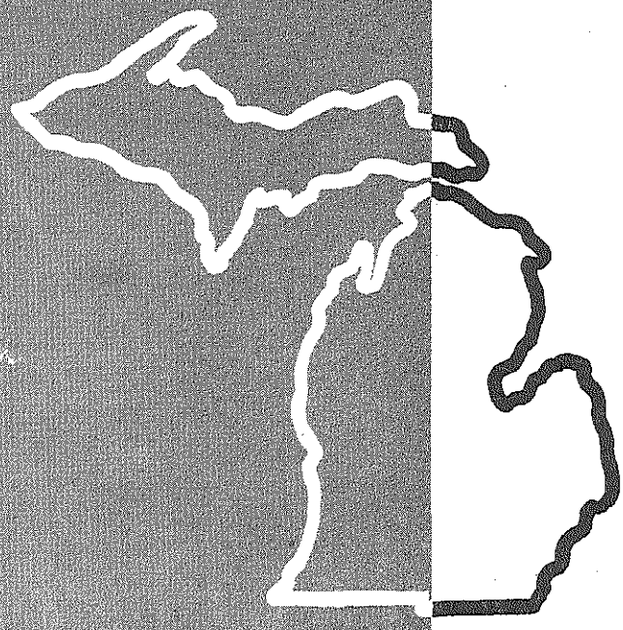
# THE BAY CITY METROPOLITAN AREA TRAFFIC STUDY



MICHIGAN STATE HIGHWAY DEPARTMENT

CHARLES M. ZIEGLER, STATE HIGHWAY COMMISSIONER

65-3323

MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

# THE BAY CITY METROPOLITAN AREA TRAFFIC STUDY

## STATE TRUNKLINE
and
## ARTERIAL STREET SYSTEMS

Cooperating Agencies;

The City of Bay City

U. S. Department of Commerce
Bureau of Public Roads

Prepared by the
Planning and Traffic Division
July, 1952

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# THE STATE TRUNKLINE SYSTEM IN BAY CITY

A system of state trunkline routes has been selected in Bay City. This revision of the existing trunkline system has been made to improve service for trunkline traffic and to cooperate with the City in remedying very serious local traffic conditions which now handicap business and cause inconvenience in the area. The purpose of this report is to describe the selected system and to explain how and why the selection was made.

## The Traffic Problem

Difficulties arising from the movement of trunkline and local traffic in the Bay City area have had the attention of the State Highway Department and the City for a number of years. Broadly, the problem involves the whole Bay City-Saginaw-Midland area. Specifically, it is related to traffic congestion and confusion in the central areas of Bay City.

When wartime restrictions were lifted in 1945, the upsurge of travel caused conditions in Bay City which called for immediate action. At the request of the City, the Department conducted a quick but thorough survey of the situation and on the basis of the findings, made several recommendations for improving traffic movement. These included the establishment of one-way operation and no-parking restrictions on certain downtown streets, and the rerouting of some trunkline traffic.

The City adopted these recommendations and they were put into operation in 1946. It is generally agreed that the results have been good, but they probably represent the best that is to be hoped for in the operation of existing street and bridge facilities. However, traffic increased by about 30 percent between 1945 and 1948 and is still growing, and it is apparent that traffic control measures by themselves are inadequate to cope with either the present or the expected load.

## 1948 Metropolitan Area Traffic Study

As a basis for planning more fundamental, long-range improvements, the Department in 1948 conducted a metropolitan area traffic study in cooperation with the Bureau of Public Roads and the cities of Bay City and Saginaw. The study project was originally set up to observe and analyze traffic in the Bay City-Saginaw area as a single unit on the theory that the relationship between certain traffic problems in the two cities was so close as to require joint treatment. Later, however, it was decided to separate the data and to deal with each city individually.

Data for the study were gathered by two methods. The first or internal phase was conducted by interviewing a 12.5 percent sample of the dwelling units and learning the local travel habits and desires. The second or external phase of the study consisted of questioning drivers at stations on all important highways radiating from the city regarding the origins, destinations and purposes of their trips.

When tabulated and analyzed, these data revealed not only the patterns of traffic as it uses existing streets, but the changes in the system that would be required to satisfy traffic needs and desires. These results were studied by the planning and traffic engineers of the City and the Department and were used in the selection of the arterial street system and the urban state trunkline system.

## Methods of Study

The routes comprising the urban trunkline system in Bay City were selected from those included in the City's arterial street system. This procedure, which is followed in all cities, is adopted in order that development of the selected streets shall provide improved service to both trunkline and local traffic and assure maximum benefits both to the state and to the community.

In the study leading to the selection of these routes, the data compiled by the metropolitan area traffic study were used in relation to basic, accepted principles of highway planning. Numerous analyses of traffic were made of which the most significant are presented in this report in a series of charts with appropriate explanations. They all are aimed toward the determination of three fundamental facts:

1. The amount and characteristics of trunkline and local traffic in the Bay City area;
2. The adequacy of the City's arterial system to serve the traffic traversing Bay City Streets; and,
3. Those arterial streets which will serve the trunkline traffic entering, leaving, and passing through the Bay City area with the greatest convenience to both trunkline and general city traffic.

## Principles of Urban Trunkline Selection

The selection of the urban trunkline system not only was based on the traffic patterns and needs revealed by these analyses of the traffic study data, but it conforms with certain general principles of urban trunkline planning established as the result of many studies of metropolitan traffic in this and other cities.

In brief, these principles are as follows:

1. The urban state trunkline routes should connect the rural state trunklines with the central business district;
2. They should serve the principal industrial areas of the city;
3. They should interconnect within the city;
4. They should avoid as far as possible existing handicaps and hazards of commercial roadside development and guard against such development in the future;
5. They should be reasonably direct and free of numerous turns in their approach to the principal areas of objective destination.

In practically all cases, urban state trunkline routes have a secondary function; i.e., to serve the major movements of local traffic to the fullest extent consistent with their primary purpose. There is a definite similarity in the location of the objective destinations of traffic entering on the state trunklines and of the local traffic using the most important city arteries. Therefore, the dual purpose of an urban state trunkline system will best be attained by selecting its component routes from the streets included in a properly planned major arterial street system.

## TERMINOLOGY AND DEFINITIONS

| | |
|---|---|
| Central Business District: | The zones comprising the concentrated commercial and retail business center of the city. |
| Cordon Trip: | A trip with one terminal outside the Study Area and one terminal inside the Study Area. |
| Destination: | The place where a trip ends. |
| Downtown Area: | The zones comprising the Central Business District and its commercial-residential fringe. |
| External: | Outside the Study Area. |
| External Cordon: | The line connecting the External Stations and outlining the Study Area. |
| External Station: | A point on a highway at the limits of the Study Area at which the drivers of vehicles were interviewed. |
| External Trip: | A trip with one or both of its terminals outside the Study Area. |
| Internal: | Within the Study Area. |
| Internal (Local) Trip: | A trip with both terminals inside the Study Area. |
| Origin: | The place where a trip begins. |
| Origin-Destination Zone; O-D Zone; Zone: | A basic subdivision of the Study Area having a single or a dominant land use, designated for purposes of tabulation and analysis. |
| Study Area: | The entire area in which travel data were obtained by home interview. |
| Thru Trip: | A trip passing through the Study Area with both terminals outside the Study Area. |
| Trip: | One-way travel between an origin and a destination. |
| Trip Terminal: | The point where a trip begins or ends. |

## SUMMARY OF FACTS

* 29766 vehicles were counted at the External Cordon Stations.

* Of the 29766 vehicles entering and leaving the area on an average weekday, 5398 made thru trips and were counted at the external station of entrance and the external station of exit.

* 69.8 percent of the total trips across the cordon line were interviewed.

* 82.1 percent of the cordon traffic was passenger cars.

* 14.6 percent of the cordon traffic was trucks.

* 3.3 percent of the cordon traffic was trailer-combinations.

* 92.3 percent of the traffic entering and leaving the area was carried on the state trunklines.

* Of the 29766 vehicles entering or leaving the area, 3524 or 11.8 percent had either origin or destination in the Central Business District, Zone 144.

* 30272 trips, which was 26.9 percent of the internal total, had either their origin or destination in the Central Business District.

* 14471 trips, 12.9 percent of the internal total, had either origin or destination in the eight principal industrial zones.

* 1932 trips, 6.5 percent of the external total, had either origin or destination in the eight principal industrial zones.

* Of the total of 137,018 vehicle trips into, out of, through, and within the area, 9587, 7.0 percent were inbound, 9676, 7.1 percent were outbound, 5398, 3.9 percent went through, and 112,357, 82.0 percent were within the study area.

* 838 trailer-combinations crossed the cordon line on the average twenty-four hour day. 627 had either origin or destination in the study area and 211 went through the area.

* 117 trailer-combinations crossing the cordon line had either origin or destination in the eight principal industrial zones.

* 152 trailer-combinations crossing the cordon line had either origin or destination in the tank farm shipping area in zone 107.

## RECOMMENDATIONS

* Adopt a revised trunkline system for the area with formal approval by the Bay City Planning Commission, the City Commission and the Michigan State Highway Department.

* Construct a bridge across the Saginaw River with approach connections on Jenny-Thomas and McKinley-Seventh Streets.

* Establish one-way street operation on McKinley and Seventh Streets from the bridge east to Monroe Avenue and on Jenny and Thomas Streets from the bridge west to Euclid Avenue.

* Establish one-way street operation on Monroe and Michigan Avenues from Third Street south to US-23 BR south of the city.

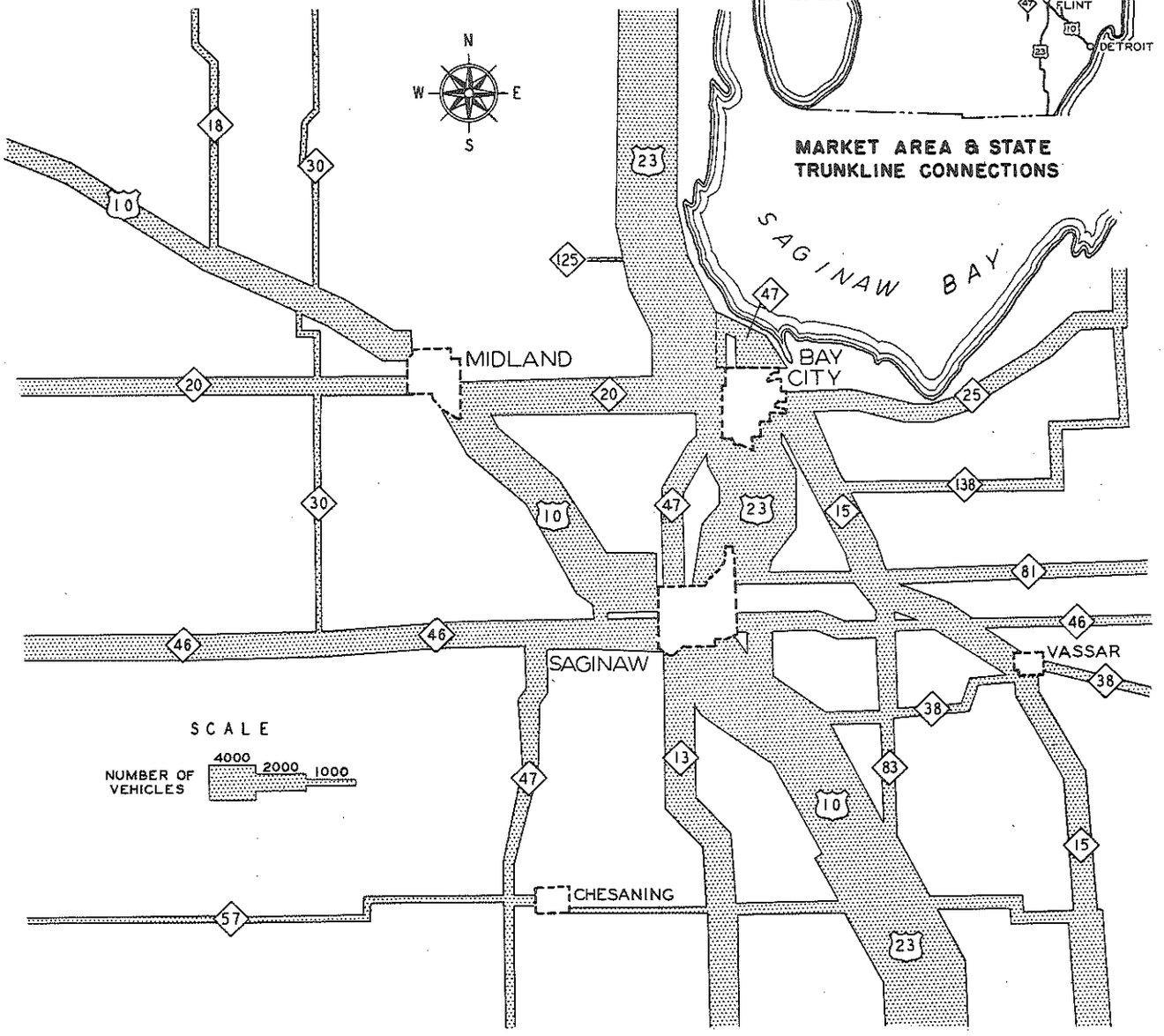
* Complete the relocation of US-23.

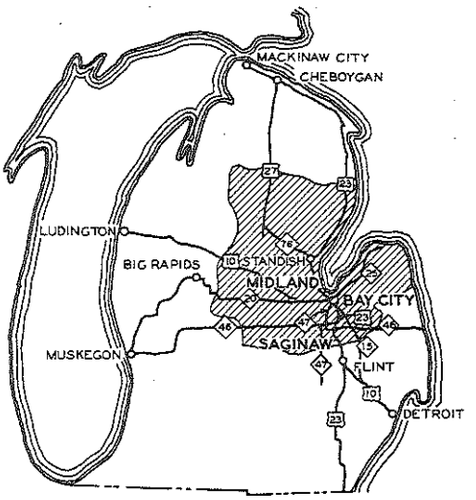
* Establish one-way street operation on Jenny and Thomas Streets extended, from Euclid Avenue to relocated US-23 west of the city.

* Relocate M-20 one-half mile south of its present location to connect with Jenny and Thomas Streets at their connection with relocated US-23.

* Reroute US-10 to coincide with M-20 from its junction with relocated US-23 west to Midland.

# STATE TRUNKLINE TRAFFIC IN TRI-CITY AREA




MARKET AREA & STATE TRUNKLINE CONNECTIONS

PLATE I

## BAY CITY, ITS MARKET AREA, AND ITS TRUNKLINE SERVICE

Bay City is located on both sides of the Saginaw River about ten miles north of Saginaw and eight miles south of Saginaw Bay. It was first settled in 1831 and when the lumbering industry got under way, it soon became an important sawmill center. After a short period of stagnation which accompanied the decline of this industry, Bay City built a new era of prosperity by expanding and diversifying its manufacturing and mercantile activities.

The present population of Bay City is approximately 53,000 persons. There are numerous industrial plants, the principal ones manufacturing automotive parts, heavy lifting machinery, prefabricated housing, knitted wear, and boats. Some 10,800 persons are employed in these factories.

The city is an active and prosperous center for retail trade. It also does a large wholesale business and is an important storage and distributing point for the petroleum industry of east central Michigan. In the area around Bay City, the principal farm crop is sugar beets and there is a large beet sugar processing plant located in the city.

The Market Area of Bay City is shown on the insert map of Plate I. The Thumb section to the east is one of the richest farming areas in the state. To the west, rich farm land and the chemical and oil industries centering in Midland, Mt. Pleasant, Alma and St. Louis, are the bases for a prosperous economy. Northward, agriculture is somewhat spotty, the major products being dairy items and livestock, but in that section abundant year round recreational resources have created an important and growing resort industry.

These sections form a very large market area comprising fourteen or fifteen counties which extends north from the Port Huron, Flint, and Lansing trade areas to include Alma to the west, Grayling and Oscoda to the north, and the larger part of the Thumb region.

Bay City and Saginaw are the two outstanding trade centers for this extensive market area and their influence is more or less combined throughout most of it. There are certain sections, however, whose trade naturally gravitates to one or the other of these major centers. Bay City's retail, wholesale, and service establishments enjoy most of the trade from sections which lie north of the city and along both shores of Saginaw Bay.

Midland, 20 miles west, the home of the Dow Chemical Company has considerable importance as a secondary trade center. Bay City, Saginaw and Midland form a tri-city group with many allied interests, and they have cooperated in the solution of several area transportation and water supply problems.

Five state trunklines enter Bay City, and these, with their connections, link it efficiently not only with the principal points in its market area, but with all parts of Michigan and with the states adjoining to the south.

US-23 is the city's major trunkline. It extends north from Toledo through Ann Arbor and Flint to Saginaw and Bay City. From Flint to Saginaw it merges with US-10 the chief trunkline route from Detroit to the northwest, and between Saginaw and Bay City it is the heaviest traveled connecting highway.

Northward, US-23 follows the shores of Saginaw Bay and Lake Huron to its terminus on the Michigan State Ferries dock at Mackinaw City. At Standish, it connects with a system of state highways radiating to all northwestern parts of the lower peninsula.

As the route from populous southern areas to scores of Lake Huron and inland towns and resort points, and as a famous scenic highway, US-23 carries heavy traffic particularly during the summer and hunting seasons.

M-15 reaches southeasterly through Vassar to its terminus on US-10 a little north of Pontiac. Its primary function and usage is as an alternate route for traffic from the Detroit area to northeastern Michigan. As such it carries much through traffic going north of Bay City on US-23.

M-20 links Bay City with Midland, Mt. Pleasant, and points farther west. At Midland it crosses US-10 which, with connecting highways, leads to Clare, Ludington, Cadillac, Manistee and Traverse City.

M-25 leads east and northeasterly along the Saginaw Bay shore of the Thumb to connect with most of the towns in Bay City's market area in that region.

M-47 runs southwesterly from Bay City across the western edge of Saginaw and through Owosso to a connection with M-78 where traffic is distributed to Lansing, southwestern Michigan and Chicago.

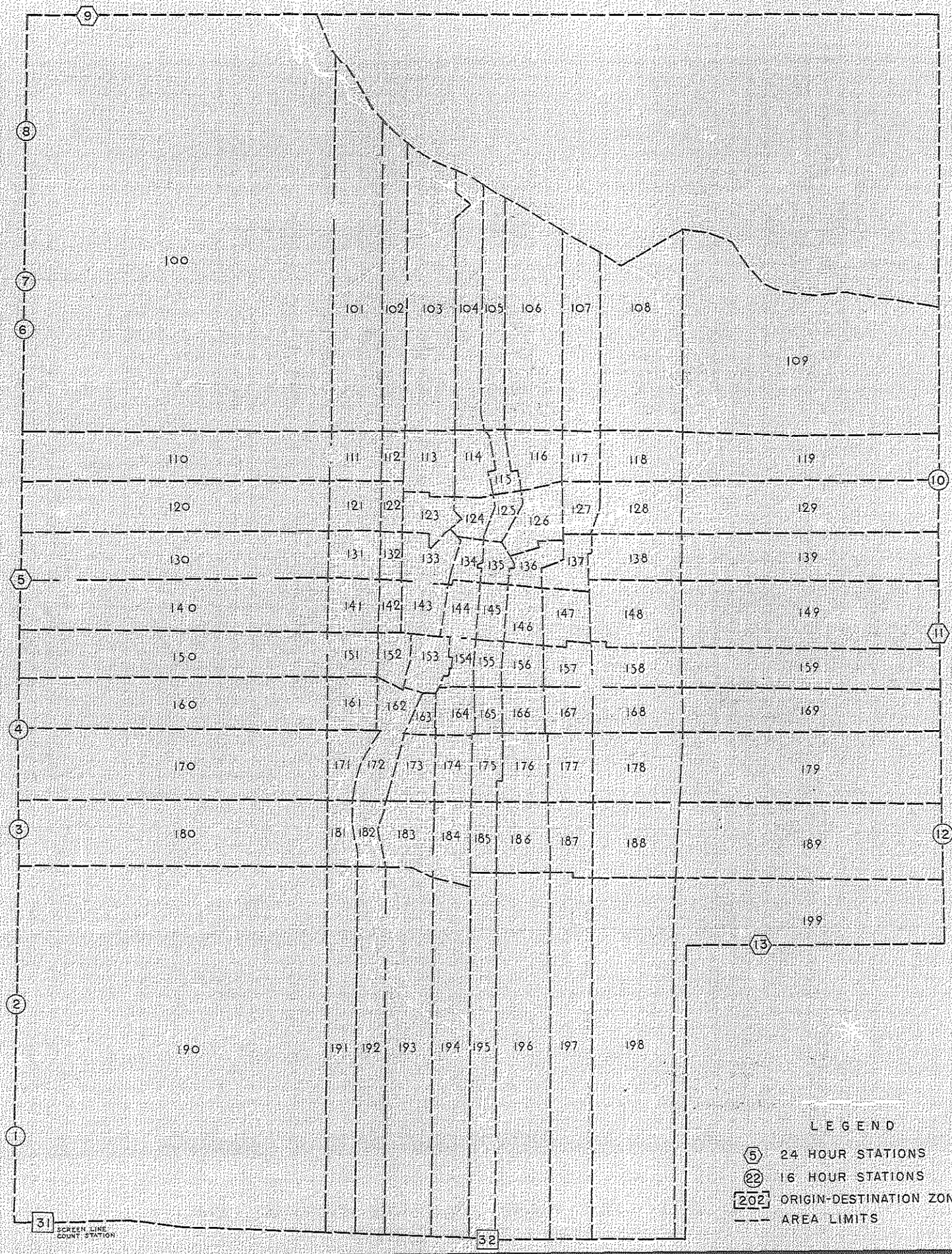
Rural state trunkline traffic in the Bay-Saginaw-Midland County area is shown on Plate I.

A feature of considerable significance is the large exchange of traffic between the three principal cities of the area. Planning and operation of state trunklines in the Saginaw Valley is complicated by this triangle of important centers in an area through which the heavy traffic from the southeastern sections must pass to reach northern and northeastern destinations. Competing with this through traffic on main highways and streets are three very considerable movements -- the travel generated within the cities, the heavy traffic between them, and the many trips made to them from all parts of their market area.

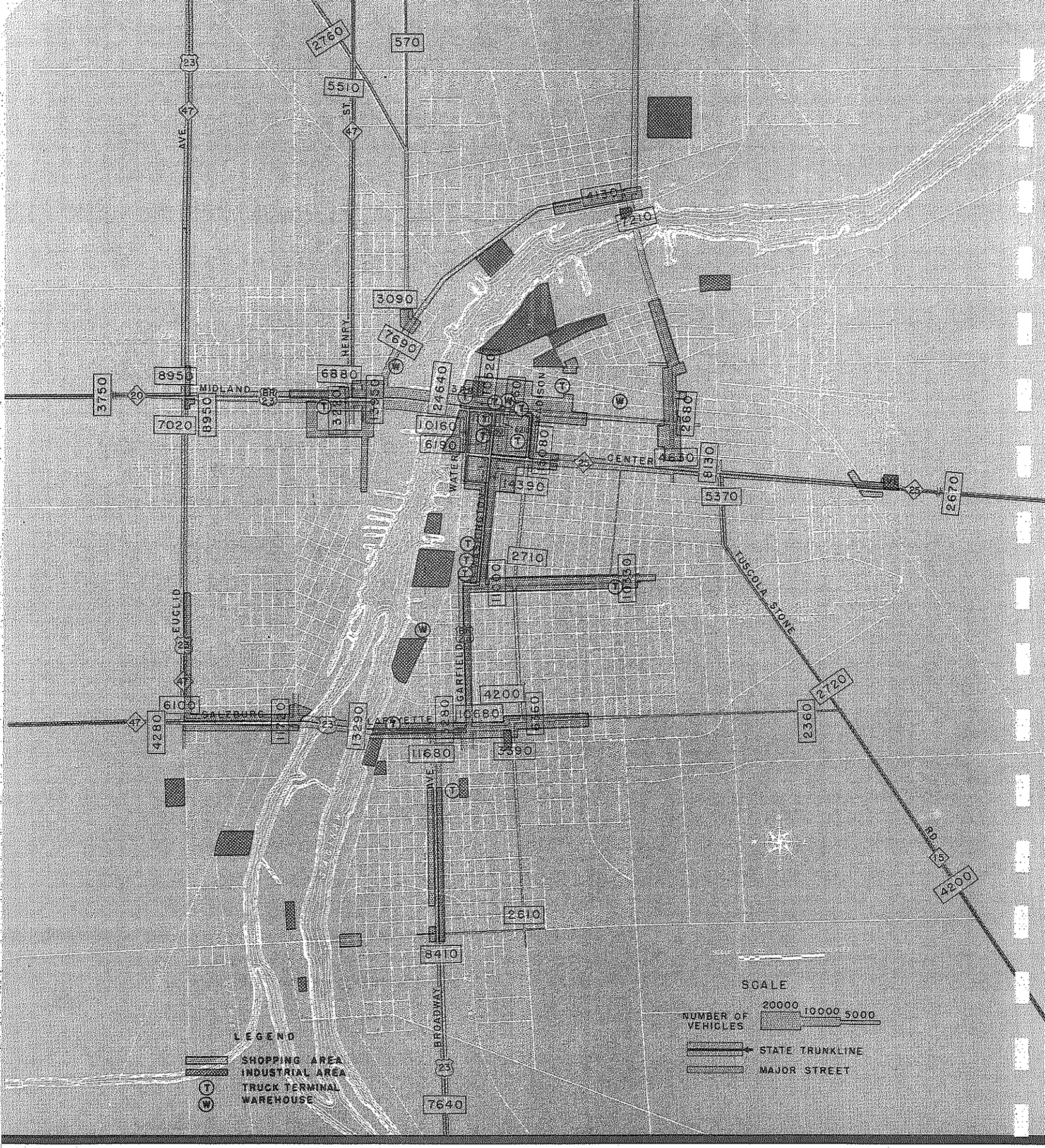
Around Bay City itself, the flow bands emphasize the special importance of US-23 in the city's transportation service. The total of the volumes shown on all trunklines amounts to nearly 28,000 vehicle trips entering and leaving across the limits of the area established for the 1948 traffic study. Of this total, a little more than half is on US-23, about equally divided between its north and south sections. M-15 and M-47 carry much north-south traffic routed over the north section of US-23. These three highways account for more than 75 percent of the total trunkline traffic.

M-20 and M-25 carry 14 and 10 percent, respectively, of the trips entering and leaving Bay City on rural trunklines. These two highways and US-23 north provide access to the city from the principal parts of its market area.

The volumes shown on this flow map are for a summer week day in 1948. In winter months they would be somewhat lower.




# THE BAY CITY STUDY AREA




# 24 HOUR DAILY TRAFFIC ON STATE TRUNKLINE AND OTHER MAJOR STREETS

WEEKDAY IN SEPTEMBER 1948

PLATE II

## DAILY TRAFFIC FLOW ON PRESENT TRUNKLINE STREETS

The flow of traffic on existing trunkline routes and certain other major streets as observed by the 1948 traffic study, is presented on Plate II. It shows the movement of traffic to and from the urban trunklines together with the local traffic it encounters on these arteries. The huge concentration of traffic on the Third Street Bridge and through the central business district, and the heavy usage of Broadway, Garfield, Washington, and Center Avenues are the most noticeable and significant features of this traffic pattern.

The location of Bay City in relation to the Saginaw River is a primary factor in shaping the local traffic pattern and in causing congestion in the central district. The broad stream flows north through the western half of the city, but before reaching the northern limits it turns east across the northeastern section. The major part of the city is east and south of the river, with the central business district just south of the river bend, and the principal industrial section northeast of the business district.

Four highway bridges span the Saginaw River within the municipal area, the Belinda Street Bridge on the north, and the Third, Lafayette and Cass Avenue Bridges on the long north-south reach of the river. Farthest north, the Belinda Street Bridge provides access to the industrial areas that lie along Water Street. The Third Street Bridge gives direct access to the north end of the central business district. Because the other two bridges are so far south, the Third Street Bridge carries practically all of the traffic between the central business and industrial districts and the populous western and northwestern sections of the city.

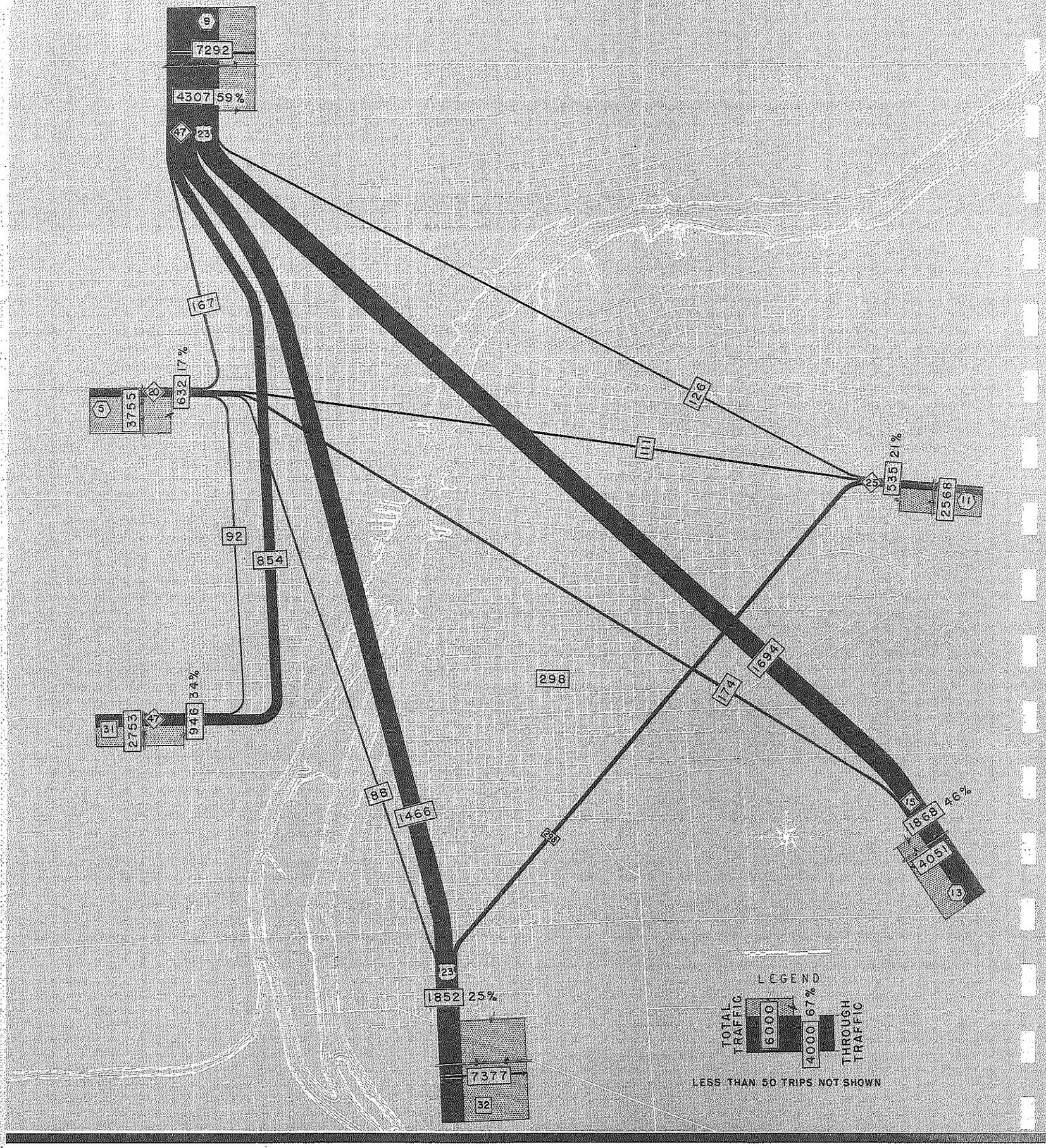
The present routing of trunklines in Bay City makes some contribution to central area traffic congestion. US-23 enters from the south on Broadway Avenue, turns west to cross the river on the Lafayette Bridge, and leaves the city on Euclid Avenue along the west limits. The business route of this trunkline continues north on the east side of the river and follows Garfield and Washington Avenue, the central business and shopping street, to Third Street where it turns west to cross the Third Street Bridge and rejoin the main route on Euclid Avenue. A large portion of US-23 traffic follows this business route through the city.

M-15 enters the city from the southeast on Tuscola Road, connects with M-25 on Center Avenue on which it enters the central business district. There it connects with US-23BR with which it interchanges the considerable percentage of its traffic bound to or from northern destinations.

M-20 enters Bay City from the west on Midland Avenue and its traffic reaches the business district and connections with eastside trunklines by following the route of US-23BR across the Third Street Bridge.

M-25 enters from the east on Center Avenue on which it proceeds to the business district and connections with other trunklines. Its through traffic bound west or north follows the route of US-23BR across the Third Street Bridge.

M-47 comes to the Bay City limits from the southwest on the Bay Street Road. It merges with US-23 on Euclid Avenue, turns east on Midland Avenue, and then goes north on Henry Street to the state park. Traffic to the business district or eastside trunklines follows the route of US-23BR.




# INTERCHANGE OF THROUGH TRIPS BETWEEN STATE TRUNKLINES

PLATE III

It is evident that the present trunkline routes channel highway traffic precisely to that central area of the city which is the focus of local travel and across the bridge which is a central factor in congestion in that area. The fact that the trunkline routes are also main arteries of the business district and that they connect with the east approach to the Third Street Bridge at right angles, produces a volume of turning movements which snarl and delay movement at these vital intersections.

To what extent trunkline traffic contributes to congestion in the critical central area, depends on the proportion of through trips in the trunkline traffic streams and on the adequacy of the trunkline and arterial street systems to collect and distribute those trunkline trips which have an origin or destination in Bay City itself.

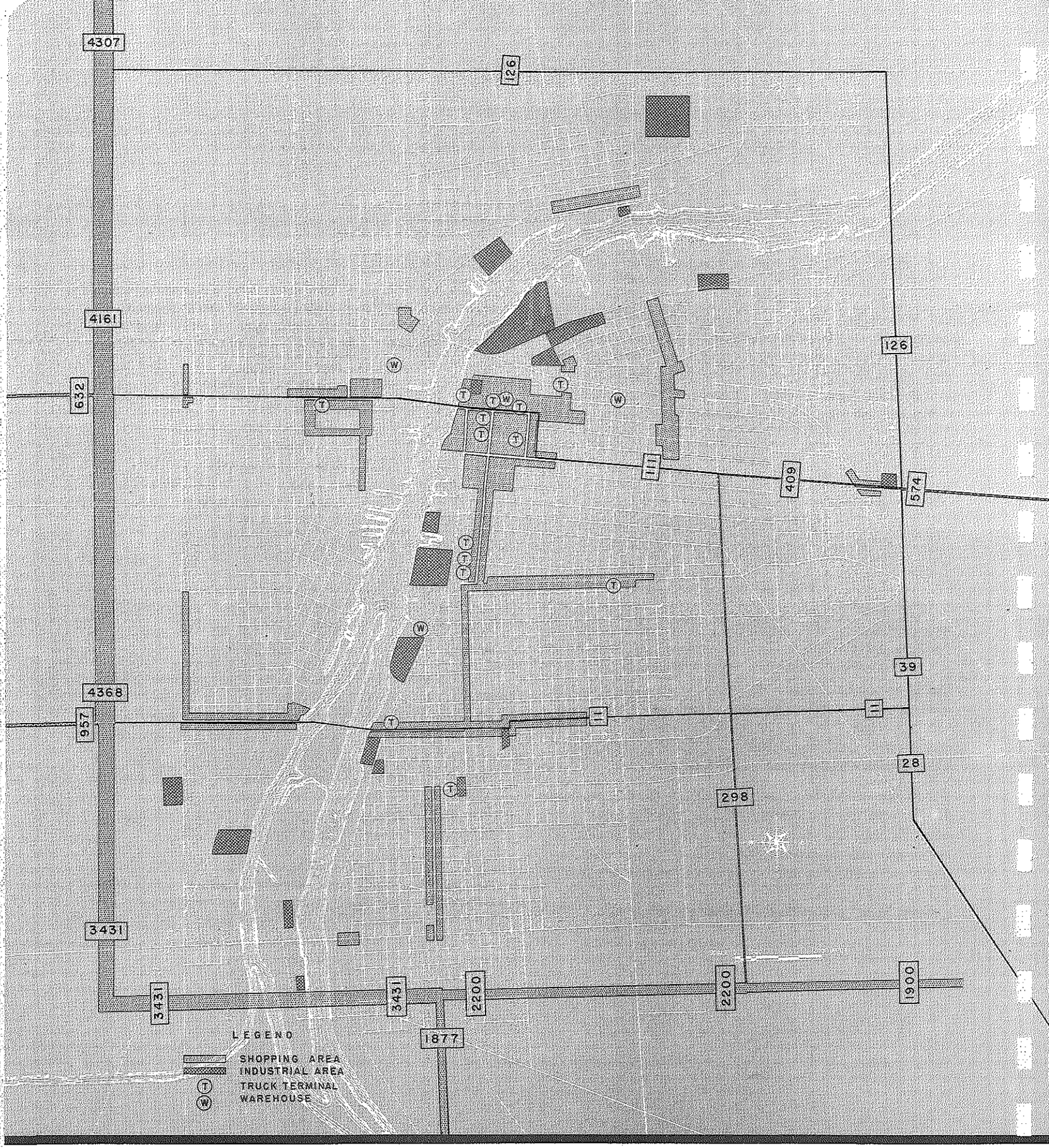
## INTERCHANGE OF THROUGH TRIPS BETWEEN STATE TRUNKLINES

The external survey phase of the 1948 traffic study revealed the magnitude of the movement of through traffic traversing the Bay City area, and at the external stations, the proportion of total traffic which this movement represents. The results, presented on Plate III, show that Bay City is the principal gateway to the north on the eastern side of the state and that US-23 and M-15 are the principal arteries through this gateway.

On the northward section of US-23, 60 percent of the traffic is through trips. Seventy-two percent of all the through trips on other trunkline sections are interchanged with US-23 north; the principal routes contributing to its traffic are M-15, US-23 south, and M-47 in the order named. This is a very large proportion of through trips for a city as large as Bay City and it results in significantly high volumes of traffic traversing the area with neither origin nor destination in it.

The data indicates that on this weekday, 3,700 of the through trips crossed the river, most of them passing through the central business district using the Third Street Bridge. This through movement represents 10 percent of the usage of the Third and Lafayette Street Bridges, the two most heavily traveled structures. This amount of traffic is sufficiently large to be a significant contribution to congestion in this central area.

In the Bay City area, improved accommodation of through traffic is necessary both to provide adequate service to this trunkline movement, and as a measure of relief for local traffic conditions.




# ESTIMATED USAGE OF RELOCATED U.S.—23

THE FLOW BANDS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO INDICATE THE ROUTE LOCATION

PLATE IV

## ESTIMATED USAGE OF RELOCATED US-23

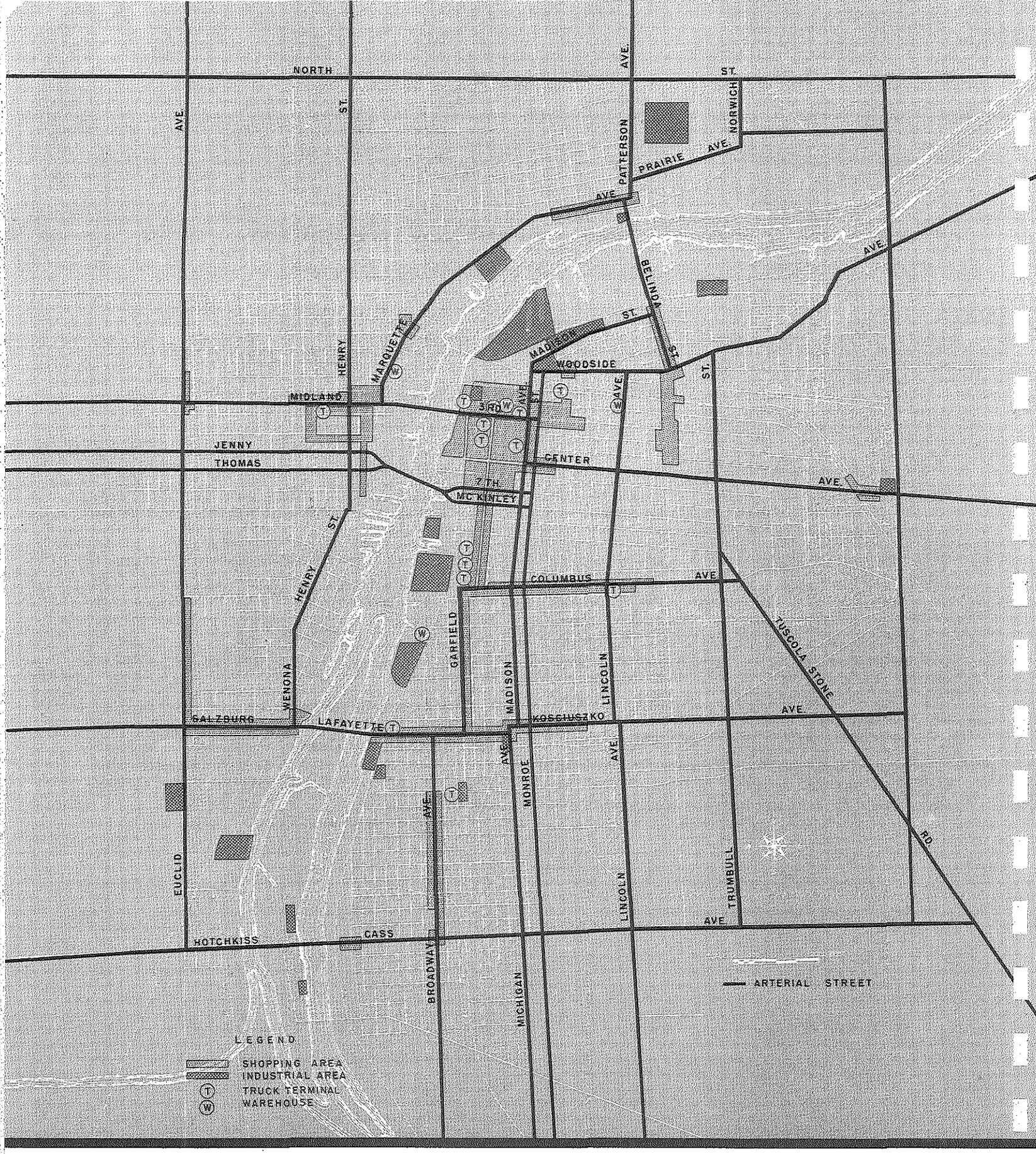
A logical remedy for city street congestion in which through trunkline traffic is an important factor, is to route the through movement around and outside of the areas of congestion.

In the Bay City area, such a route connecting US-23 north with M-15 and US-23 south, could remove from Bay City streets more than 90 percent of the through trips that would normally traverse the whole length of the city including the crowded central business district. Properly located to cross the Saginaw River somewhere between Saginaw and Bay City, it would facilitate trunkline movement and relieve street congestion not only in Bay City itself, but in the entire Bay City-Saginaw area.

The flow bands on Plate IV show the movement of through trunkline traffic in and around Bay City which could be removed from the city streets and routed on a new US-23 and M-15. The traffic quantities assigned on this plate, are those presented on Plate III of the interchange of through trips between trunklines.

The Department is committed to the construction of such a route. A section in the Saginaw area from US-10 - US-23 at Bridgeport north to M-46 has been built. The location of remaining portions is now under study. The flow bands on Plate IV are purely diagrammatic and they in no sense indicate a selected route.

The studies of traffic in the remaining portions of this report are based on the presumption that the US-23 relocation will be completed and in operation. From this point on, through trunkline trips which would logically use this projected facility, are assigned to it.




# ARTERIAL STREET SYSTEM

PLATE V

## ARTERIAL STREET SYSTEM

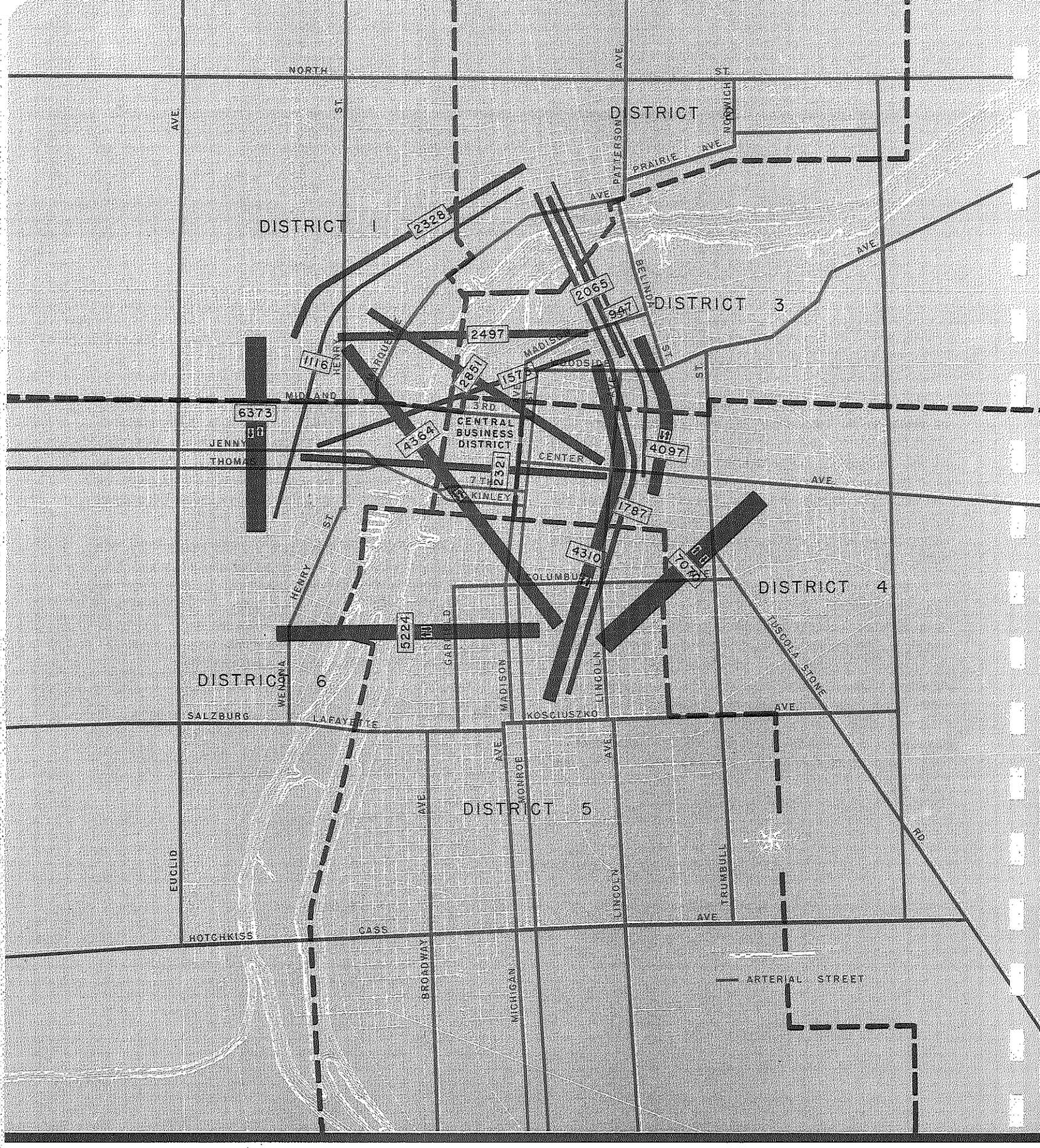
Plate V shows Bay City's arterial street system in relation to the most important land uses. The objective is to set up a system of arteries which, when adequately and properly developed, will provide routes for the major traffic movements to reach the principal areas of traffic attraction from all the principal areas where traffic originates including the points where rural state trunklines enter the city.

In 1949, city planning officials started analyzing the metropolitan area traffic study data with the objective of selecting a system of arterial streets which would serve demonstrated local traffic needs. An arterial system was produced and during the ensuing year a series of conferences concerning it were held with state highway department representatives. After some minor revisions had been made, agreement was reached on the system as shown on this plate. However, it is believed that there are still three street sections which should be deleted; these will be discussed on a later page.

The planned system includes several existing streets which will have to be built to higher standards to enable them to perform their arterial function. It also includes several streets or street connections which do not now exist, but which must be built to accommodate the desired movements of traffic as disclosed by the traffic study.

Among the new arteries contemplated by the plan is a river crossing approximately on the line of Thomas and McKinley Streets, in the existing mile-and-a half gap between the Third Street and Lafayette Avenue Bridges. Another new street is the long arterial on the extreme eastern edge of the city, which extends north across the river.

The four succeeding plates are aimed to reveal the extent to which the arterial street system fits the pattern of traffic movements between city areas and the rural state trunklines, and between the principal terminal areas of city traffic.




# TRAFFIC MOVEMENTS BETWEEN THE SIX GEOGRAPHIC DISTRICTS

PLATE VI

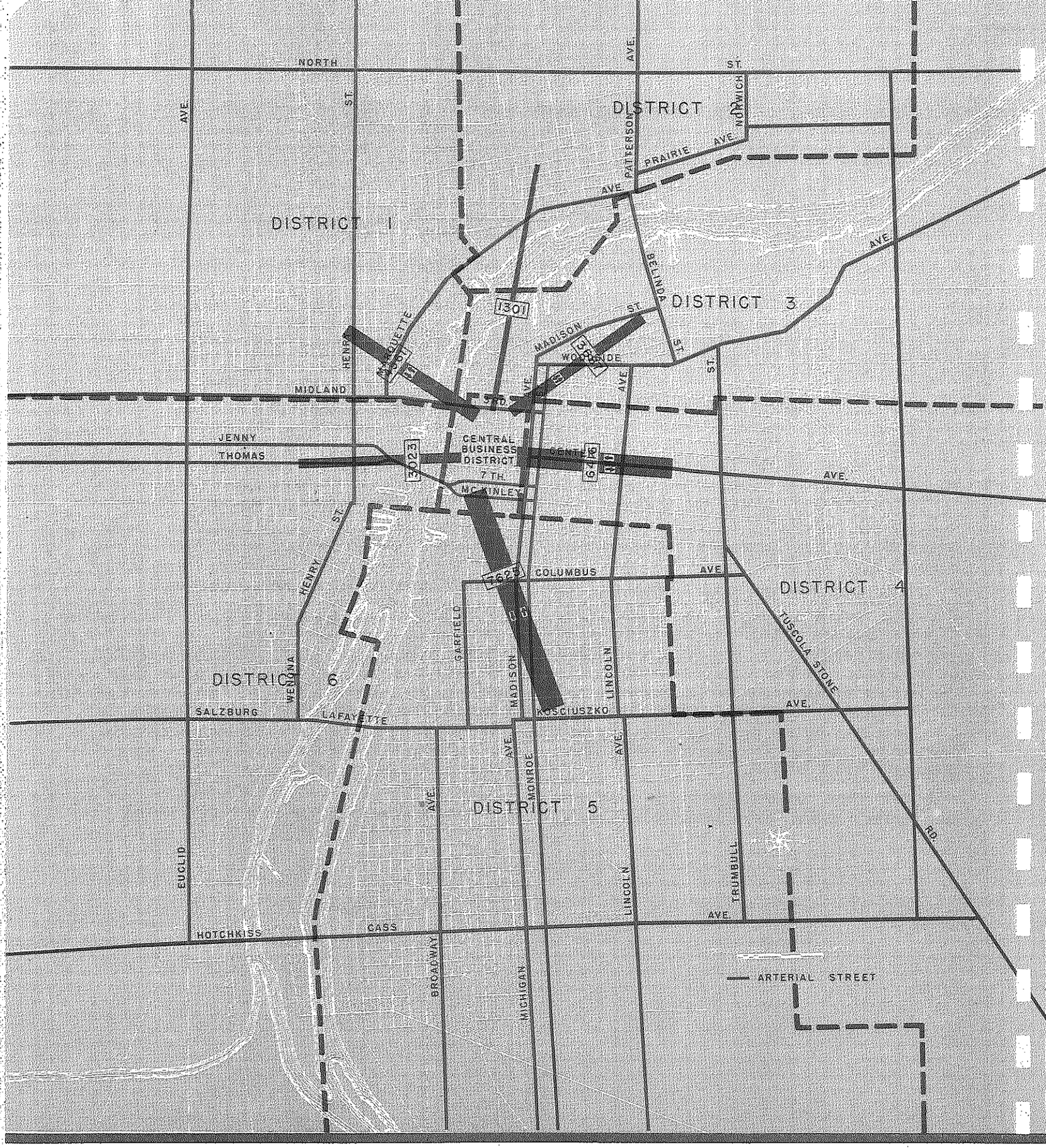
## TRAFFIC MOVEMENTS BETWEEN THE SIX GEOGRAPHIC DISTRICTS

On the basis of travel records obtained from interviews with a large sample of the population in the 1948 traffic study, it was estimated that more than 112,000 individual local vehicle trips were made within the Bay City area on an average summer weekday of that year.

In order to analyze this huge mass of data, the Bay City area was divided into six geographic districts, plus the central business district which was treated separately because of its special traffic importance. The boundaries were determined by the location of barriers to traffic movement, i.e. rivers, railroads, and natural traffic sheds. The trips were then traced from their origins to their destinations as they were located within these seven established districts.

It was found that one-third of the trips took place entirely within one or another of the designated districts: these trips would use local streets for the most part. The remaining 67 percent, or a total of 75,500 trips, went from one district to another. When these were inscribed as graphic totals on a map of the area, as on Plates VI and VII, they provide significant information as to the arterial street service required by local traffic.

Plate VI shows the interchange of daily trips between the geographic districts other than the central business district. There are nearly 49,000 of these trips and they account for about 65 percent of the inter-district trips. Four of the five largest of these movements have one terminal in District 5, the most populous of the six districts. A large percentage of these trips are now required to pass thru the central business district because of the location of the bridges and because of the lack of north-south arterial thru streets outside of the central business district.




# TRAFFIC MOVEMENTS BETWEEN THE SIX GEOGRAPHIC DISTRICTS AND THE CENTRAL BUSINESS DISTRICT

PLATE VII

## TRAFFIC MOVEMENTS BETWEEN THE SIX GEOGRAPHIC DISTRICTS AND THE CENTRAL BUSINESS DISTRICT

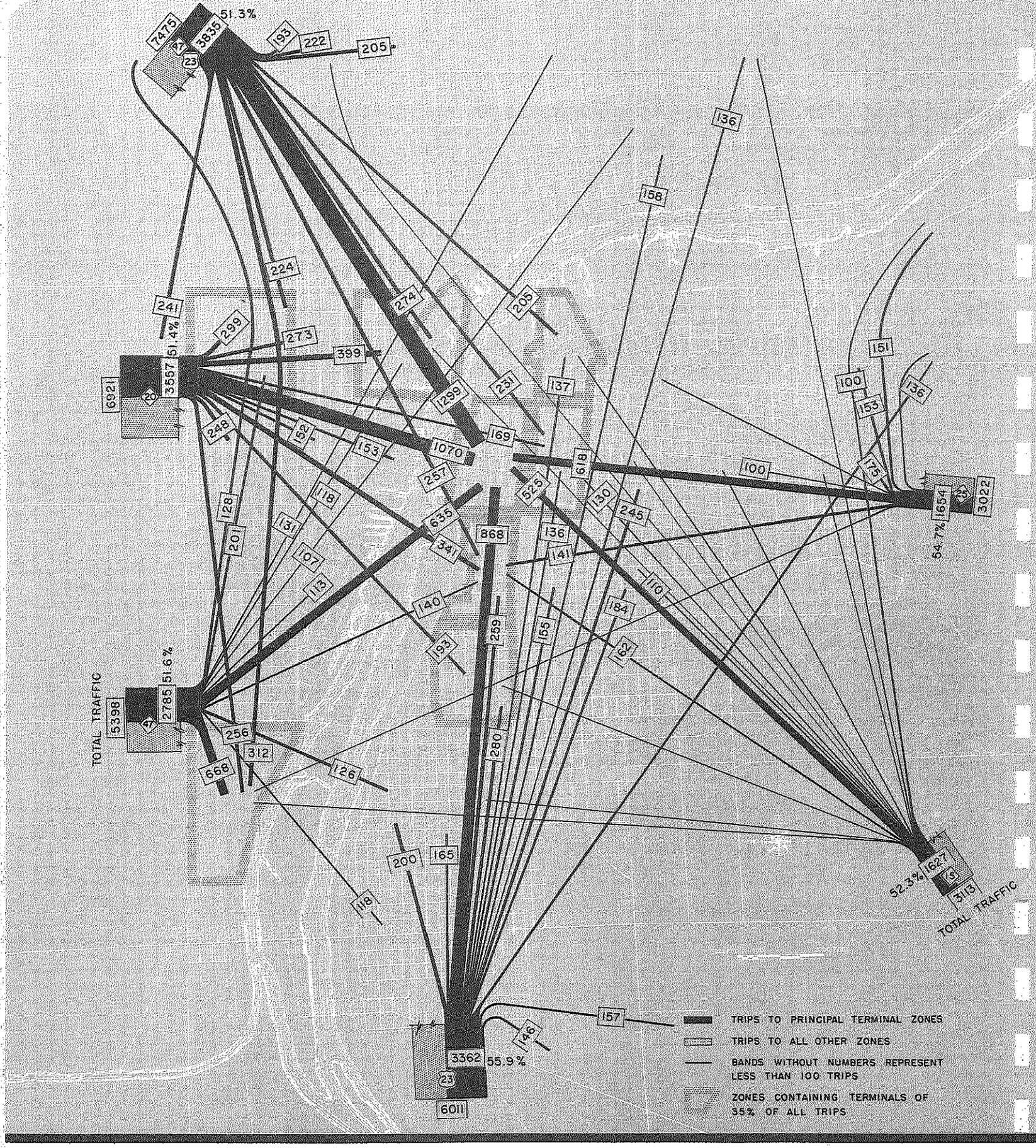
Plate VII shows the number of daily trips between each of the geographic districts and the central business district. The 26,600 trips to and from the central business district amounts to 35 percent of all the inter-district movements. As in every other city studied, this central area is the primary focus for local as well as for trunkline traffic. The largest source of traffic for the business section is geographic District 5.

Because the central business district has always been the major objective destination of traffic, the existing street pattern was developed to give direct access to it. This accounts for the fact that so many of the movements between other parts of the city either are forced, or find it more convenient, to pass through this central traffic hub. Along with the over-all increase of traffic, this condition accounts for the congestion in the central district and on its entrance streets and bridge.

The data on which these plates are based, show that 43 percent of all inter-district trips cross the river and that more than half of the river crossings are made on the Third Street Bridge. There are more than 18,000 of these trips across the Third Street Bridge and they account for more than 75 percent of that structure's daily load.

With traffic using the streets shown on the arterial street system much will be done to reduce congestion on this bridge and in the central district. The proposed bridge at Thomas and McKinley Streets will greatly ease the present pressure on the Third Street Bridge. The two pairs of one-way arteries across the south and east borders of the central business district will carry traffic to, but not through, this focal area.

By eliminating unnecessary and often intruding travel from its streets, the central district will be able to accommodate its proper traffic. At the same time, movements between other districts in the area will be more efficiently and directly served by arterial streets not traversing the central district. The arterial street system appears to fit the local traffic needs of the city as indicated by the traffic desires of its people.




# TOTAL TRAFFIC BETWEEN ALL STATE TRUNKLINES AND PRINCIPAL ZONES OF ATTRACTION

PLATE VIII

## TOTAL TRAFFIC BETWEEN ALL STATE TRUNKLINES AND PRINCIPAL ZONES OF ATTRACTION

The two preceding plates established the service required of the arterial street system to local traffic. The Plates VIII and IX present the requirements of trunkline traffic for arterial street service.

It was shown on Plate III that 37 percent of the traffic entering or leaving the Bay City area on the trunklines was made up of trips bound through the area without origin or destination in it. Plate VIII points out the parts of the city where are located the terminals of most of the other 63 percent of trunkline trips which start or end within the area.

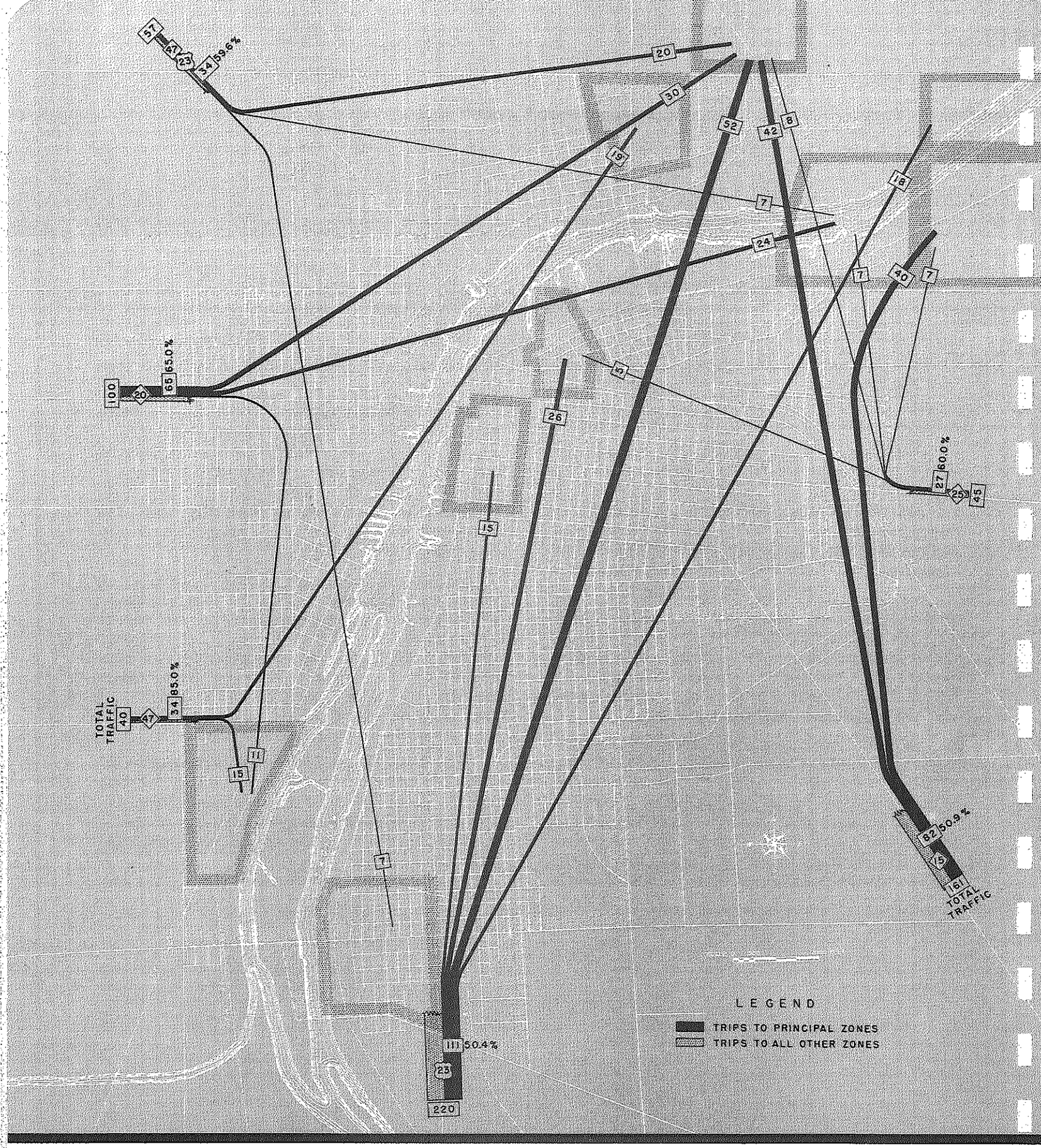
The desire lines were determined by selecting from the traffic on each trunkline, groups of trips with the same terminal. These groups were selected in the descending order of their size until more than half the entering and leaving trips had been taken. The balances represent trips whose terminals are distributed throughout the study area.

The traffic quantities shown for each trunkline are not the same as those shown on Plate III. The volumes on the previous plate were those recorded at cordon stations on the outer perimeter of the Bay City study area, often several miles beyond the city limits. Those shown on Plate VIII were tabulated approximately at the city limits; they do not include through trips, but they do include the traffic accumulated in the suburban areas just beyond the city borders.

Analysis of the data on this plate and on Plate III indicates that the largest amount of Bay City's trunkline traffic has its outside terminus in Saginaw and in the Detroit area. Next most important are Midland and the city's northern market area. Suburban traffic comes largely from the north, the southwest, and the western sections of the surrounding country.

The outstanding feature of this diagram is the very high percentage of trips on every trunkline which are coming from or going to the central business district. Of considerable, but distinctly secondary importance, are the proportions of trips attracted by the industrial districts. It is evident that the bulk of this trunkline traffic consists of trips from the city's market area and suburbs to local terminals in the business section.

When these desire patterns of traffic are examined in relation to the street pattern, it is clear that the streets included in the arterial street plan will provide adequate and reasonably direct access from the trunklines to the places where trunkline traffic wants to go.




# TOTAL TRIPS BY TRAILER-COMBINATIONS BETWEEN STATE TRUNKLINES AND PRINCIPAL ZONES OF ATTRACTION

PLATE IX

## TOTAL TRIPS BY TRAILER COMBINATIONS BETWEEN STATE TRUNKLINES AND PRINCIPAL ZONES OF ATTRACTION

The traffic desire bands in Plate IX show the desire lines of trailer-combination trips entering and leaving Bay City on the rural state trunklines and bound to or from termini in the city.

The travel of this class of vehicle has special significance in planning an arterial street system and in selecting urban trunkline routes. The services performed by these heavy freight haulers are of greatest importance to the business and industry of the community. At the same time, they have characteristics of dimension and weight which demand special consideration in matters of highway design and traffic operation.

On the summer weekday when the 1948 study was made, 630 trailer combinations entered or left Bay City on trunklines. More than 60 percent of them were on US-23 south and M-15, the two routes to the Detroit metropolitan area. The next largest count was on M-20 from Midland and Isabella Counties.

A significant portion of the trips on US-23 south, were to and from the central business district; but aside from these, all major heavy truck movements on the trunklines were bound to or coming from the principal industrial sections. Of special note, was the very heavy movement of tank vehicles with a terminus at the petroleum storage facilities beyond North Street in the northeast corner of the city. This area is the largest single terminal zone for trailer combination trips on each of the entering trunklines.

Other industrial zones which attract this commercial traffic are the down river district in the northeast part of the city, the district near the central business area, and the two districts on either side of the river between Lafayette and Cass Avenue Bridges.

The arterial system provides routes by which the heavy carrier units can reach their destinations without entering the congested central area.

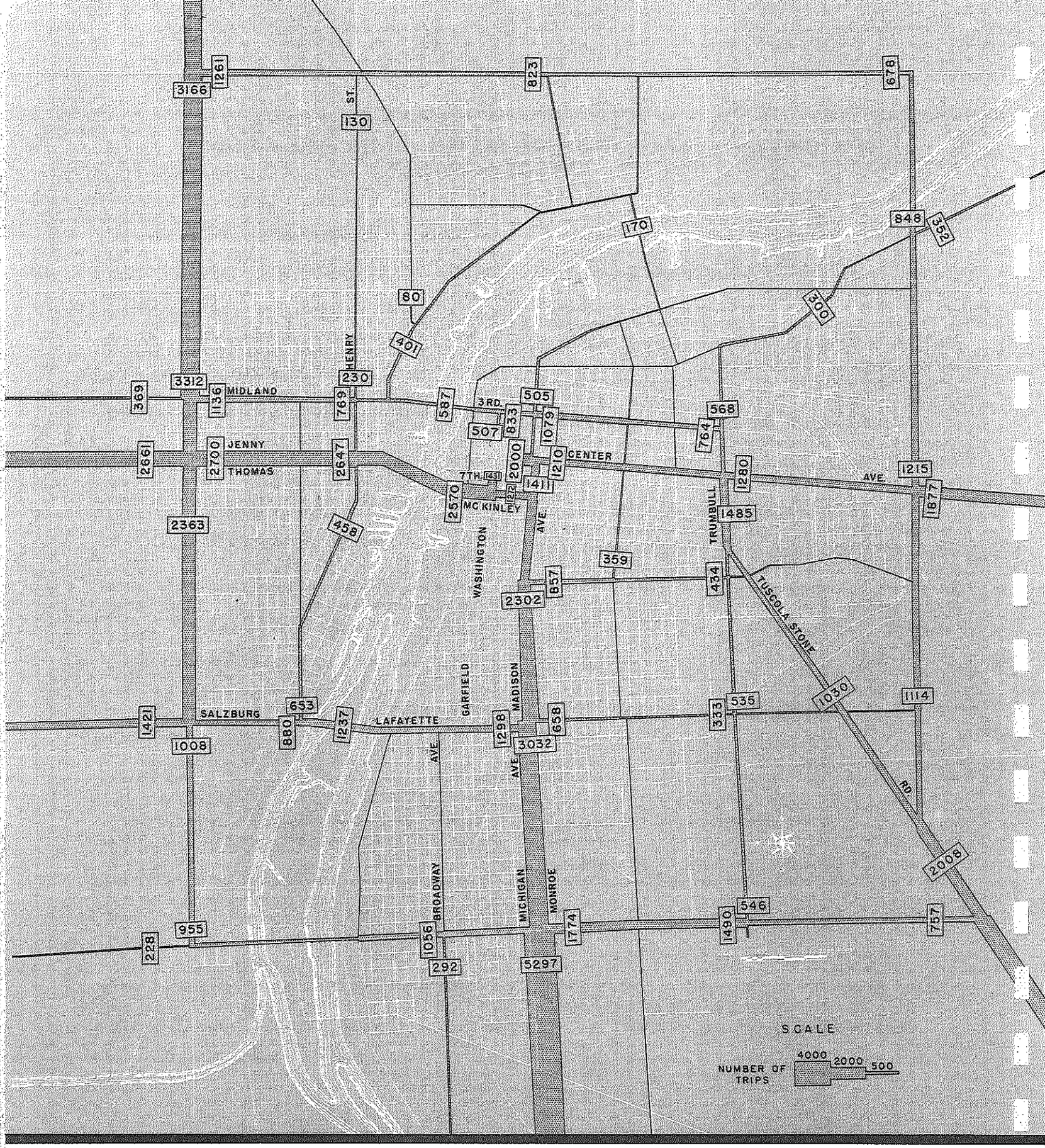
## STATE TRUNKLINE TRIPS TO AND FROM BAY CITY, ASSIGNED TO ARTERIAL STREET SYSTEM

The flow bands on Plate X represent an estimate of the usage of the arterial street system by traffic entering and leaving the city on the state trunklines. The estimate is based on an assignment of this traffic to the selected arterials. It was made on the following assumptions:

1. The driver picks the shortest route
2. He uses the route with the fewest turns
3. He avoids the central business district and other congested areas if routes are available which do not involve adverse distance.

It is readily apparent that the arterial street system is adequate for the collection and distribution of rural trunkline trips to and from their principal destinations and origins in Bay City. Although a very large proportion of this total traffic has terminals in the central business district, as was shown on Plate VIII, there are no undue concentrations of these trips on any of the arteries giving entrance to that district.

This dispersion of traffic is due largely to the accommodation of a large number of entering and leaving trunkline trips on the proposed Thomas-




# STATE TRUNKLINE TRIPS TO AND FROM BAY CITY ASSIGNED TO ARTERIAL STREET SYSTEM

PLATE X

McKinley Street route. This new artery with its linking bridge, would handle much of the traffic with terminals in the central area and bound to or from southwest, western, and northern rural trunklines. In like manner, the proposed streets along the eastern and northern edges of the city would remove from the central areas much of the heavy commercial traffic to and from industries and tank farms in the northeastern sector.

Part of this desirable redistribution of trunkline traffic and particularly the lessened usage of the Third Street Bridge, is due to proposed changes in the location of two rural trunklines. Rural M-20 would be relocated to connect with Thomas Street about one-half mile south of its present route on Midland Avenue. The south entrance route of US-23BR would be shifted east to connect with Michigan Avenue instead of with Broadway Avenue as at present.

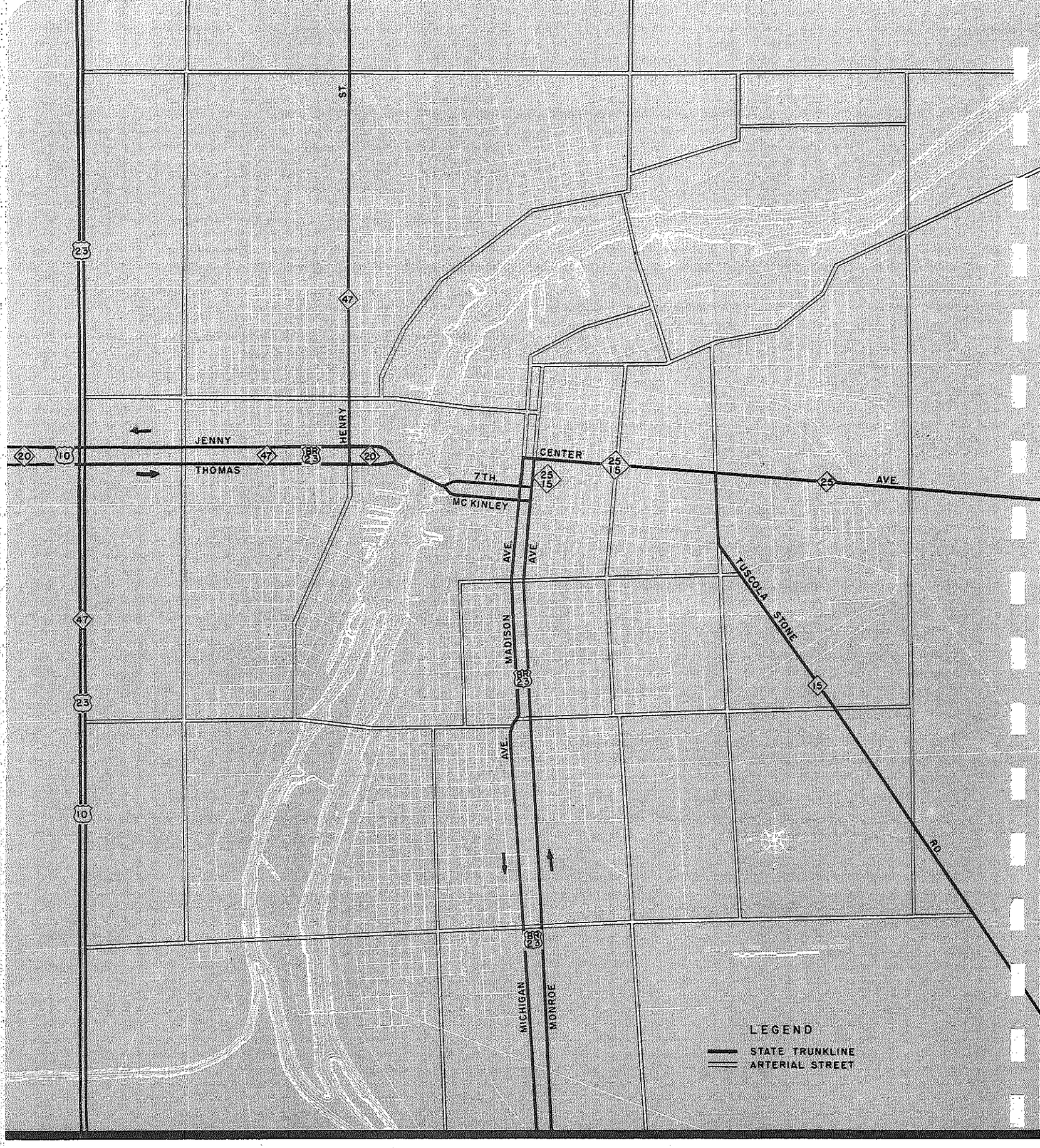
Both of these proposed rural trunkline relocations would be necessary to fit into the approved arterial street system. Both of them were assumed as parts of the plan for the purposes of this assignment of traffic.

Two street sections in the central business district have had some of the trunkline trips assigned to them on this plate solely because they were designated as major arteries in the original city arterial system and the assigned traffic had destinations along the routes. The first of these is Washington Avenue between Seventh and Third Streets, and the second is Water Street between the same two arteries and extended northeastward to a connection with Woodside Street. Note that no traffic is assigned thru the area on Washington Avenue and the assignment on Water Street is minor.

The section of Washington Avenue under discussion is the principal retail and business street of the city. All the business of the establishments on it is transacted with people who, at the time at least, are pedestrians. The street itself would be used close to reasonable capacity if its usage were limited to these pedestrians and to the vehicles whose occupants are seeking a place where they can get out and proceed to stores or offices on foot. Using it as an arterial would seriously reduce its capacity for this service, and the traffic routed through it would be impeded by the local movement.

Water Street is in a somewhat different category. Its present considerable usage as a one-way street to drain off traffic from the east end of the Third Street Bridge, will not be necessary when congestion at that point is remedied by measures included in the arterial street system and in this report. As a major artery it would drastically interfere with the operation of the Third Street Bridge and the proposed Thomas-McKinley Street structure by channelling much traffic across their immediate east approaches. The proper use of Water Street is to give access to property abutting upon it and to afford a certain amount of added circulation in the central area when needed.

It will be noted that the inclusion of neither of these streets in the arterial system, is essential to enable the remaining routes of the arterial system to collect and disperse Bay City traffic bound to and from the rural state trunklines.




**STATE TRUNKLINE SYSTEM SELECTED FOR ULTIMATE DEVELOPMENT**

PLATE XI

## STATE TRUNKLINE SYSTEM SELECTED FOR ULTIMATE DEVELOPMENT

An ultimate system of urban state trunklines is shown on Plate XI. The routes on this system were selected from the approved arterial street system on the basis of usage as indicated by the assignment of trunkline trips with termini in the survey area. Due consideration was given also to the extent to which the selected system would improve street operation throughout the Bay City area.

The selected state trunkline routes within the city as shown on this plate are described as follows:

US-23 BR
From a relocated connection with US-23 north on a southward extension of Michigan Avenue to a point south of Cass Avenue; then northward as a pair of one-way streets on Michigan Avenue and Monroe Street to Kosciuszko Avenue; northward on Madison Avenue and Monroe Street to McKinley Avenue and Seventh Street; then westward on McKinley and Seventh to the east approach to the Thomas-McKinley Street Bridge; westward across the bridge to connect with Thomas and Jenny Streets; and then westward on Thomas and Jenny as one-way streets to US-23.

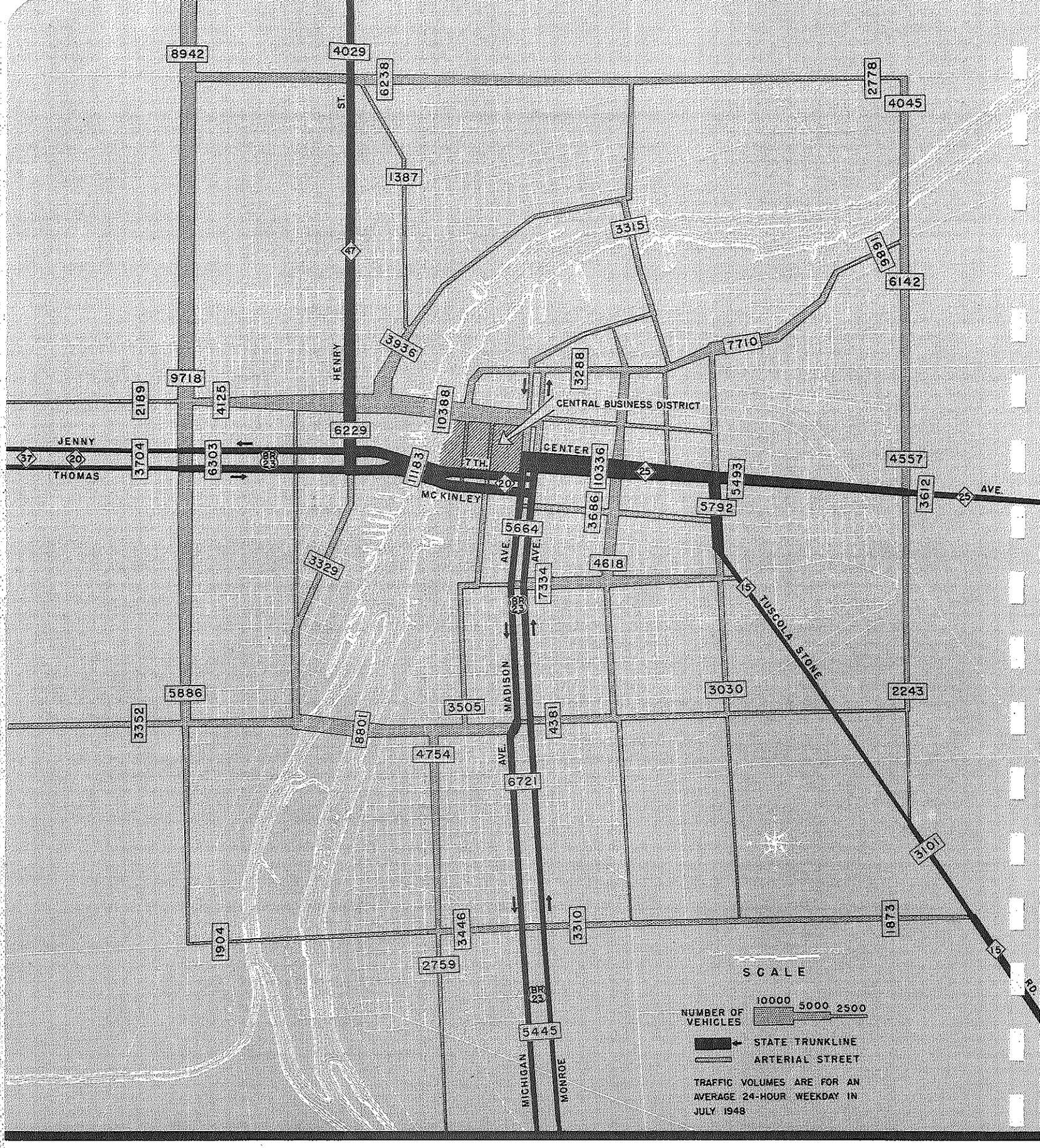
M-20
From a connection with relocated rural M-20 at the intersection of Thomas and Jenny Streets with US-23, east as a pair of one-way streets on Thomas and Jenny Streets over the Thomas-McKinley Street Bridge and terminate at the intersection of US-23BR at Madison Avenue and Monroe Street.

M-47
From a connection with relocated rural M-47 at the intersection of Thomas and Jenny Streets with US-23, east as a pair of one-way Streets on Thomas and Jenny Streets to Henry Street; and then north on Henry Street to join rural M-47 at the north city limits.

M-25
From a connection with rural M-25 on Center Avenue, west on Center Avenue to Madison Avenue and Monroe Street; then south on Madison and Monroe, as one-way streets, to connect with and terminate at the intersection of US-23BR and McKinley Avenue and Seventh Street.

M-15
From a connection with rural M-15 on Tuscola Road, northwesterly on Tuscola Road to Trumbull Street; then north on Trumbull Street to Center Avenue; then west on Center Avenue to Madison Avenue and Monroe Street; and then south as a pair of one-way streets on Madison and Monroe to connect with and terminate at, the intersection of US-23BR and M-20 at McKinley Avenue and Seventh Street.

The ultimate urban state trunkline system formed by these routes meets the needs of traffic in Bay City revealed by the metropolitan area traffic study as they are presented on the earlier pages of this report.




# TOTAL TRAFFIC ASSIGNED TO SELECTED URBAN TRUNKLINE SYSTEM AND OTHER ARTERIAL STREETS

PLATE XII

I. It provides routes for the pertinent trunkline traffic shown on Plate I, except those through trunkline trips which it is assumed will use the projected US-23.

II. The selected system is integrated with and is a part of the approved arterial street system and together they meet the requirements of local and trunkline traffic as presented on Plates VI, VII, VIII, and IX.

III. The system conforms to the principles for urban trunkline location established by studies of traffic desire and operation in 18 Michigan metropolitan areas:

1. It connects the rural state trunklines with the central business district;
2. It serves most of the major industrial sections;
3. The several selected routes interconnect within the city;
4. The routes do not traverse the central focus of congestion; and,
5. They are reasonably direct.

## TOTAL TRAFFIC ASSIGNED TO SELECTED URBAN TRUNKLINE SYSTEM AND OTHER ARTERIAL STREETS

The validity of a system of streets or highways is proved by the way traffic uses it and by the degree to which this usage improves transportation conditions in the area served.

On Plate XII are shown the estimated traffic volumes imposed on the selected urban state trunklines and the other streets of the arterial system by Bay City's trunkline and local traffic. The estimate was made by assigning to these trunkline and city arterials all of the 1948 traffic shown on Plate II with the exception of the more than 4,000 through trunkline trips which will travel via the relocated US-23.

The traffic pattern on this plate has several highly important features. On trunklines and arterials alike, the volumes on even the most heavily traveled sections are well within the desirable capacity of the streets. The benefits to both trunkline and local traffic can be judged by comparing the volumes on this plate with those on Plate II. The improvement is particularly marked on the Third Street Bridge, on the arteries leading to the central business district, and in the district itself.

Traffic on the Third Street Bridge is reduced from nearly 25,000 trips to just over 10,000. This reduction is due to the introduction of the Thomas-McKinley Street artery and bridge into the street system, to the relocation of M-20 to a more southerly line where its traffic moves over the new artery, and to the relocation of US-23. These changes decrease the volume of crossing traffic on all of the city's existing bridges.

Relief on the trunklines and other arteries leading to the central area is obtained either by relocating the trunkline routes or by providing additional or improved facilities. The relocation of the south section of the US-23BR a half-mile east of constricted Broadway Avenue and provision of one-way street operation through the more densely settled parts of the city, disperses and facilitates traffic movement. Because of the change of the routing of both through and Bay City traffic on US-23, the former routes, including the Lafayette Bridge, are left free to serve the local movements between the central districts and south and southwest sections.

Similarly the relocated US-23 and the new artery along the east and north limits, reduces the volumes on the routes of M-15 and M-25 on Tuscola Road and Center Avenue, and on the east-west city arterials. To the west and northwest of the business district, access to that central area is improved by the elimination of through traffic and the provision of the additional artery on Thomas-McKinley Streets. Relocation of M-20 reduces the load on Midland Street and Midland Road to the volumes generated by the suburban developments along this route.

In the central business district volumes are reduced and traffic operation is improved by the elimination of through trips of all kinds from its business and retail streets. The trunkline and arterial streets bring traffic to it and then form an inner belt of one way streets on which traffic can circulate around the congested area. If the city carries out its plan to provide parking areas adjacent to this belt, traffic and business conditions within the enclosed area will be still further enhanced.

In conclusion: the projected route of US-23 and the selected system of urban state trunkline streets will provide completely adequate and convenient service to trunkline traffic in and through the Bay City area. These improvements together with the development of the arterial streets included in the approved plan, will remedy most of the handicapping conditions which create the city's traffic problems.

It should be noted that for the most part, these benefits will be obtained by the better utilization of existing street facilities. The Thomas-McKinley Street Bridge and the structure at the north end of the proposed new eastside city arterial street are the only major construction projects involved within the city. The principal remaining proposals are for the establishment of one-way operation on Michigan and Madison Avenues and Monroe Street, and on the Thomas-Jenny and McKinley-Seventh pairs of streets.

A detailed study of traffic operation has been made for the recommended urban state trunkline system. This study has indicated that the inclusion of one way streets is an integral and essential part of the system. The large turning movement necessary at the intersections of Monroe-Madison with Center, McKinley-Seventh, Kosciuszko and Lafayette could not be accommodated on streets operated with two way traffic. Other high turning movements will occur at the intersection of Thomas-Jenny and Henry Streets and at several intersections along the periphery circulator where traffic with destinations in the central business area will turn off to reach the proposed off street parking lots.

## PHASE DEVELOPMENT

As it is a physical and financial impossibility to put the entire Arterial Street and Trunkline system under either construction or operation at one time, a priority schedule should be established starting with the most important phase of the ultimate plan. The following phases are listed in the recommended order of fulfillment to the end that an operating system of urban state trunklines will provide service throughout the improvement period.

1. The Thomas-McKinley Street Bridge with its approach connections is the basic element in the selected urban trunkline system. It is recommended for the first priority in the program for bringing the selected system into being.

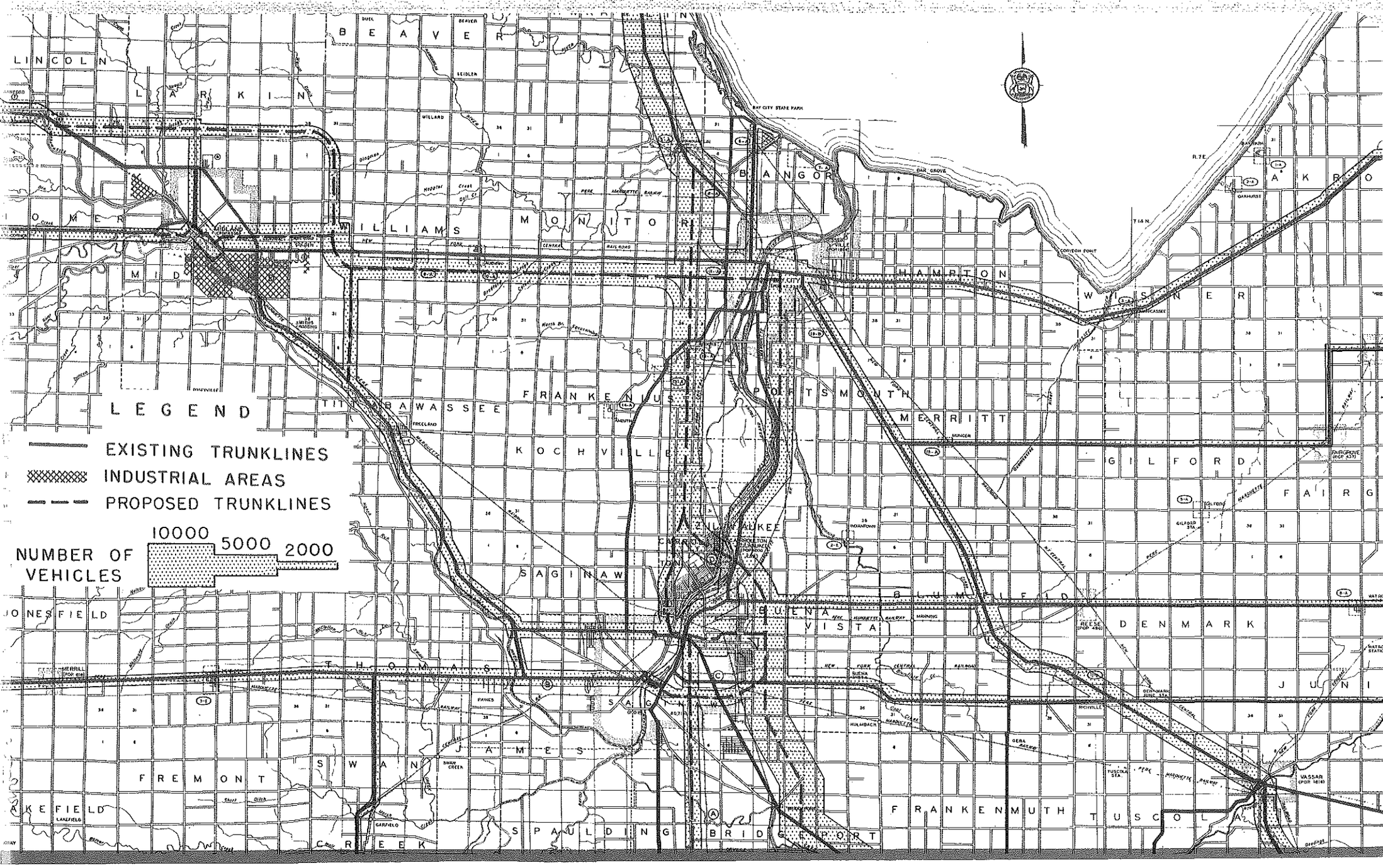
   As soon as the bridge project is completed, one-way street operation should be initiated on McKinley Avenue and Seventh Street from the bridge to Monroe Street, on Thomas and Jenny Streets from the bridge to Euclid Avenue and on Monroe Street and Madison Avenue from Third Street to connect with present US-23 south of the city limits.

2. Relocation of US-23 west of the city is recommended for second priority.

   With the new route in service, the opening of Thomas and Jenny Streets and additional construction will be necessary to connect these one-way streets from Euclid west to US-23.

3. As third priority it is recommended that M-20 be relocated approximately one-half mile south of its present location to connect with Thomas and Jenny Streets at US-23.

   Relocated US-23 should have a dual marking to include US-10 from south of Saginaw to this junction and M-20 should be dual marked with US-10 to Midland.




# TRAFFIC ASSIGNED TO EXISTING AND PROPOSED TRUNKLINES

## TRI-CITY AREA TRAFFIC STUDY

PLATE XIII

## TRI-CITY AREA TRAFFIC STUDY

Traffic flow hands on the three county map indicate the close traffic relationship that exists between the cities of Bay City, Saginaw, and Midland, which comprise a rather closely knit tri-city area. Due to the location of this triangle of important cities on the routes of two major trunklines, a network of highways is needed to interconnect the cities and to by-pass the considerable quantities of through trips around them.

The system shown on Plate XIII has been approved in principal by the Department and the planning authorities of the Bay City-Saginaw-Midland area for the improvement of state trunkline connections and service in this tri-city area. This system includes a projected route for US-10 and US-23 east of Saginaw, across the Saginaw River north of Saginaw, and then north to join present US-23 northwest of Bay City. At a point west of Bay City the route intersects and joins a projected highway, located one-half mile south of the present location of M-20, over which is routed US-10 and M-20 west to Midland. The system contemplates continuance of a trunkline route between Saginaw and Midland and to the Tri-City Airport east of Freeland.

Selection of an urban trunkline system in Bay City was aimed at obtaining satisfactory integration with the Tri-City area system.