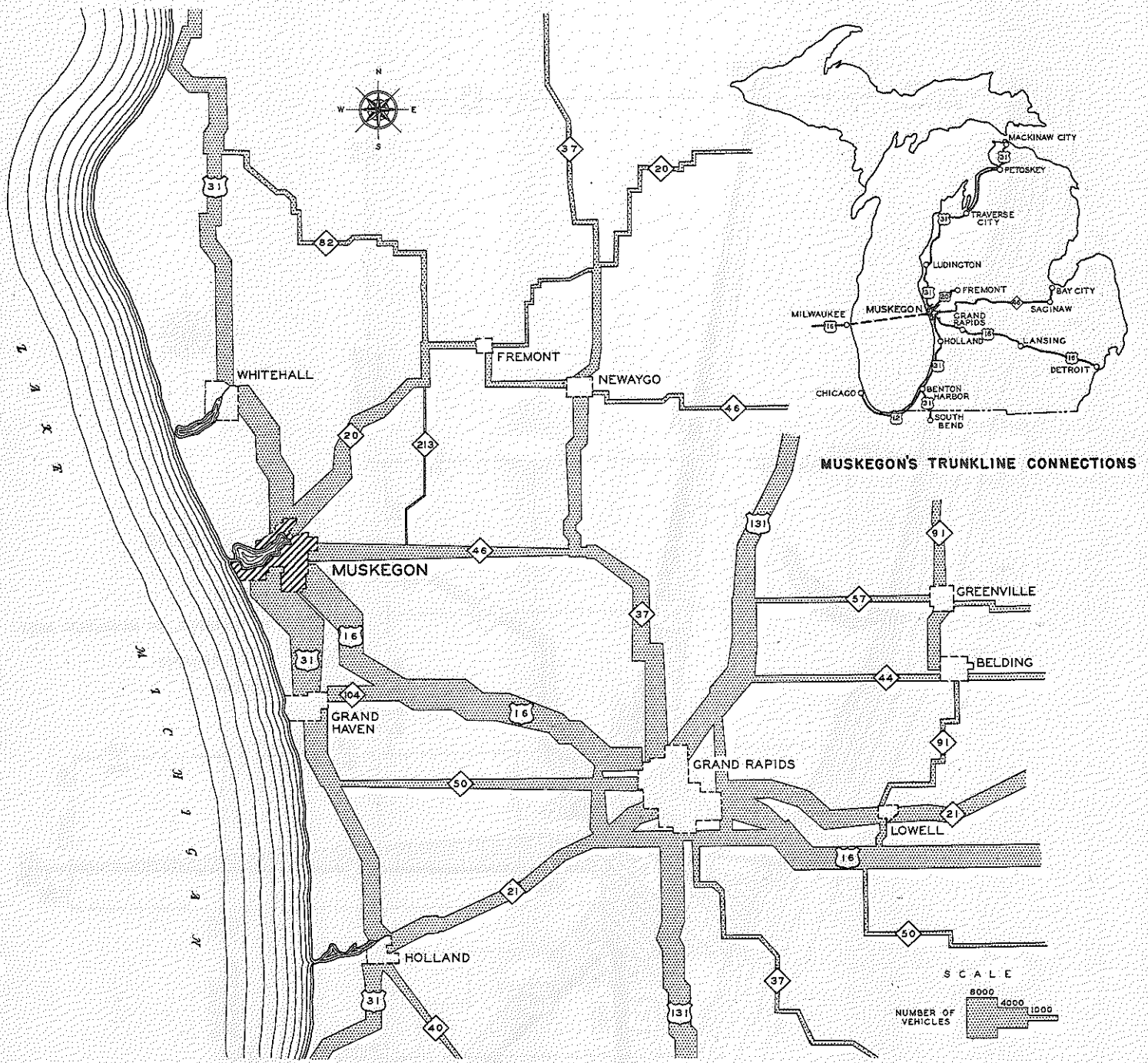


PLATE I

TRAFFIC TO THE MUSKEGON AREA ON STATE TRUNKLINES

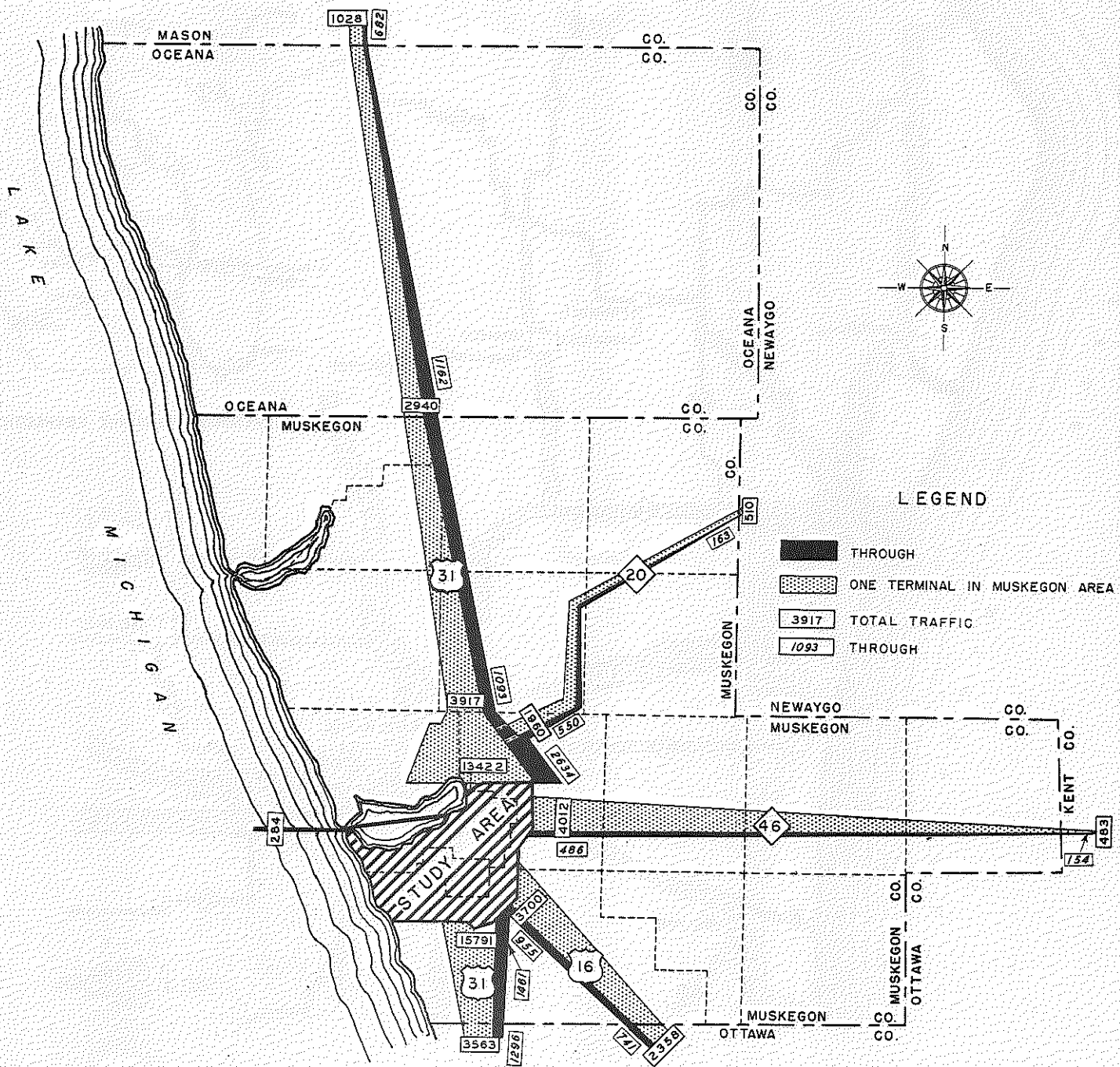


PLATE II

PLATE II -- Trunkline Traffic To The Muskegon Area

State trunkline street requirements in Muskegon are determined primarily by the character of the traffic entering and leaving the area on the rural state trunkline routes.

Plate II shows this traffic as it converges on the area and presents basic information regarding the number of trips, the range of their movement, and whether they have origins or destinations within the area or are passing through it. It is constructed to demonstrate the characteristics of the traffic service delivered by each of the rural trunklines serving the area, and to indicate in general terms the service that must be provided by the urban routes of these trunklines.

The rapid accumulation of traffic on US-31-North, as it approaches the city through the counties forming the Muskegon market area, is indicative of the importance of that trunkline to Muskegon's commercial activities. The stepping up of the rate of increase just north of the area is due largely to traffic generated in North Muskegon by shoppers and employees bound to or from the stores and plants in the city. Similar usage of M-46 is indicated by the fact that of the 4,498 trips entering or leaving the area on this trunkline, 86 per cent have terminals in Muskegon County.

On the other hand, the more gradual increase of traffic on US-16 and US-31-South, points to the larger component of state-wide transportation traffic carried by these rural routes. This is particularly true of the cross-state route, US-16; two-thirds of the traffic it delivers at the entrance of the area comes from beyond Muskegon County.

It will be noted that the heaviest bands of through traffic are on the north and south sections of US-31. US-16 also carries a considerable amount of traffic bound through the area. The trunkline entrance showing the greatest proportion of through trips is the dock on the lake front where boat connection is made between the Michigan section of US-16 and the highway's western extension at Milwaukee.

TABLE I

TYPES AND EXTERNAL TERMINALS OF TRIPS
ENTERING STUDY AREA ON STATE TRUNKLINES

	<u>US-31 North</u> No. of Trips	<u>US-31 South</u> No. of Trips	<u>US-16</u> No. of Trips	<u>Dock</u> No. of Trips	<u>M-46</u> No. of Trips	<u>Totals</u> No. of Trips
<u>Trips to and From Area</u>						
Origin in Muskegon or Oceana Counties (Percent of trips)	12,371 (92)	2,171 (38)	1,469 (38)	---	3,524 (88)	19,535 (73)
Origin Outside Counties (Percent of trips)	1,028 (8)	3,563 (62)	2,358 (62)	20 (100)	483 (12)	7,452 (27)
Total Terminal Trips	13,399	5,734	3,827	20	4,007	26,987
<u>Trips Through Area</u>						
Terminals in Muskegon and Oceana Counties (Percent of trips)	1,975 (74)	222 (15)	87 (11)	---	337 (68)	2,621 (45)
Terminals Outside Counties (Percent of trips)	682 (26)	1,296 (85)	741 (89)	284 (100)	154 (32)	3,157 (55)
Total Through Trips	2,657	1,518	828	284	491	5,778
<u>Total All Trips</u>	16,056	7,252	4,655	304	4,498	32,765
(Percent of Trips With Terminals in Area)	(84)	(79)	(82)	(7)	(89)	(82)
(Percent of Through Trips)	(16)	(21)	(18)	(93)	(11)	(18)
<u>Commercial Vehicle Trips</u> (Percent of Total Trips)	1,625 (10)	929 (13)	694 (15)	5 (2)	488 (11)	3,741 (11)

Plate II (Cont.)

Data similar to that presented in Plate II is contained in Table 1, but in more detail. A total of 32,765 trips are represented on this table of which 82 per cent were bound to or from the Muskegon area, and 18 per cent were passing through. More than two-thirds of the 26,987 trips terminating in the area, originated in Muskegon and Oceana Counties.

Of these 26,987 trips with a terminal in the area, nearly half enter or leave by US-31-North, more than a third by the combined route of US-16 and US-31-South, and about 15 per cent by M-46. Forty-six per cent of the 5,778 trips passing through the area are on US-31-North, 41 per cent on US-16 and US-31-South, eight per cent on M-46, and five per cent through the dock. The type of service of the last-named facility is indicated by the fact that through trips make up 93 per cent of all its traffic.

The table shows a total of 3,741 commercial vehicles entering or leaving the area. US-31-North carried 43 per cent of these trips, US-16 and US-31-South 44 per cent, and M-46 13 per cent. These vehicles constituted 14 per cent of the traffic on US-16-US-31-South, the highest proportion on any of Muskegon's trunkline entrance routes.

The information contained in Plate II and Table 1 proves the high importance to Muskegon of US-31-North and M-46 in providing connection with its market area. It also points out that US-16, US-31-South, US-31-North, and M-46 have importance as statewide transportation routes in the order named.

The latter order of significance reflects the size and distance of the places with which these trunklines make connection. US-16 leads through Grand Rapids and Lansing to Detroit, a distance of 186 miles. US-31-South connects with Grand Haven, Holland, Benton Harbor-St. Joseph, and Chicago which is 179 miles from Muskegon. The importance of the cities interconnected by the 233-mile course of US-31-North to the Straits of Mackinac, depends generally on their service to smaller trading areas. M-46 and M-20 lead to places of more limited influence.

24 HOUR DAILY TRAFFIC ON STATE TRUNKLINE STREETS

JULY WEEKDAY 1946

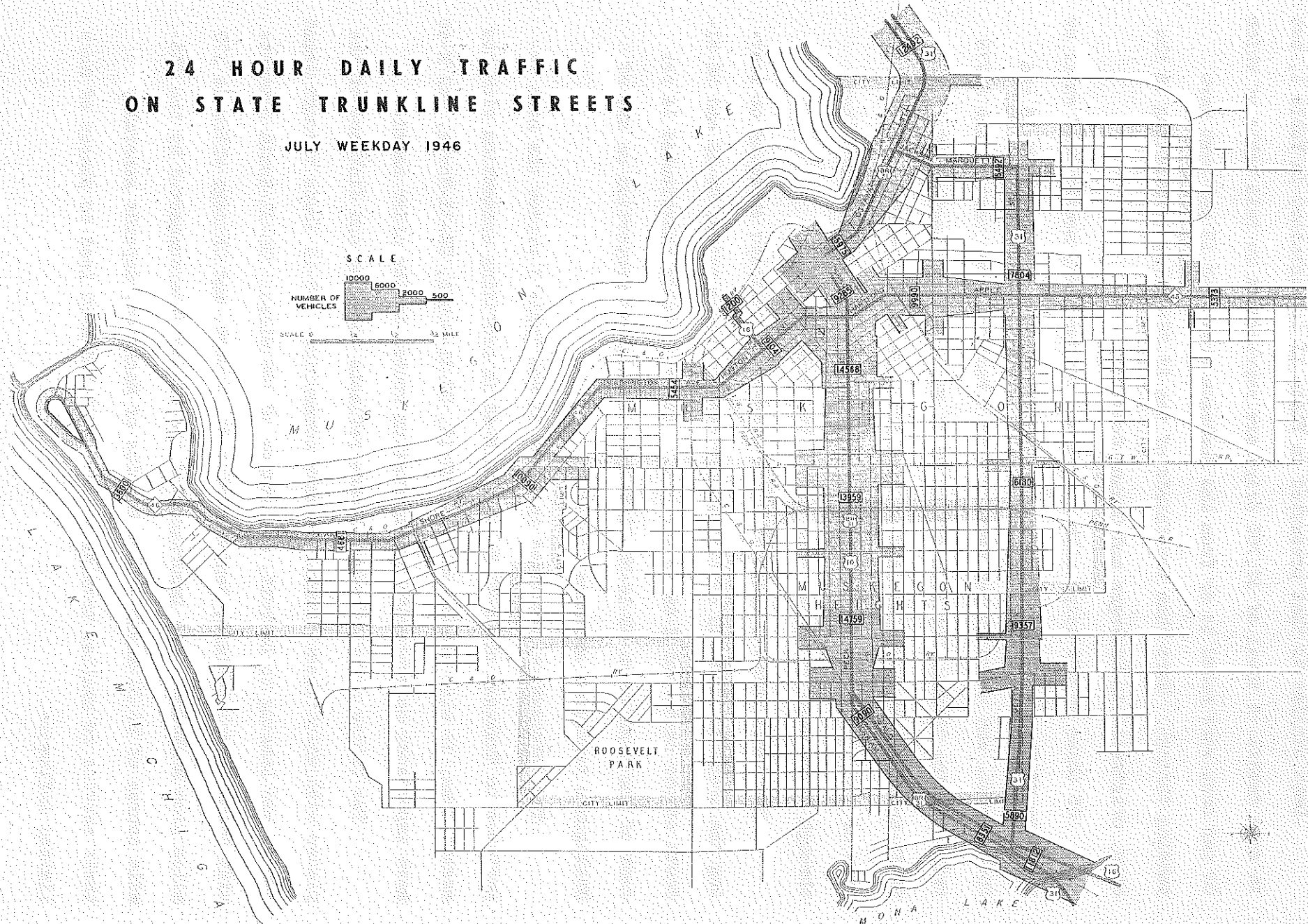


PLATE III

PLATE III -- 24-Hour Daily Traffic on State Trunkline Streets

Muskegon's location on the lake and the pattern of its development are factors which have long complicated the task of finding efficient urban routes for its trunklines. The fact that the city's central business district and several major industrial plants as well as its port facilities are located at the waterfront, means that these focal points are accessible from only two directions and that state trunkline traffic must move entirely across the city area to reach them.

In consequence of this urban pattern, the trunkline streets which converge on the central district carry very heavy loads of local shopping, business, industrial, and terminal traffic. Furthermore, the shopping and business sections in the adjoining municipalities and in Muskegon's own outlying sections have grown up along these trunkline streets and handicap them in performing their function of carrying state trunkline and local arterial travel.

Plate III shows the heavy usage of existing state trunkline streets as recorded in the Metropolitan Area Traffic Study on a weekday in July, 1946. Conditions have been found to be particularly bad on US-16 and US-31 Business Route which are routed together over Peck Street for most of their course through the urban area, and on the route of US-31 on Getty and Marquette Streets.

Drivers on the present route of US-16 and US-31BR are frequently confused and irritated by its circuitous and indirect approach to the central business district. On Peck Street, which is the principal business street of Muskegon Heights, trunkline traffic must contend with the congestion due to business district parking, cross traffic, and pedestrian movement. In addition, this trunkline traffic which includes large numbers of trailer-combinations from US-16 and the summer tourist rush on US-31, must compete for the use of this street with the heavy north-south local movement which has no other through improved route to the central district.

The existing route of US-31 on Getty Street was determined in the 1930's as a trunkline by-pass around the already crowded downtown sections. Except for

Plate III (Cont.)

the old pavement, conditions on this route have greatly changed. The population of the adjoining areas has grown rapidly and there has been an entirely unregulated commercial development along both sides of the highway. As a result of the accompanying increase in local neighborhood and business traffic, the expanded through movement from the rural trunklines encounters heavy congestion and serious hazards.

The flow bands on this plate show that volumes on most of Peck Street and Getty Street are in excess of the practical capacity of these arteries under existing operating conditions. A very considerable volume of travel in these two north-south movements is not shown on these sheets because many drivers prefer to follow other less direct routes rather than contend with the congestion on the marked trunkline streets.

The route of M-46 on Apple Street affords generally satisfactory service to its traffic. M-20 is not shown on this plate since its traffic enters Muskegon on US-31-North.

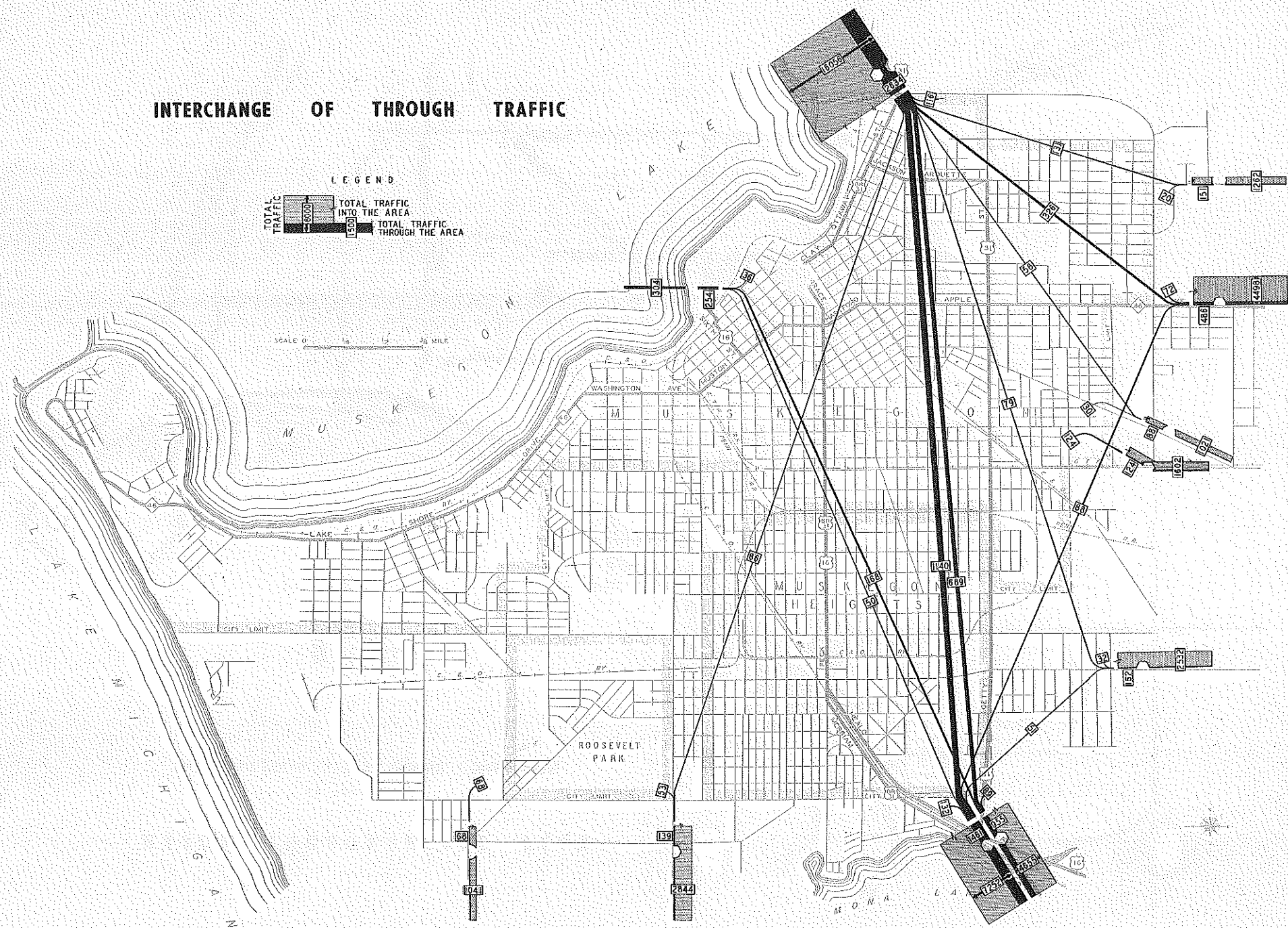
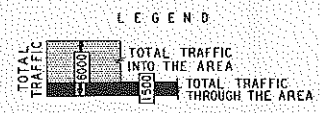
PLATE IV -- Interchange of Through Traffic

Through trunkline traffic traversing city streets is frequently cited as one of the important causes of congestion. Plate IV indicates that such traffic is not a very serious factor in the Muskegon area.

The plate shows diagrammatically the amount of traffic passing through Muskegon and Muskegon Heights and the interchanges that occur between the several state trunkline and county routes serving the cities. It also shows the proportion of total traffic on each of these entrance routes which comes from or is bound for other rural highway routes.

It is probable that through trips can and will avoid involvement in downtown congestion by using the new by-pass route of US-31 on the east and north edges of the area.





INTERCHANGE OF THROUGH TRAFFIC



MAJOR THOROUGHFARE PLAN

AS PREPARED BY
THE MUSKEGON CITY PLANNING COMMISSION

LEGEND

-  SHOPPING AREA
-  INDUSTRIAL AREA
-  TRUCK TERMINAL
-  WAREHOUSE

SCALE 0 1/4 1/2 3/4 MILE

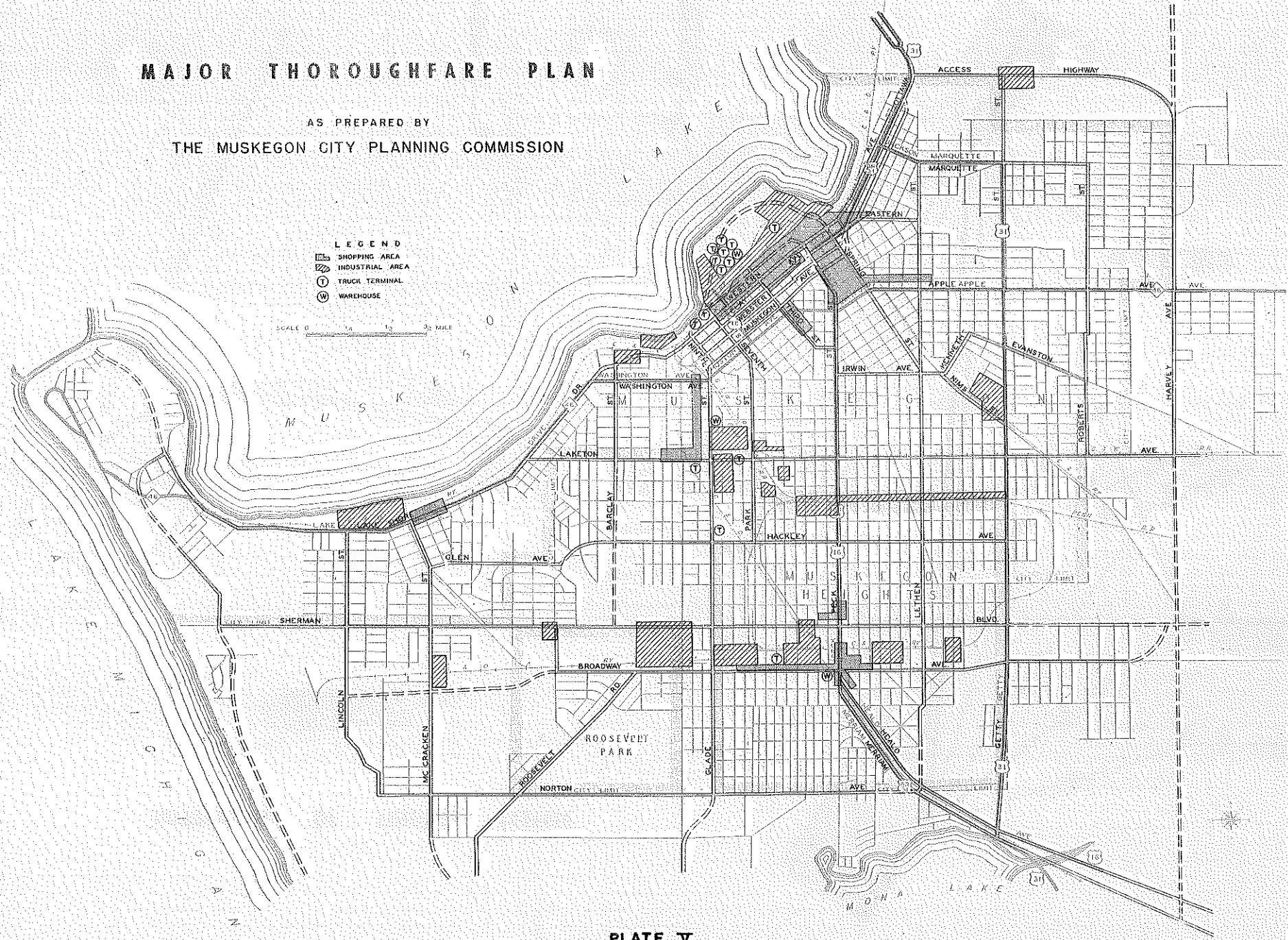


PLATE V

PLATE V -- Major Thoroughfare Plan As Prepared by the Muskegon City
Planning Commission

The Major Thoroughfare Plan was drawn up by the Muskegon City Planning Commission with the cooperation of the Department and other interested agencies, for the purpose of providing the Muskegon area with adequate arteries for the major movements of local and trunkline traffic. The planned network of major streets is shown on Plate V together with the locations of the principal land uses which are the principal origins and destinations of traffic.

The Commission proposed that certain changes be made in the routing of state trunklines within the area and designated routes in the Plan for that purpose. They proposed to route US-16 and US-31 BR over Norton and Glade Streets to the central business district, and US-31 over Harvey Street and the highway built on the north edge of the area to give access to the Continental Motors aviation engine plant. State construction is now completed on Harvey Street and the Department has examined and approved the main features of the Norton-Glade Route.

Plate V shows that the Thoroughfare Plan provides adequate connections serving the most important objectives of travel as indicated by the major land uses. The four following plates present the evidence of the service of these major thoroughfares to traffic as derived from the Department's studies of the Plan.

OBJECTIVE DESTINATIONS OF PASSENGER CAR TRIPS

LEGEND
 [Hatched Box] SHOPPING AREA
 [Dotted Box] INDUSTRIAL AREA
 [Circle with T] TRUCK TERMINAL
 [Circle with W] WAREHOUSE
 EACH DOT EQUALS 50 TRIPS
 SCALE 0 1/4 1/2 3/4 1 MILE

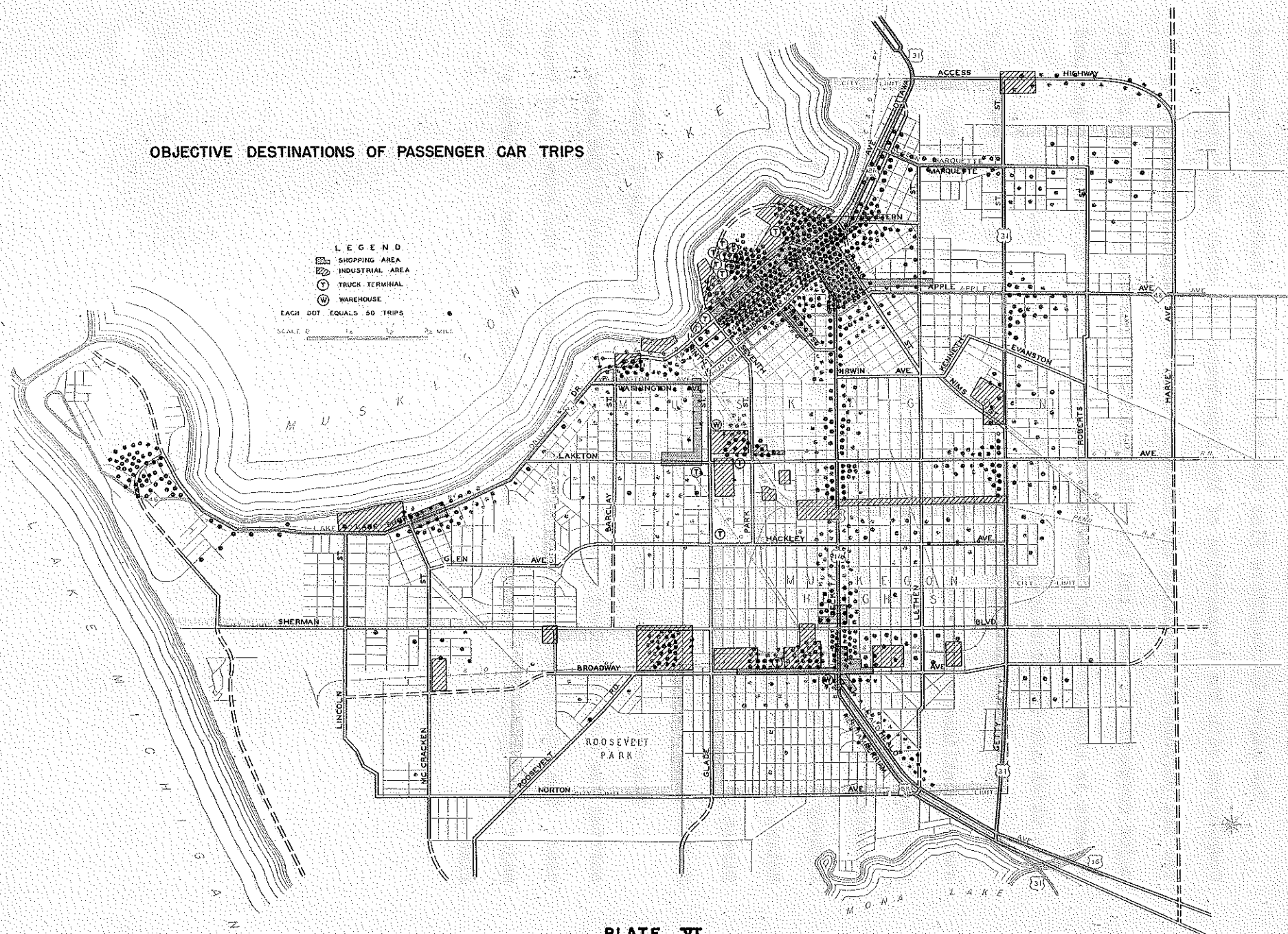


PLATE VI

PLATE VI -- Objective Destinations of Passenger Car Trips

There are certain parts of and places in a city where people get goods, services, or entertainment, or where they go to work or on social errands. They are called the objective destinations of trips. For example the industrial plant where a man works and the store where the housewife buys supplies are objective destinations of their trips; the homes to which they return when work and shopping are done, are not.

Plate VI shows the results of an analysis of passenger car trips for the purpose of determining the most important objective destinations of this travel. It proves that the various districts and places where land is used for purposes of significance to many people are the actual destinations of trips. It proves that the major thoroughfares which were planned to give access to these principal land uses will actually serve the car trips that these land uses attract.

ORIGINS AND DESTINATIONS OF COMMERCIAL VEHICLE TRIPS

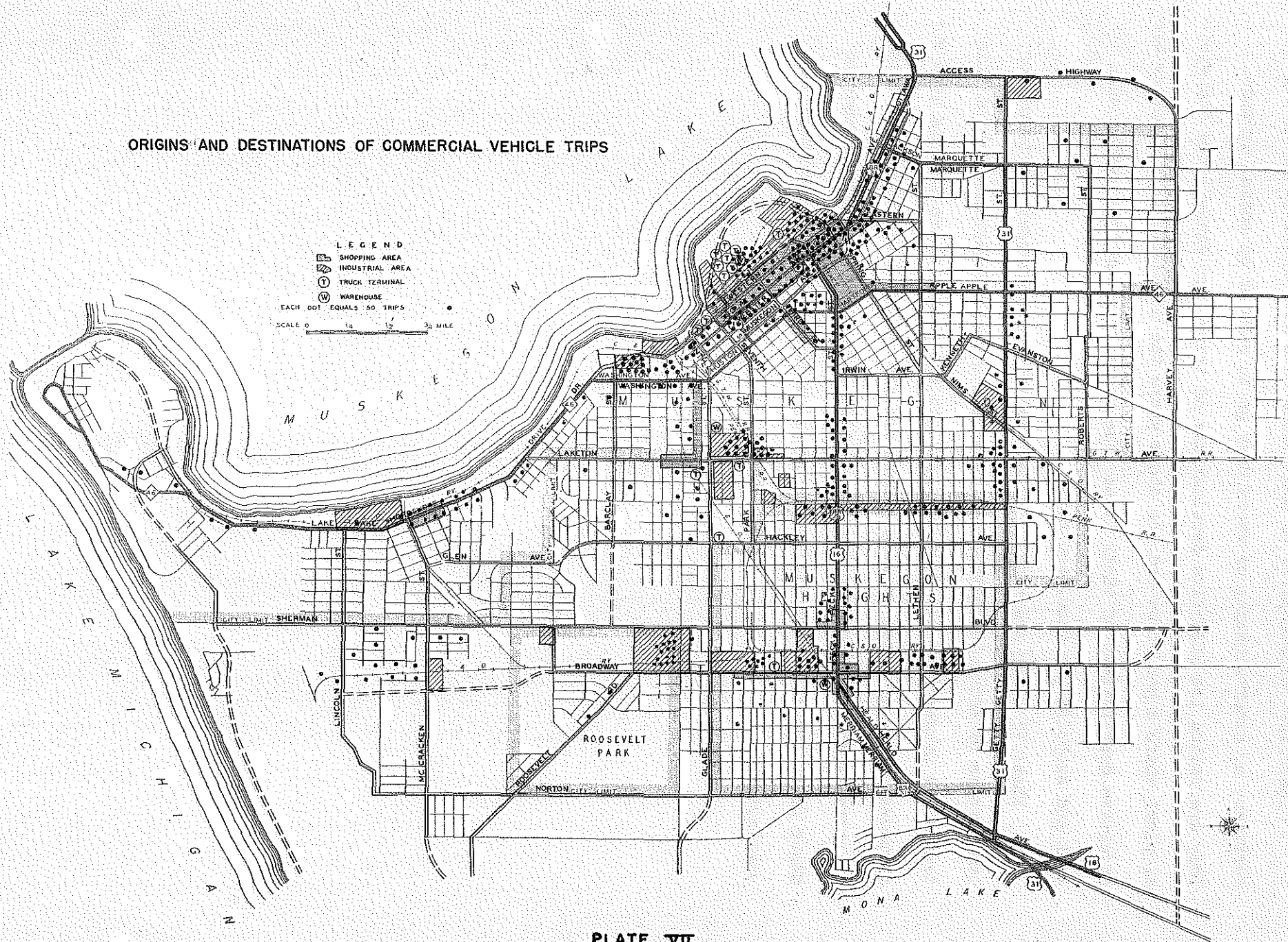


PLATE VII

PLATE VII -- Origins and Destinations of Commercial Vehicle Trips

Like the preceding chart, Plate VII shows the results of a test which was made of the adequacy of the selected major thoroughfares to serve the principal movements of actual traffic. In this case, however, the study is concerned with the travel of commercial vehicles.

Truck traffic, and in particular the travel of heavy tractor-trailer combinations, creates special problems in the operation of a highway transportation street system. The weight, dimensions, and operating characteristics of these vehicles often obstruct the movement of other vehicles or the view of other drivers. Their noise and weight make them objectionable on all residential streets and on most commercial arteries. Their weight and size make special demands on highway design and construction.

This plate indicates that all of the areas containing the most important origins and destinations of this commercial travel would be conveniently inter-connected by the proposed major thoroughfares.

DESIRE PATTERNS OF NORTH-SOUTH TRAFFIC MOVEMENT

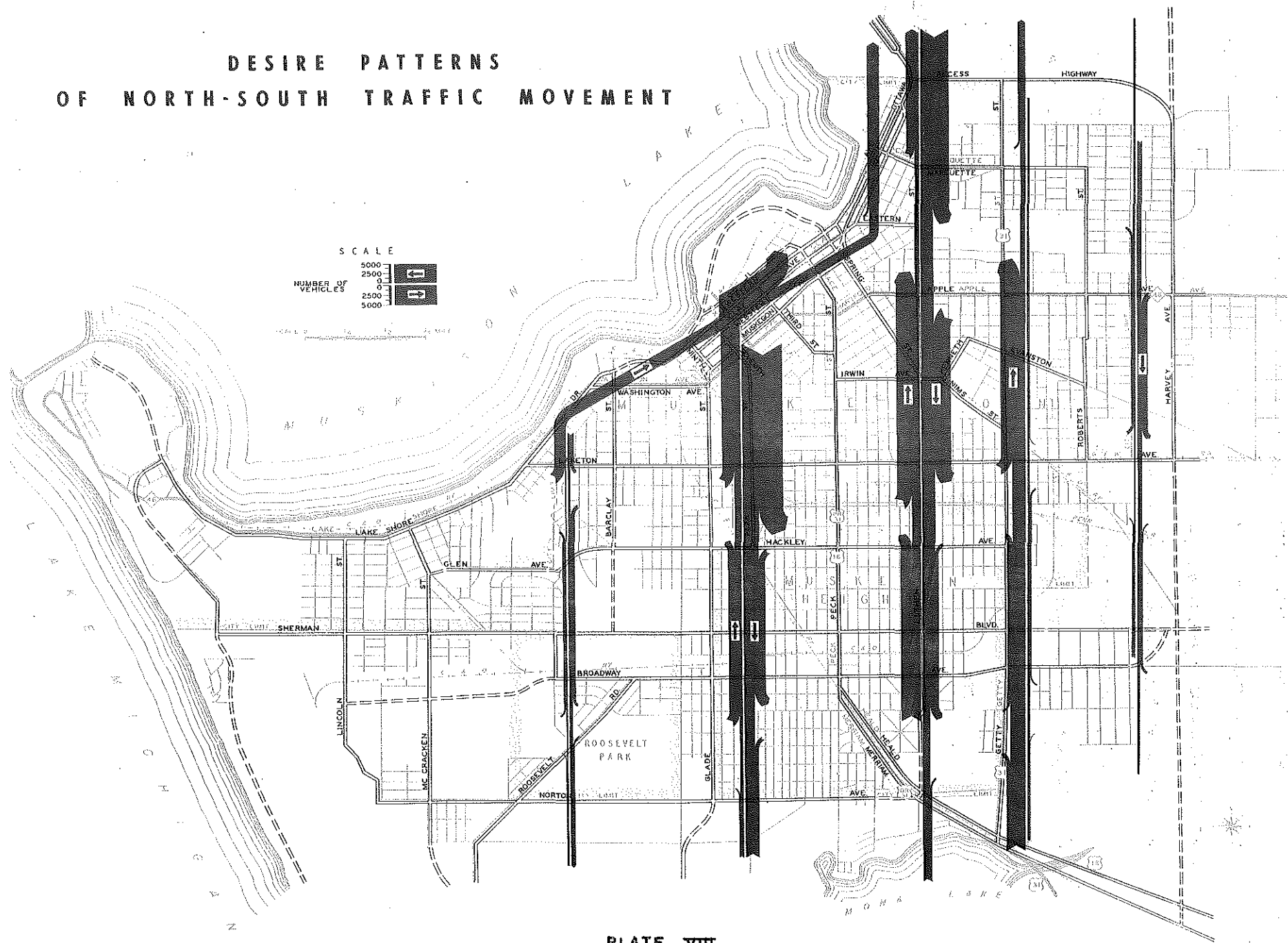
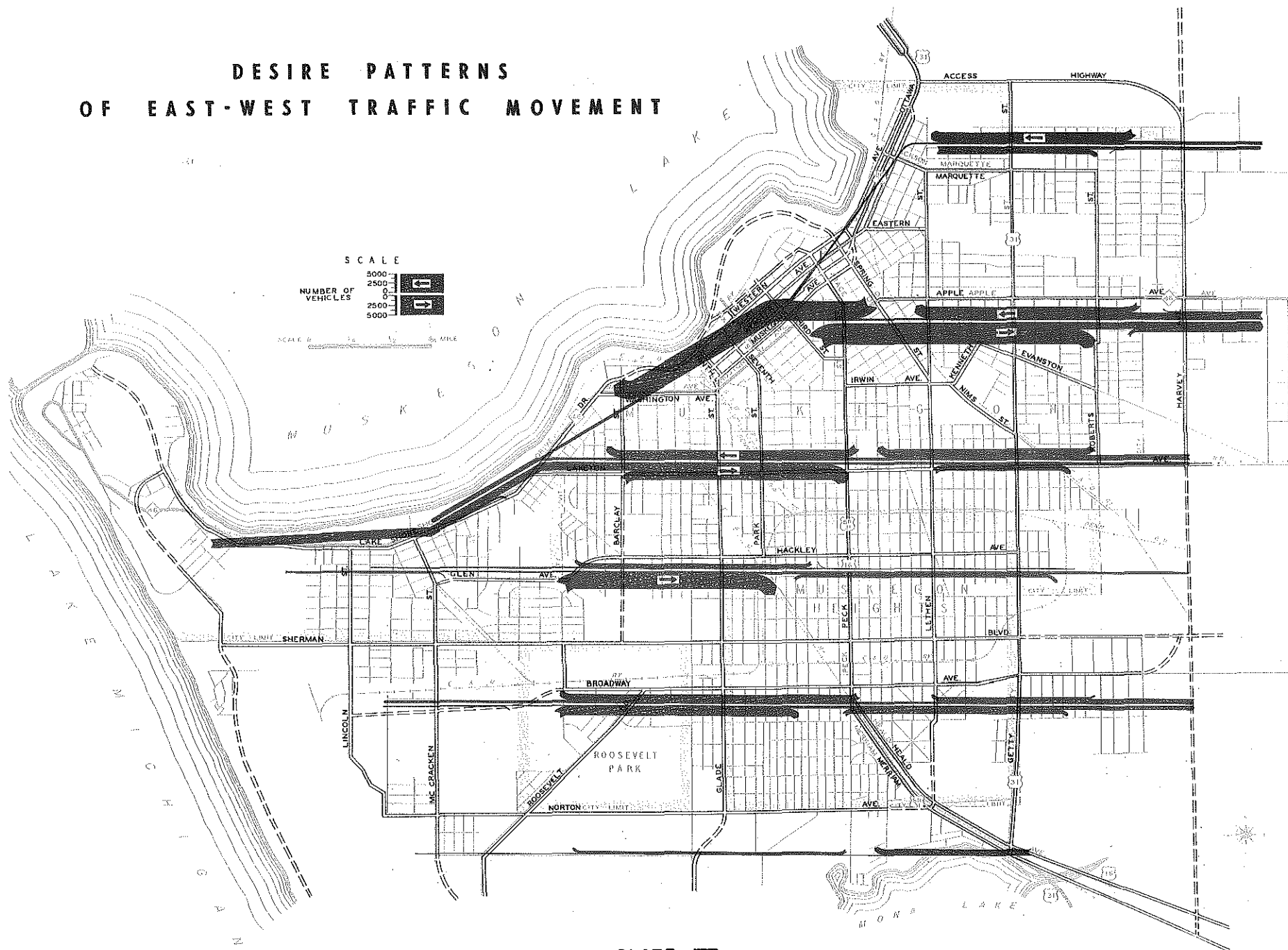


PLATE VIII

DESIRE PATTERNS OF EAST-WEST TRAFFIC MOVEMENT



PLATES VIII AND IX -- Desire Patterns of North-South and East-West Traffic Movements

The two Plates VIII and IX present the final step in the process by which the traffic study data were analyzed to test the effectiveness of the Major Thoroughfare Plan as proposed by the Muskegon City Planning Commission.

In planning streets for efficient and convenient service, it is more important to know where traffic wants to go than to know by what routes it now goes there. In many cases existing streets are inadequate, and in some cases needed streets do not exist.

These two charts show the desire lines of movement for traffic in each of the four cardinal directions. The flow bands are not placed on existing or proposed streets. They were made by establishing directional corridors oriented on the generally rectilinear street pattern, and by then grouping all the desired trips in the appropriate corridors. The resulting diagrams are true desire patterns of all trips by all types of vehicles with the width of the bands indicating the magnitude of the desired movement in each direction on all sections.

These two desire pattern charts reveal the areas of heavy concentration of the traffic movement. When compared with the planned major thoroughfares, they afford convincing proof of the adequacy of the Thoroughfare Plan. They form the principal reasons for the Department's approval of the Plan and for the Department's acceptance of it as a basis for the selection of the trunkline routes in the Muskegon area.

PLATE X -- Trunkline Trips in Muskegon Area Assigned to Major Thoroughfares

Plate X shows the logical usage of the streets of the Major Thoroughfare Plan by trunkline trips to, from, and through the Muskegon area. It represents the assignment to this major urban network of the rural trunkline trips shown on Plate II. It is the first of seven plates on which are presented the steps by which the major thoroughfares most suitable for urban trunkline routes were selected and tested for their service to both trunkline and local arterial traffic.

In general the assignment of trunkline traffic was accomplished by an analysis of the local origins or destinations of the trips entering or leaving the area on each rural trunkline. The end results of this analysis as they apply to passenger cars and commercial vehicles are recorded in Tables 2 and 3, respectively. The trips were then routed to or from these local termini via the most direct and convenient major thoroughfares.

In the case of the central business district, which is the principal objective of trunkline as well as local travel, this basic process was modified by two other factors. In the first place, US-16 must terminate on the dock, just west of the central district, to link up with the essential boat connection to its extension on the west side of Lake Michigan. In the second place, trunklines should not merely dump into the central business district the large proportion of their traffic bound for that area; they should provide a channel for the circulation of this traffic through or along that district.

For these reasons, central business district traffic to or from US-16 and US-31-South was not assigned to Peck Street, which leads directly toward the center of the district, but to the route along Norton and Glade Streets which taps the southwest side of the central district and reaches a convenient connection to the dock.

Plate X (Cont.)

The figures in Tables 2 and 3 show that nearly 27 per cent of trunkline trips originate in or are bound for the central business district, and more than 23 per cent in the seven next highest traffic zones. In other words, out of 32,765 trips entering or leaving the Muskegon area on rural state trunklines, 8,868 trips have a terminus in the central business, industrial, and terminal area, and 7,540 in the seven other high zones.

US-31-North carries nearly half the total trunkline traffic to and from this central district and more than half the traffic to the seven other high traffic zones. The combined route of US-16 and US-31-South carries approximately 30 per cent of the traffic to the central district and to the seven other high zones. M-46 carries less than 20 per cent of the traffic to these areas. The trunkline entrance on the dock makes an insignificant contribution to local traffic because it is principally used for through trips.

The flow bands on Plate X reflect these characteristics of the desired travel of trunkline trips. The heavy movement on US-31-North connects with the central business district on the several major thoroughfares traversing that area. From the south and southeast, the heavy movements on US-16 and US-31-South merge to follow the Norton-Glade route to the same area.

Traffic to and from rural trunkline M-46 inevitably follows Apple Street to connect with intersecting thoroughfares and reach the central business district. It is noteworthy that the present urban extension of M-46 southwest from the central business district shows less trunkline traffic usage than most of the non-trunkline thoroughfares.

It should be noted that, whereas there is a movement of trips through the central business district to and from other local zones, no through trips between rural trunklines were routed in this area. All such through trips naturally were assigned to the by-pass facilities afforded by the route on Harvey Street and the access highway.

TABLE 2

DESTINATIONS OF PASSENGER CARS
ENTERING AREA ON STATE TRUNKLINES
Number and Percentage of Trips Bound to
The Central District or Major Industrial Districts

	US-31 North		US-31-South		US-16		Dock		M-46		Totals	
	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total
<u>Central District</u>												
Zone 21	1,295	9	647	10	413	10	27	9	432	11	2,814	10
" 22	1,372	9	569	9	495	13	4	1	661	16	3,101	11
" 23	1,099	8	340	5	243	6	2	1	424	11	2,108	7
Total to Cent. Dist.	3,766	26	1,556	24	1,151	29	33	11	1,517	38	8,023	28
<u>Major Industrial Dists.</u>												
Zone 25	417	3	153	3	74	2	-	-	67	2	711	2
" 29	558	4	224	4	123	3	1	0	78	2	984	3
" 32	710	5	213	3	128	3	-	-	380	10	1,431	5
" 33	800	6	91	1	64	2	1	0	88	2	1,044	4
" 35	331	2	108	2	49	1	3	1	245	6	736	2
" 40	365	2	203	3	130	3	1	0	56	1	755	3
" 47	381	3	259	4	168	4	-	-	89	2	897	3
Total to 7 Ind. Zones	3,562	25	1,251	30	736	18	6	2	1,003	25	6,558	22
<u>Total to All 10 Zones</u>	7,328	51	2,807	44	1,887	47	39	13	2,520	63	14,581	50
<u>Total Cars Entering Area</u>	14,431		6,323		3,961		299		4,010		29,024	

NOTE: - Zones are those with the highest number of destinations for passenger car trips from the rural state trunklines.

TABLE 3

DESTINATIONS OF TRUCKS
ENTERING AREA ON STATE TRUNKLINES
Number and Percentage of Trips Bound to
The Central District or Major Industrial Districts

	<u>US-31-North</u>		<u>US-31-South</u>		<u>US-16</u>		<u>M-46</u>		<u>Totals</u>	
	<u>No. of</u> <u>Trips</u>	<u>% of</u> <u>Total</u>	<u>No. of</u> <u>Trips</u>	<u>% of</u> <u>Total</u>	<u>No. of</u> <u>Trips</u>	<u>% of</u> <u>Total</u>	<u>No. of</u> <u>Trips</u>	<u>% of</u> <u>Total</u>	<u>No. of</u> <u>Trips</u>	<u>% of</u> <u>Total</u>
<u>Central District</u>										
Zone 21	88	5	65	7	27	4	33	7	213	6
" 22	135	8	74	8	106	15	44	9	359	9
" 23	<u>139</u>	<u>9</u>	<u>46</u>	<u>5</u>	<u>45</u>	<u>7</u>	<u>43</u>	<u>9</u>	<u>273</u>	<u>7</u>
Total to Central District	362	22	185	20	178	26	120	25	845	22
<u>Major Industrial Districts</u>										
Zone 29	45	3	41	5	32	4	19	4	137	4
" 30	48	3	13	1	15	2	18	4	94	2
" 32	66	4	38	4	26	4	66	13	196	5
" 33	126	8	15	2	27	4	28	6	196	5
" 35	39	2	21	2	24	4	35	7	119	3
" 40	57	4	28	3	37	5	10	2	132	4
" 48	<u>39</u>	<u>2</u>	<u>47</u>	<u>5</u>	<u>14</u>	<u>2</u>	<u>8</u>	<u>1</u>	<u>108</u>	<u>3</u>
Total to 7 Industrial Zones	<u>420</u>	<u>26</u>	<u>203</u>	<u>22</u>	<u>175</u>	<u>25</u>	<u>184</u>	<u>37</u>	<u>982</u>	<u>26</u>
<u>Total to All 10 Zones</u>	782	48	388	42	353	51	304	62	1,827	48
<u>Total Trucks Entering Area</u>	1,625		929		694		488		3,741	

Dock: - Five trucks entered area on the dock and all were bound through the area to outside destinations.

NOTE: - Zones are those with the highest number of destinations for truck trips from the rural state trunklines.

STATE TRUNKLINE TRUCK TRIPS IN MUSKEGON AREA ASSIGNED TO MAJOR THOROUGHFARES

JULY WEEKDAY 1946

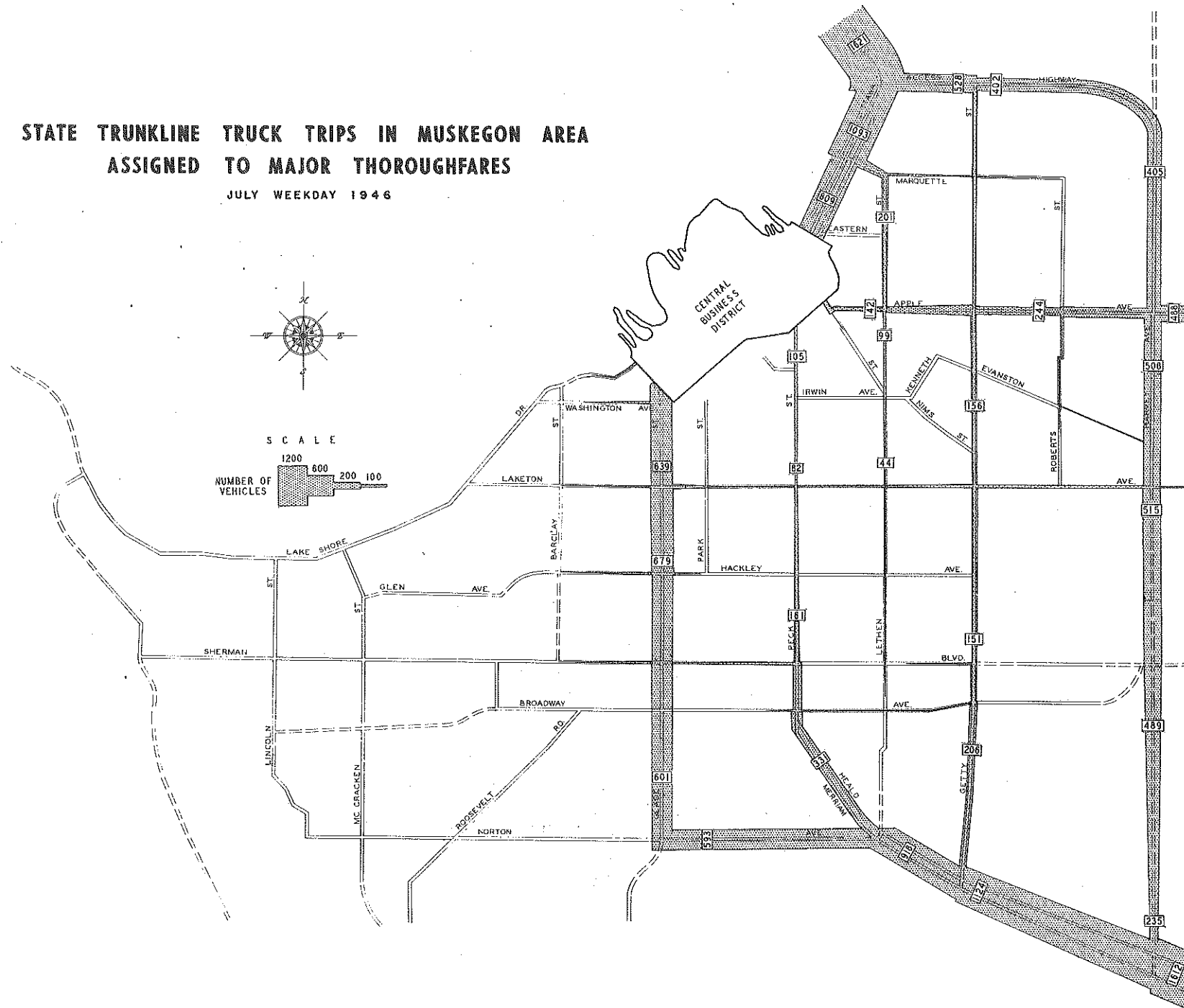


PLATE XI

PLATE XI -- Trunkline Truck Trips in the Muskegon Area Assigned to Major Thoroughfares

The movement of trunkline commercial vehicle trips to, from, and through the Muskegon area was indicated by a solid strip in the flow bands of the preceding chart. On Plate X these same trips are presented in larger scale to show in greater detail their distribution on the major thoroughfares. This is important and necessary because of the marked significance of these vehicles in street traffic operation.

Certain facts of value in determining the urban trunkline routes and in the operation of traffic in the area, are revealed by a comparison of the figures in Table 2 with those in Table 3. These show that while the origins and destinations of trunkline passenger car travel are concentrated principally in the central business district and secondarily in the other seven high traffic zones, the order of interest is reversed in the case of trunkline commercial vehicle trips. The central business, industrial, and terminal district attracts nearly 28 per cent of passenger car trips but a little over 22 per cent of truck trips. On the other hand, the seven next highest traffic zones attract only 22 per cent of passenger car trips but over 26 per cent of truck trips.

These special characteristics of the commercial vehicle movement to and from the rural trunklines are seen in Plate XI. Like Plate X, its traffic bands, show the heaviest movements on US-31-North and on combined US-16 and US-31-South, extending to the central business district. But in this case, a greater proportion of the trips are diverted from these main streams to reach other industrial and commercial districts and zones in other parts of the city area. The lesser volumes of these trips on M-46 are distributed in much the same fashion.

The relatively large number of truck trips assigned to the route on Harvey Street and the access highway is significant. These are either through trips or trips bound to or from industrial plants on the northern and eastern edges of the area. They indicate the amount of traffic relief which would be

Plate XI (Cont.)

obtained by removing this traffic from present routes traversing already congested or unsuitable streets closer to the center of the community.

The slight usage by trunkline traffic of the section of the urban route of M-46 southwest of the central business district, is even more strongly emphasized by this chart than by Plate X. On the other hand, there is a higher proportionate usage of Peck and Getty Streets by truck traffic than by passenger car traffic. This is probably due to the fact that, as existing trunkline streets, they have in past years attracted a considerable amount of commercial and industrial development at or near their roadsides.

PLATES XII AND XIII -- Distribution and Termini of Traffic in the Central District Entering or Leaving on Trunkline Streets; and, Interchange of Trips Passing Through The Central Business District.

The origins and destinations of traffic in the Central District of Muskegon and the movement of trips traversing that district are shown on Plates XII and XIII. Together, these plates present the basic information for selecting routes which will provide convenient and essential access and circulation within that focal area.

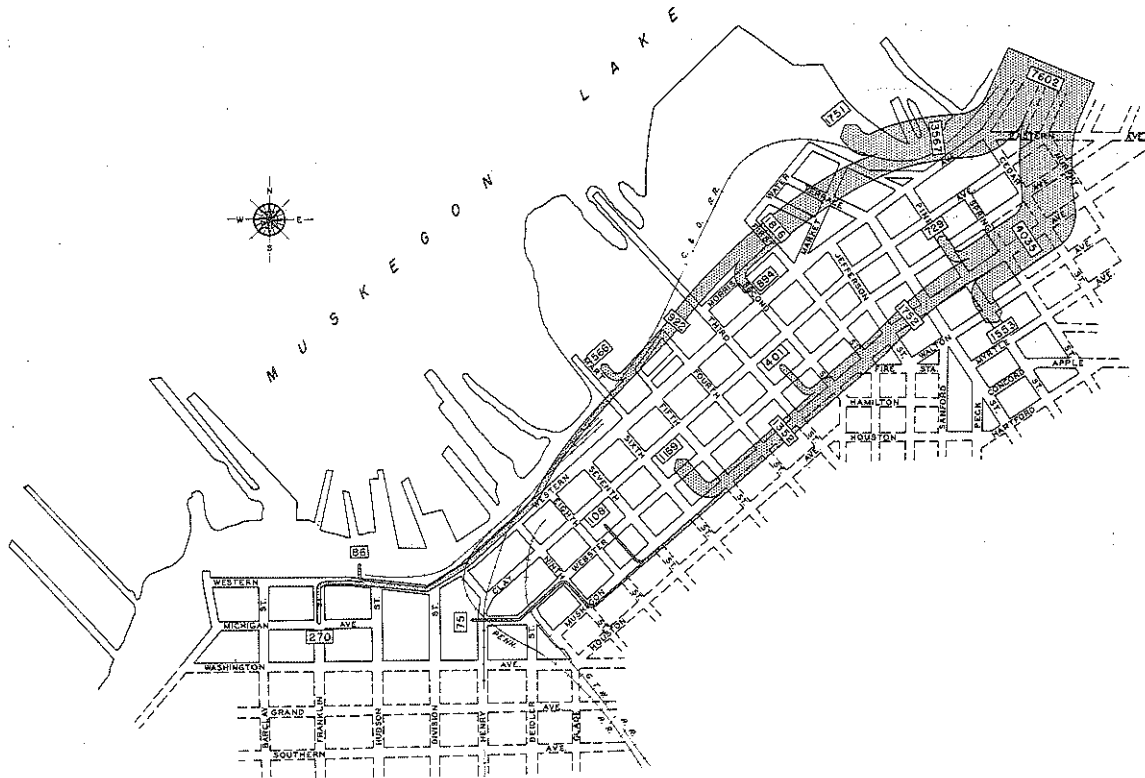
The two traffic flow diagrams on Plate XII show the termini of trips entering or leaving the Central District on US-31BR-North and on US-16--US-31BR-South. The upper traffic flow diagram on Plate XIII gives the same data regarding trips entering or leaving the District via M-46.

It is clearly evident that the great majority of the trips passing through all of these portal arteries, have their termini in the central shopping and business area. These termini are somewhat evenly distributed through the length of the district in the blocks abutting on Western Avenue.

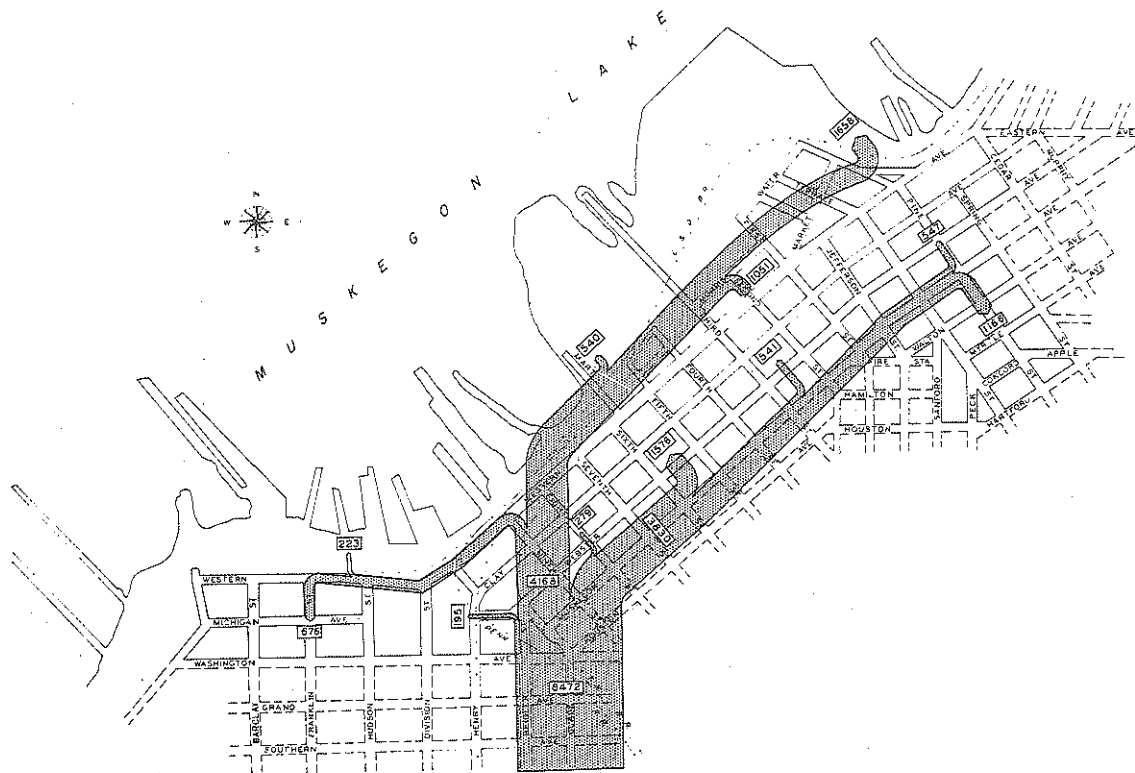
It is to be noted, however, that the greatest single terminus of such trips is the group of industrial plants just north of that area. These plants are the origins or destinations of approximately 20 per cent of the trips on the north and south trunkline arteries and of 30 per cent of those on the eastward trunkline artery.

The lower chart on Plate XIII shows the interchange of trips passing through the Central Business District between the arteries serving that area. The principal interchange movement is along the northeast-southwest axis of the District on the routes of US-31BR and US-16. In addition, Third and Terrace Streets and Michigan Avenue each carries considerable, but nevertheless minor, amounts of traffic which traverse the district without destination in it.

DISTRIBUTION AND TERMINI OF TRAFFIC IN CENTRAL DISTRICT



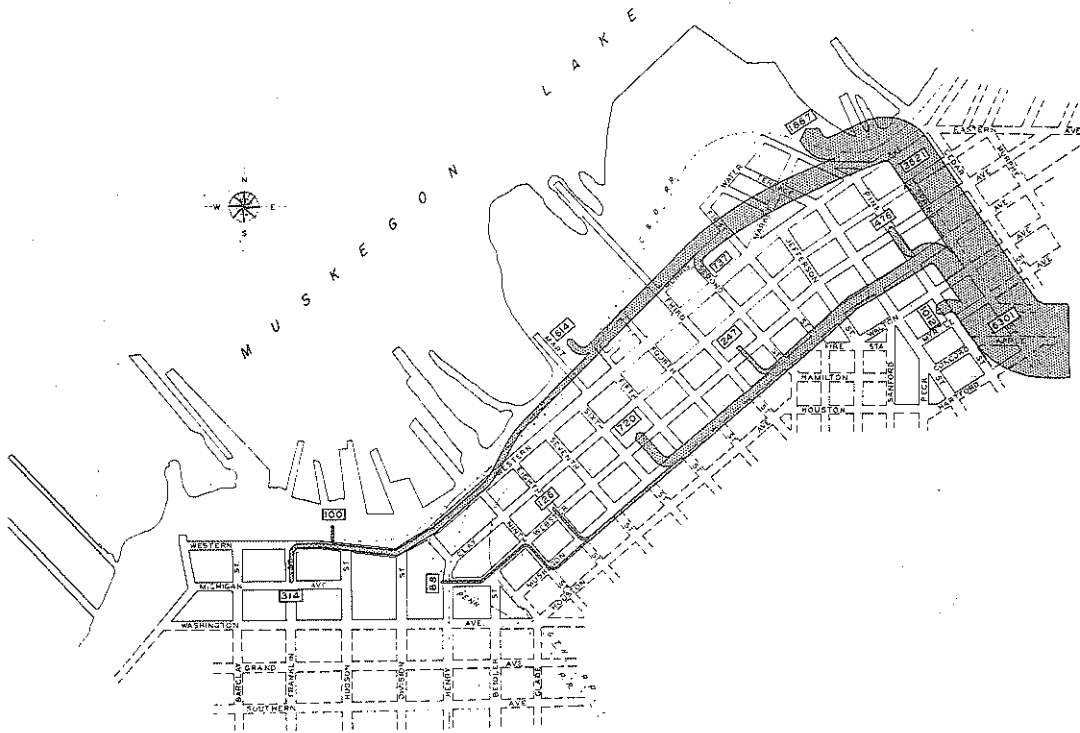
ENTERING AND LEAVING ON U.S. 31 BR - NORTH



ENTERING AND LEAVING ON U.S. 16 & U.S. 31 BR - SOUTH

DISTRIBUTION AND TERMINI OF TRAFFIC IN CENTRAL DISTRICT

ENTERING AND LEAVING ON M-46



INTERCHANGE OF TRIPS PASSING THROUGH THE CENTRAL DISTRICT

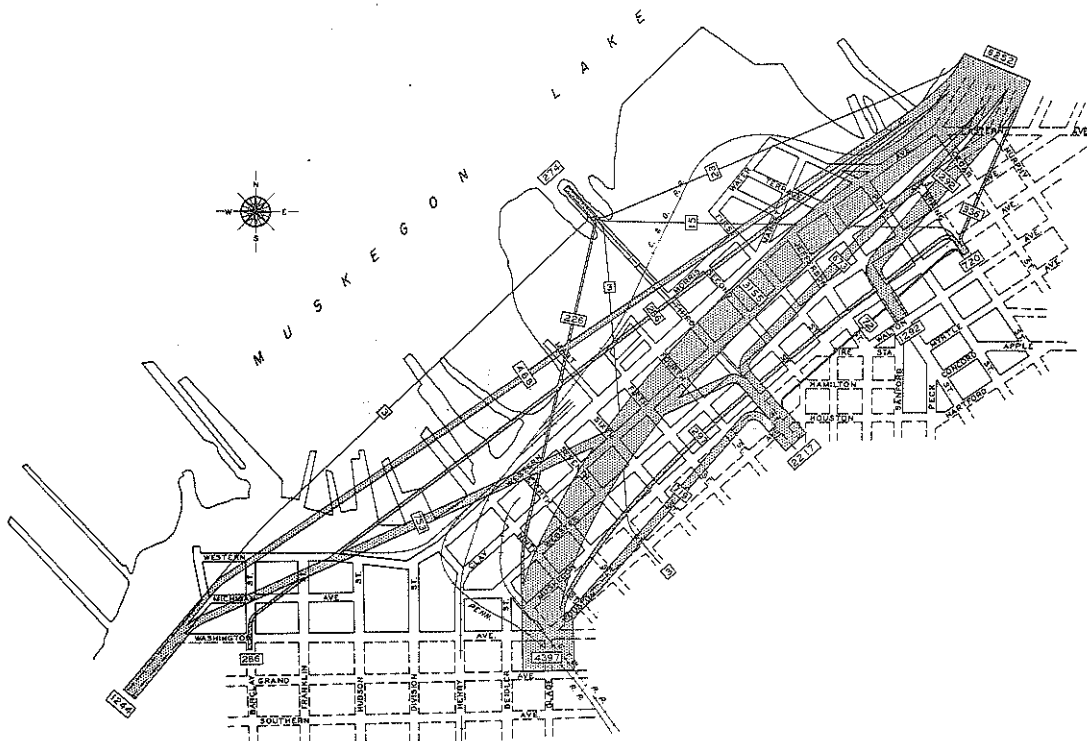


PLATE XIV -- Trunkline Trips to and from Industrial Zones Assigned to Major Thoroughfares

The flow bands on Plate XIV show the actual amount of trunkline traffic generated by the industrial activities of the Muskegon area. They represent the trips of passenger cars and commercial vehicles between the area's industrial zones and the rural trunklines.

The chart shows the location and numbers of the zones set up for the Metropolitan Area Traffic Study which were designated as industrial, and the number of trips entering or leaving each zone by the connecting thoroughfares. It also shows the numbers of each of the two main types of vehicles at various points along these thoroughfares as they bring workers and goods to and from the several plants.

The outstanding feature of this flow map is the preponderant utility of Norton and Glade Streets to this traffic from the south and southeast, and the use by traffic from the north of the major thoroughfare entering the central district from the northeast. There is also a considerable volume of such trips on Apple Street as it carries passenger vehicles between the central industrial district and suburban settlements along M-46 east of the city area. The chart also makes clear the value of the Harvey Street access-highway route in serving the large northeastern industrial zone.

The heavy movement of commercial traffic from US-16 and US-31-South, reflects the important interchange of parts and products between Muskegon's industry and plants in Grand Rapids and the automobile industry of southeastern Michigan.

PLATE XV -- Trips Between Industrial Zones Assigned to Major Thoroughfares

One of the most important traffic movements on the streets of the Muskegon area is that between the various industrial plants. The area's industrial operations are closely integrated as between the different local plant units as well as with the industry of the rest of southern Michigan.

This inter-plant traffic is basic to the functioning of the area's economy and, because of the large component of heavy trucks comprised in it, it is an important factor in planning state trunkline routes. If streets are not patterned and designed with this usage in mind, not only will the vital industrial movement be handicapped, but it will interfere with the flow of other traffic on trunkline streets. If, however, this movement is foreseen and provided for on the trunkline arterials, the operations of both industry and traffic in the area will be greatly improved.

The flow bands on Plate XV show the volume of passenger car and commercial traffic on major thoroughfares produced by trips between the various industrial districts. The large numbers of these trips, particularly those of trucks, on Glade, Lethen and Getty Streets, Sherman Boulevard, and the arterials entering the central business district are of special interest. They indicate on what streets plans must be made to accommodate these movements whether those streets are for trunkline or purely local arterial service.

PLATES XVI AND XVII -- Selection of State Trunkline Routes in the Muskegon Area; and Total Traffic Usage of Routes.

A complete system of urban state trunkline routes has been selected on the basis of the assignments of trunkline and of inter-plant industrial traffic shown on the preceding six plates. In each instance the selection was made to provide an urban route connecting the major interior areas of origins and destinations with the existing state trunkline, except in the case of US-31-South where connection is made with the projected relocation of this rural trunkline.

The selected state trunkline routes within the city and their connections with the rural state trunkline routes are shown on Plate XVI and are described as follows:

US-16

From a connection with US-16 at the intersection of that trunkline with the south extension of Harvey Street, -- northwesterly to a line parallel with Norton Avenue, then west to a line parallel with Glade Street, and then north to the central business district in the vicinity of Webster and Muskegon Avenues at 9th Street; then northwest paralleling 9th Street to the Lake front; then northeast along the lake front to the dock where connection is made with trans-lake ferry.

US-31 BUSINESS ROUTE

From a connection with the projected relocated route of US-31-South at the intersection of that route with US-16, -- northwesterly to a line parallel with Norton Avenue, then west to a line parallel with Glade Street, and then north to the central business district in the vicinity of Webster and Muskegon Avenues then parallel to Webster and Muskegon Avenues northeasterly to the vicinity of Erickson and Octavius Streets, then parallel to Erickson and Octavius to Wood Street, then parallel to Wood Street to a connection with US-31-North.

US-31

From a connection with the projected relocated route of rural US-31-South at the intersection of that route with US-16 and the south extension of Harvey Street, -- north to the north city limits of Muskegon, and then west to the present junction with US-31.

M-46

From a connection with M-46 at the east city limits of Muskegon, -- west on a line parallel to Apple Street to the central business district in the vicinity of Pine and Spring Streets, then parallel to Pine and Spring Streets to the vicinity of Webster and Muskegon Avenues where connection is made with US-31 Business Route. Route markers for M-46 should follow US-31 Business Route southwesterly to the connection with US-16 with direction signs to the dock.

It will be noted that the existing extension of trunkline M-46 southwesterly and west from the central business district, is omitted from this selection. This extension is essentially a local arterial thoroughfare connecting with a municipal park. Its usage by state trunkline traffic is insignificant and it should be vacated as a state trunkline route.

The basic factors and evidence on which the selection of these routes was made can be summarized as follows:

1. The selected system of urban trunkline routes is oriented and patterned to accommodate the state trunkline traffic flow shown in Plate II;
2. The Major Thoroughfare Plan, presented on Plate V, meets the requirements of the principal movements of traffic within the area, as shown in Plates VI, VII, VIII and IX;
3. Trunkline trips by passenger and commercial vehicles entering, leaving, and passing through the Muskegon area would make preponderant use of the selected routes, as shown by Plates IV, X, XI, XII, XIII, and XIV; and
4. It was shown by Plate XV that the highly important local movement of industrial traffic between plants would be served in considerable part by the selected routes. In the following and final plate, Plate XVII, it is shown that the selected routes form the basic framework of the major thoroughfare system in their service not only to trunkline traffic but to the principal streams of local traffic.

On Plate XVII all trips recorded in the Metropolitan Area Traffic Study of July 1946 are assigned to the major thoroughfare system including those arteries selected as state trunkline routes. The plate shows the high degree of service that will be rendered by the selected routes to all kinds of traffic, both state trunkline and local.

The plate shows that these selected trunkline routes would be by far the most heavily traveled thoroughfares for traffic bound into, out of, and through Muskegon and Muskegon Heights; that they would be the most heavily traveled routes to and between the industrial plants of these cities; and that they would be the routes most heavily traveled by general local traffic. They would constitute the basic network carrying the bulk of the area's whole volume of vehicular travel.

SELECTED STATE TRUNKLINE ROUTES IN MUSKEGON AREA

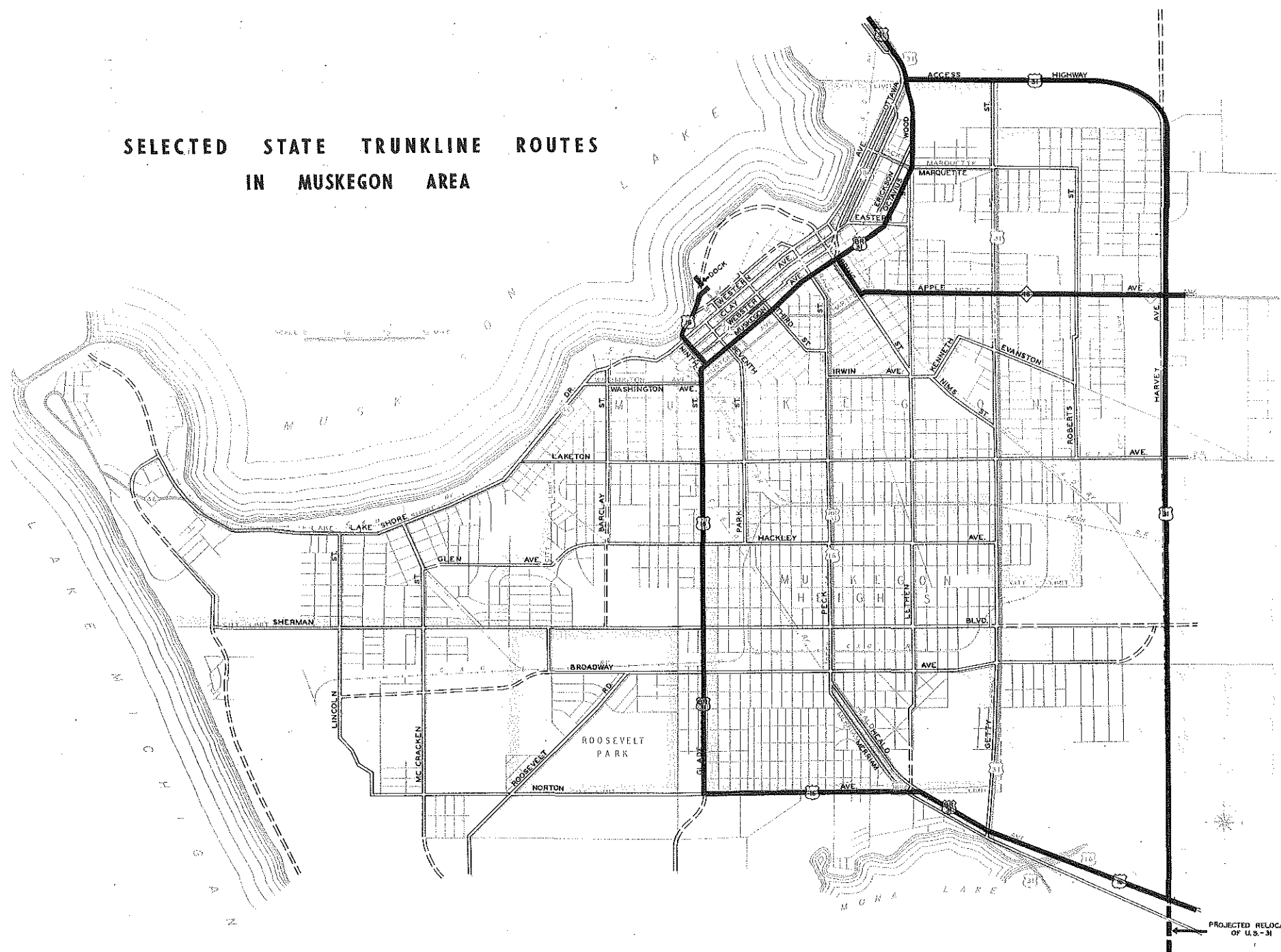


PLATE XVI

PROJECTED RELOCATION
OF U.S. 31

Plates XVI and XVII (Cont.)

The heavy traffic bands on the three principal north-south thoroughfares through the middle zones of the area, indicate the predominant importance of this movement. But of these three streets, only Peck Street actually exists as a through artery. As of today, Peck Street and two or three inadequate minor streets carry the large traffic volumes assigned on Plate XVII to Glade, Peck, and Lethen Streets.

It is therefore apparent that the improvement of the proposed Norton-Glade Route which is vital to the efficient accommodation of traffic on the area's two principal state trunklines and of traffic in the heaviest local movement, is of the highest importance and priority.

In final summary, these selected routes satisfy all the accepted requirements for urban state trunkline routes:

1. They connect the rural state trunklines with the central business district;
2. They serve most of the major industrial areas;
3. They interconnect within the city area;
4. They avoid the handicaps and hazards of roadside commercial developments now existing on present routes; and,
5. They are reasonably direct.

It should be pointed out that requirement "Four" above could be satisfied only by relocating the two principal urban state trunkline routes. It must be emphasized that the advantage gained by this relocation can be retained only if the routes now selected are protected from future detrimental usage or development. This protection should be provided by the design of the roadway facilities or by control of the land abutting on the right-of-way either through land-use zoning or through purchases of land development control rights, provided legislation is enacted to make such action possible.

The selection of this system of state trunkline urban routes in the Muskegon-Muskegon Heights area enables the State Highway Department and the

Plates XVI and XVII (Cont.)

two cities to proceed with plans and construction on the selected streets with the assurance that their improvement will furnish service where it is most needed and where it will be most used by both trunkline and local traffic. Developed and operated as contemplated by the Department and the cities, this system will effectively meet the needs of the major traffic movements in the area.