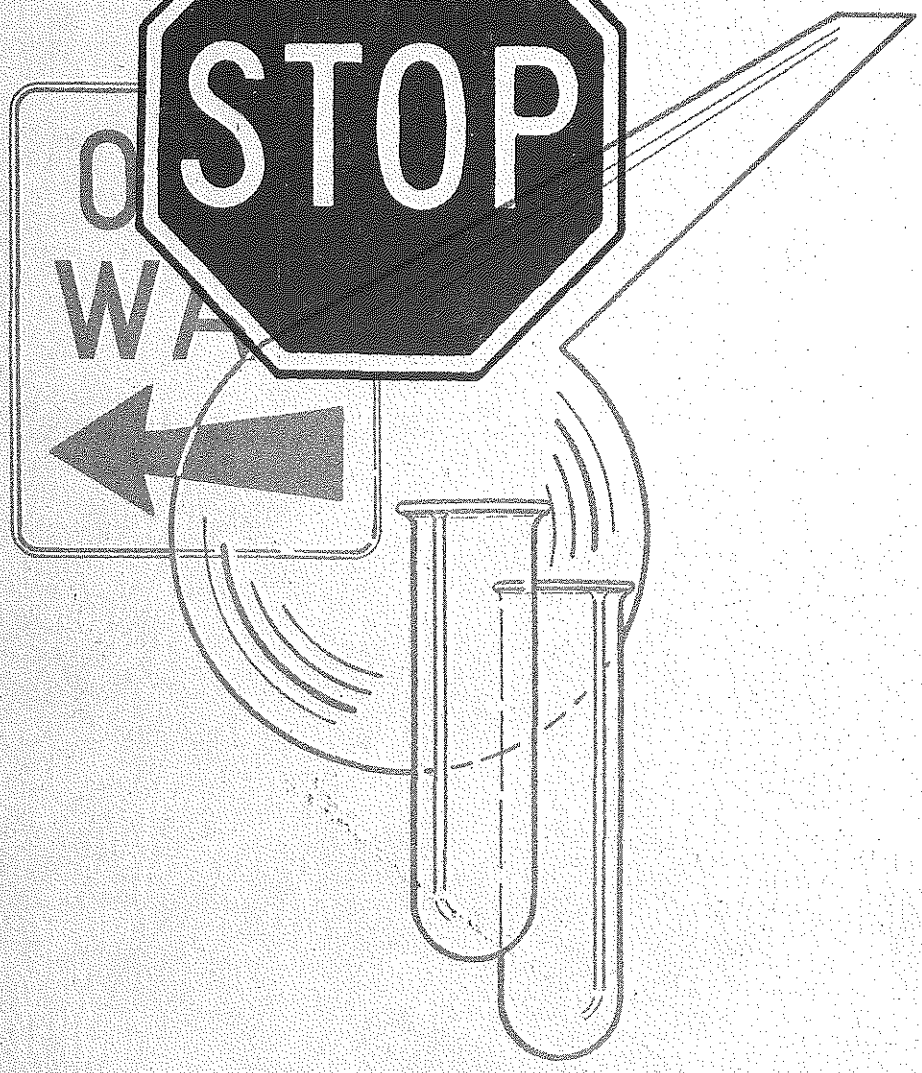
172

City of

Midland



TRAFFIC STUDY

1959

CENTRAL TRAFFIC SERVICES

65-172

CITY OF MIDLAND
TRAFFIC STUDY

By Central Traffic Services
1959

REPORT CERTIFIED BY: EDWARD F. GERVAIS, P.E.

TABLE OF CONTENTS

TABLE OF CONTENTS (Con't.)

TRAFFIC AND TRANSPORTATION CONSULTANTS
PLANNING SURVEYS OPERATION DESIGN
2100 EAST GRAND RIVER AVENUE, LANSING 12, MICHIGAN

To: Honorable Mayor James W. Stevens

Councilmen: Cletus E. Supinger

John Pearce

Stuart S. Branson

Warren Sheets

The City of Midland has shown, through action of its officials, that it is a progressive, forward looking community striving to keep abreast of the ever changing times and to lay plans for safeguarding the future welfare of its citizenry.

It has been the distinct pleasure of Central Traffic Services to assist the City of Midland in one phase of its planning by making a thorough study of traffic operations on its streets with accompanying recommendations for improvement. Through the application of sound Traffic Engineering principles and techniques, we have evolved a plan which will result in maximum efficiency at minimum cost. This plan can easily be put into practical operation by a concentrated effort toward cooperation by everybody in the community, with the final result in mutual benefit which will far exceed the investment.

Respectfully submitted,

Frederick J. Eggan

Frederick J. Eggan

Edward F. Gervais

Edward F. Gervais

FIG:EFG:ss

ACKNOWLEDGMENT

Throughout the period during which this Traffic Study was in progress, it was necessary at times to request assistance of various city officials, citizens and civic groups. Their willing cooperation in supplying vital information and assistance has made our task much more pleasant and our efforts more fruitful. Our staff wishes to take this opportunity to thank all of these people and organizations for their generous help in this endeavor.

We wish to especially thank the following people without whose aid our work in preparing this report would have been immeasurably more difficult.

The Honorable James W. Stevens	Mayor, City of Midland
Cletus E. Supinger	Councilman
John Pearce	Councilman
Stuart S. Branson	Councilman
Warren Sheets	Councilman
Ray Fry	City Manager
Raymond W. Mills	Director of Planning
William Day	Office of Planning
Douglas Craig	Chief of Police
Hubert Carter	Sgt., Police Dept., Records Bureau
Charles A. Johnson	Director of Public Works
Clifford Arnold	Secretary, Chamber of Commerce

INTRODUCTION

Midland, the home of the Dow Chemical Corporation, one of the largest chemical plants in the world, is known throughout the state as the city of churches and beautiful homes. It's spacious residential neighborhoods with ultra-modern architecture are sights which command the attention of visitors.

The progressiveness of the community is manifested in the long list of projects undertaken by its dynamic city officials. To the already impressive list of projects aimed at civic betterment must be added the current traffic study designed to provide a safe and sound plan of traffic operation upon the city streets. The most modern and efficient techniques and devices are being utilized to bring this plan into being.

Located at the junction of the Tittabawassee and Chippewa Rivers, Midland is in the position of being both a semi-suburban residential city and a center of industrial activity created by the home of Dow Chemical and Dow-Corning. The proximity of larger trading and shopping centers adds to this unique position, and combined with the two factors below creates a condition which poses many complex problems in traffic management. As a manufacturing and distributing center it is necessary that a large number of workers must enter and leave the area daily. Also, since much of the shipping is done by truck, both in bringing in materials for manufacturing plants as well as distributing the finished product, a large percentage of its traffic is commercial. At the same time the normal amount of traffic experienced by a city of some 35,000 people must be handled on it's streets. In addition to this is the traffic carried into and through the city by State Trunklines US-10 and M-20 which cross paths as they run north-south and east-west, through the state.

The following report and recommendations are submitted after an extensive search into the basis for the traffic ills which now beset the city, and it is sincerely believed that the wise and impartial application of these recommendations will cure these ills and insure greater freedom of movement with less delay and greater safety for many years to come. While it is true that there may be some slight inconvenience to a few, and that these few will form an obstructive block of opposition through selfish reasoning, far-sighted officials who in their wisdom must administer the business of the city for the common good will find that the resulting benefits will far outweigh these slight inconveniences.

ASHMAN CIRCLE BUSINESS AREA

MAIN STREET BUSINESS

PLATE 1

TRAFFIC ACCIDENTS

Traffic accident experience on the streets of a community plays an important part in a good traffic study, since accidents are a wasteful by-product of an inefficient street system. This accident experience gives conclusive evidence of the manner and degree of inefficiency at which the street system is operating and gives a fairly accurate indication as to whether the Police Department is functioning in the area of greatest traffic need. It also reflects the attitude of citizens towards the operation of existing traffic control devices and traffic ordinances. The street system in a modern city of today must be safe as well as efficient. To accomplish this, a well designed and properly maintained accident reporting and record system must be established. The availability of such information to public officials will generally provide the needed momentum to acquire needed street and traffic betterments.

An extensive investigation was made into the accident experience for the City of Midland; and, as a result, many important facts were brought to light which served as an excellent foundation upon which recommendations in this report could be made.

Method of Reporting

The City of Midland has been found to be very well equipped to handle the task of reporting traffic accidents and keeping a record system which can produce valuable information in a short time. The Uniform Accident Report Form is used in reporting all accidents. This form, when properly filled out, provides information which is not only sufficient from a legal standpoint, but gives an excellent basis for planning a program of accident prevention. The use of this standard form makes it possible to compare accident experience in Midland with that of other cities in the state and thus gain valuable information as to the effectiveness of its system. The accident records are kept in a file which makes it possible to keep a running account of the locations of especially high accident experience and should prove very helpful to the police in directing their enforcement into the areas of greatest need. In this manner, the greatest benefits can be gained for a given amount of effort.

Accident Statistics

Accidents in the City of Midland have shown a definite rise in the years between 1954 when 559 accidents were reported, and 1957 which had a total of 703. In this period the increase amounted to slightly over 20%. At the same time, the entire state showed an increase of a little over 3% when accidents rose from 185,534 in 1954 to 191,915 in 1957. It is true that during the same period the City of Midland has experienced a huge growth which resulted in an increase of vehicle miles traveled and motor vehicle registration. This fact notwithstanding, the record serves as a grim reminder that in this period two people were killed on the streets of Midland and 15% of the accidents resulted in injury to 113 people.

In 1958, the rate of accidents per 1,000 vehicles registered in Midland is 38. This is somewhat lower than the statewide average and is an indication of how Midland stands in relationship to other cities of comparable size. The

state had 177,934 accidents with 1,375 deaths and 57,767 injuries for 1958. Loss through traffic accidents in Michigan for 1958 amounted to nearly a quarter billion dollars. To this must be added the loss through misery and suffering caused by injury or death. This human element which cannot be measured in dollars and cents serves to emphasize why every effort must be put forth to reduce this staggering total. Table I shows the accident experience and vehicle registrations in Midland over the last five years.

As a means of finding ways to further reduce the accident rate in Midland a detailed study of accident records and reports was made for the years 1957 and 1958. There was a reduction of 29% in 1958 totals as compared to 1957 which was quite spectacular since it amounted to twice the reduction of statewide totals. Enhancing this record even further is the fact that there was a reduction of approximately 50% in the total number of people injured. This also reflects itself in another statistic which shows that 5% less accidents caused personal injuries than in the previous year. The fatal accidents dropped from 3 in 1957 to 2 in 1958. Plate 2 shows the accident experience and severity in Midland from 1954 to 1958. The high in total accidents was reached in 1957 when there were 703 accidents. The greatest number of injuries was recorded in 1954 with a total of 146.

Table II shows a tabulation of the types of violations by drivers in reported accidents in 1957 and 1958 which clearly brings out the fact that in nearly every accident there is some violation of driving rules of the road. This tabulation shows the areas in which more effort will have to be made if there is to be any appreciable lowering of the accident rate.

The greatest number of violators are found in the 'Failure to Yield Right of Way' category which accounts for 47.2% of the total. Most of this is, of course, attributable to the drivers themselves, but at some of the intersections the signing and other controls are poor and so the city itself must share in this responsibility. These locations will be discussed in other sections of the report. Recommendations will be made to rectify the conditions and circumstances creating the accident potential.

'Failure to Stop in the Assured Clear Distance' was found to be second in the group of highest number of violations. This is caused by drivers following too closely in most cases and is an indication that they are either not paying attention or they are driving in quarters too close for their perception and reaction time. These people can only be helped by changing their present attitude and habits by a program of driver education and safety which will make them more cognizant of their limitations and impress upon them the desirability of driving in a safe and orderly manner. This group of violators was responsible for 32.4% of the total.

Speeding and driving faster than conditions permit were also a factor in contributing to the accident toll. In 5.2% of the accidents, it was found that violation of the posted or statutory speed was the cause of the accident. While the speed checks taken on the streets of Midland did not reveal any abnormal tendencies of the drivers to exceed the appropriate limits, there were enough violators to indicate the need of maintaining a good speed enforcement program. The fact that 6% of the drivers involved in accidents were driving faster than conditions warranted shows lack of good judgment on the part of these people, and that they will also have to be reached in this same program of public education and instruction as mentioned previously. Since the acci-

Table I

City of Midland

TRAFFIC ACCIDENTS AND VEHICLE REGISTRATIONS

Year	Property Damage	Personal Injury	Total Accidents	Vehicle Registrations
1954	413	146	559	10,997
1955	504	131	635	11,542
1956	529	117	646	12,355
1957	567	136	703	13,409
1958	423	73	496	13,131
Total	2,436	603	3,039	61,434 *

* Vehicle registrations in this five year period increased by approximately 10%. Rise state-wide in the same period is only approximately 13%.

PLATE 2

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

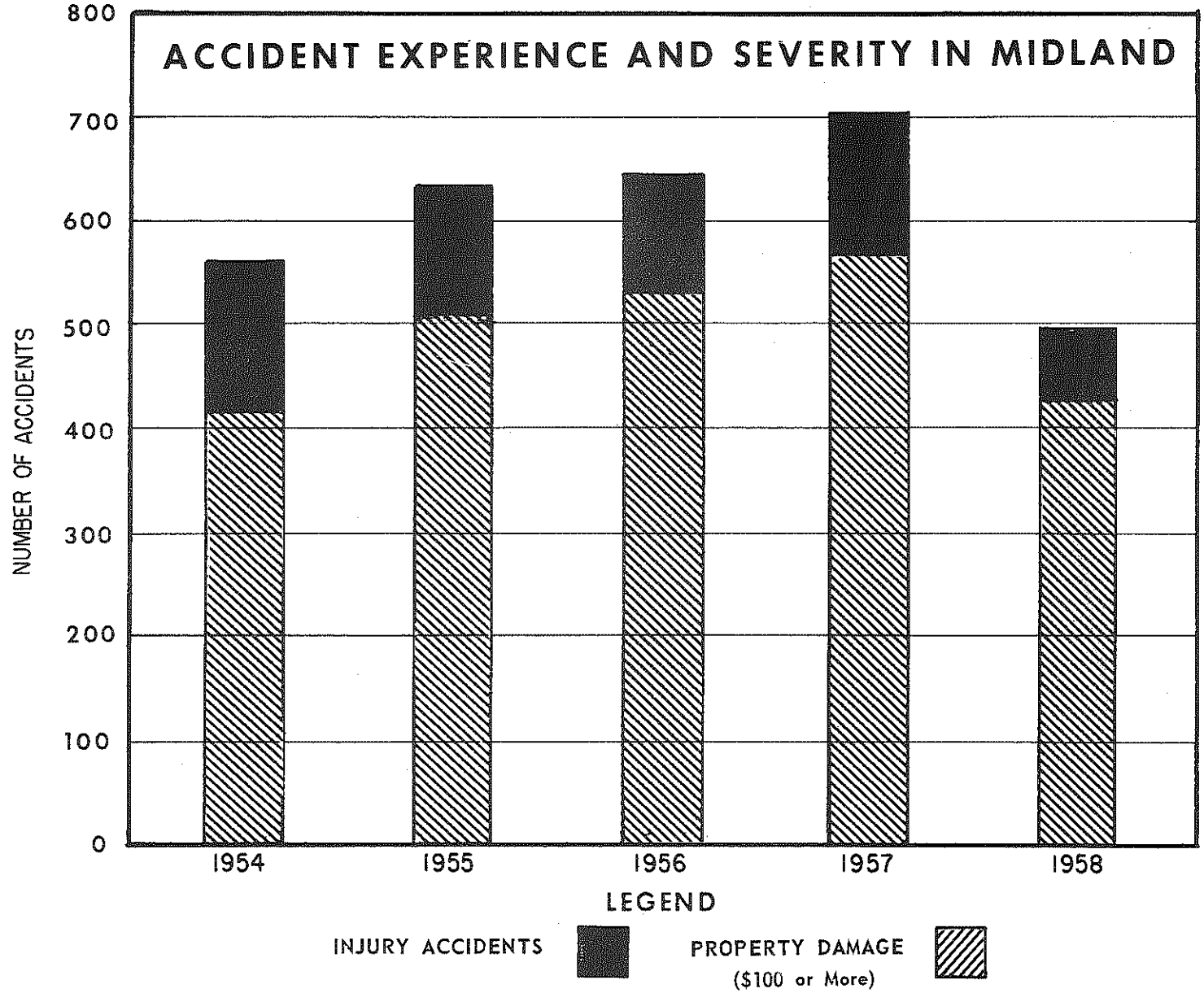


Table II

DRIVER VIOLATIONS INDICATED IN ACCIDENTS

Violation	1957		1958	
	No.	%	No.	%
Failure to yield right of way	264	37.6	235	47.2
Following too closely	269	38.2	161	32.4
Improper turns	21	3.0	6	1.2
Disobeyed traffic control	48	6.8	19	3.8
Improper passing	5	.7	17	3.4
Speeding	21	3.0	26	5.2
Drunk driving	9	1.3	15	3.0
Reckless driving	24	3.4	4	.8
All others	42	6.0	15	3.0
Total	703	100.0	498	100.0

dents caused by speeding constitute a small percentage of the violations causing accidents, the police department is to be commended for its activities in this direction. The number of speed summonses issued by the department is a further testimonial to their efficiency in this area.

Disobedience of a traffic control device was found to be the responsible factor in accidents to the extent of 6.8% in 1957 and 3.8% in 1958. The reduction for 1958 is another tribute to the efficiency of the police department. While this violation may be indicative of a poor attitude on the part of drivers towards traffic control devices, it may also be a definite indication that a careful study of existing traffic control devices in Midland is needed in order to insure that they have been properly installed and that their message is readily interpreted by the motorist In the course of the traffic study, examples were found of traffic control devices which would be obeyed better if they were more visible or if established standards were followed. The matter of providing good maintenance to these devices is also very important, since the installed effectiveness can often be reduced by weathering and other effects caused by aging. Uniformity of traffic control devices in size, shape and color will become mandatory in Michigan on January 1, 1960, and strict adherence is required. The Michigan Manual of Uniform Traffic Control Devices outlines the rules and procedures to be followed in maintaining a standard of uniformity in all traffic control devices. Although it is quite common to find public officials who feel they can improve on the existing standards, there are avenues open by which this can be accomplished. Much time and effort can be saved as well as public money by insuring the appropriate uses of these devices in their proper place.

Drunk and reckless drivers contributed to 3.8% of the violations involved in accidents. This figure is about normal and can be kept in restraint by vigorous enforcement and punitive court action. This is the most effective way of handling the driver who is guilty of these actions which lead to some of the most serious accidents.

Graphs shown on Plates 3 and 4 show conclusively the effect of sustained and rigid enforcement on the number of traffic accidents. Plate 3 shows the relationship between accidents and violations requiring court action for 1957 while Plate 4 shows the same data for the year of 1958. In the months which show the largest number of violation summonses issued, a correspondingly lower accident rate is also noted. This only goes to prove the fact that the driver becomes more acutely aware of the need to observe all driving rules when violation of such rules almost certainly leads to apprehension and punishment in court. Good enforcement for this reason is considered essential for the elimination of driver violations which is the basic cause of traffic accidents. It must be borne in mind that the regulations established to handle this problem must have sound reasoning behind them. Regulations should never be placed in effect for the purpose of creating revenue or to alleviate unproven fears. If regulations cannot be based on factual evidence, public confidence in them will be lost and the safety program can collapse from lack of support.

Table III shows violations for which summonses were issued. In comparing this table to Table II, it is easy to see that speeding receives the most attention from the police even though the accidents caused by speeding are not too common. The enforcement of this violation may have been very responsible for keeping this record good. It is also true that speeding is a rather simple violation to detect. Most drivers are prone to violate speed regulations in

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

1957 ACCIDENTS AND VIOLATIONS IN COURT

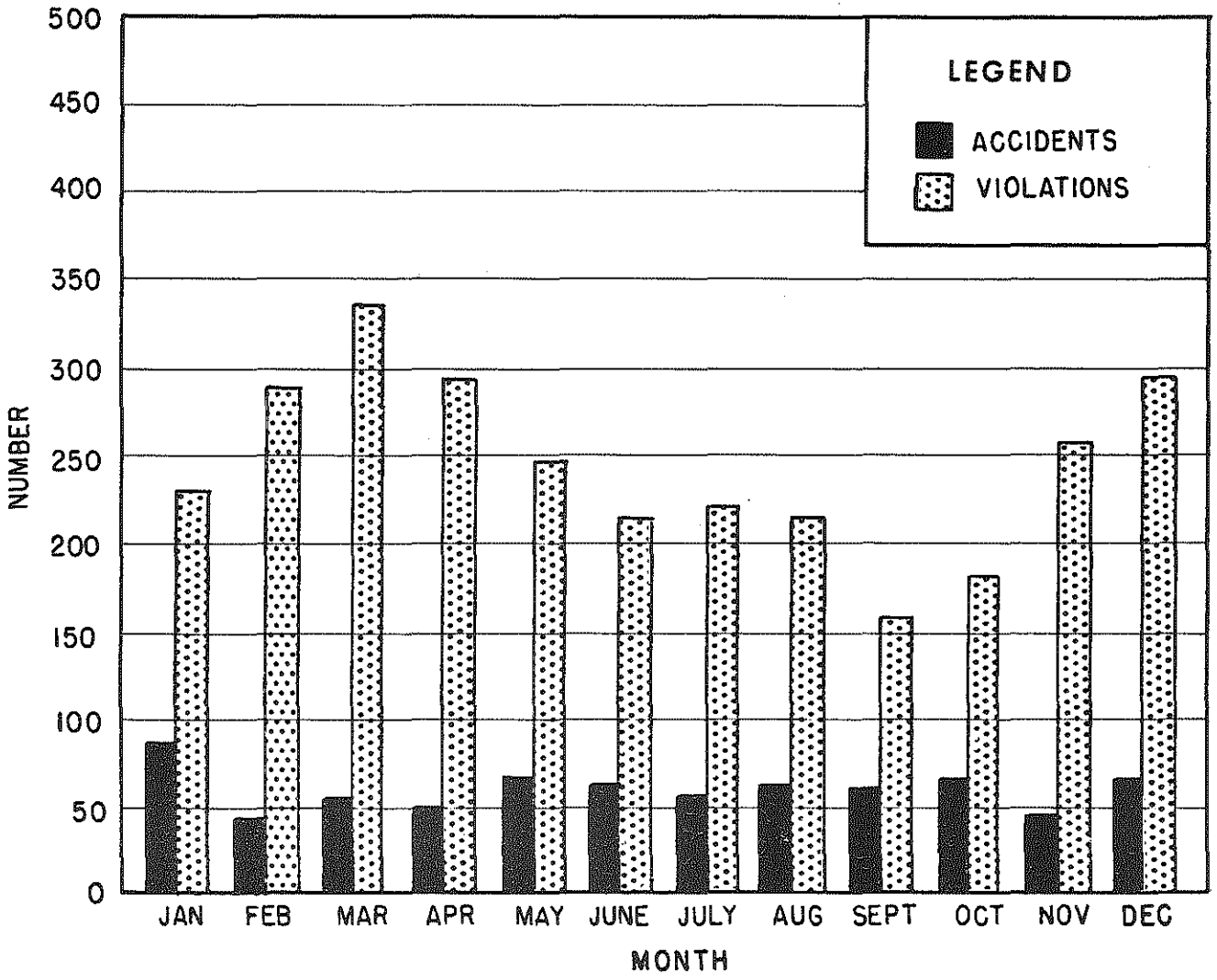


PLATE 3

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

1958 ACCIDENTS AND VIOLATIONS IN COURT

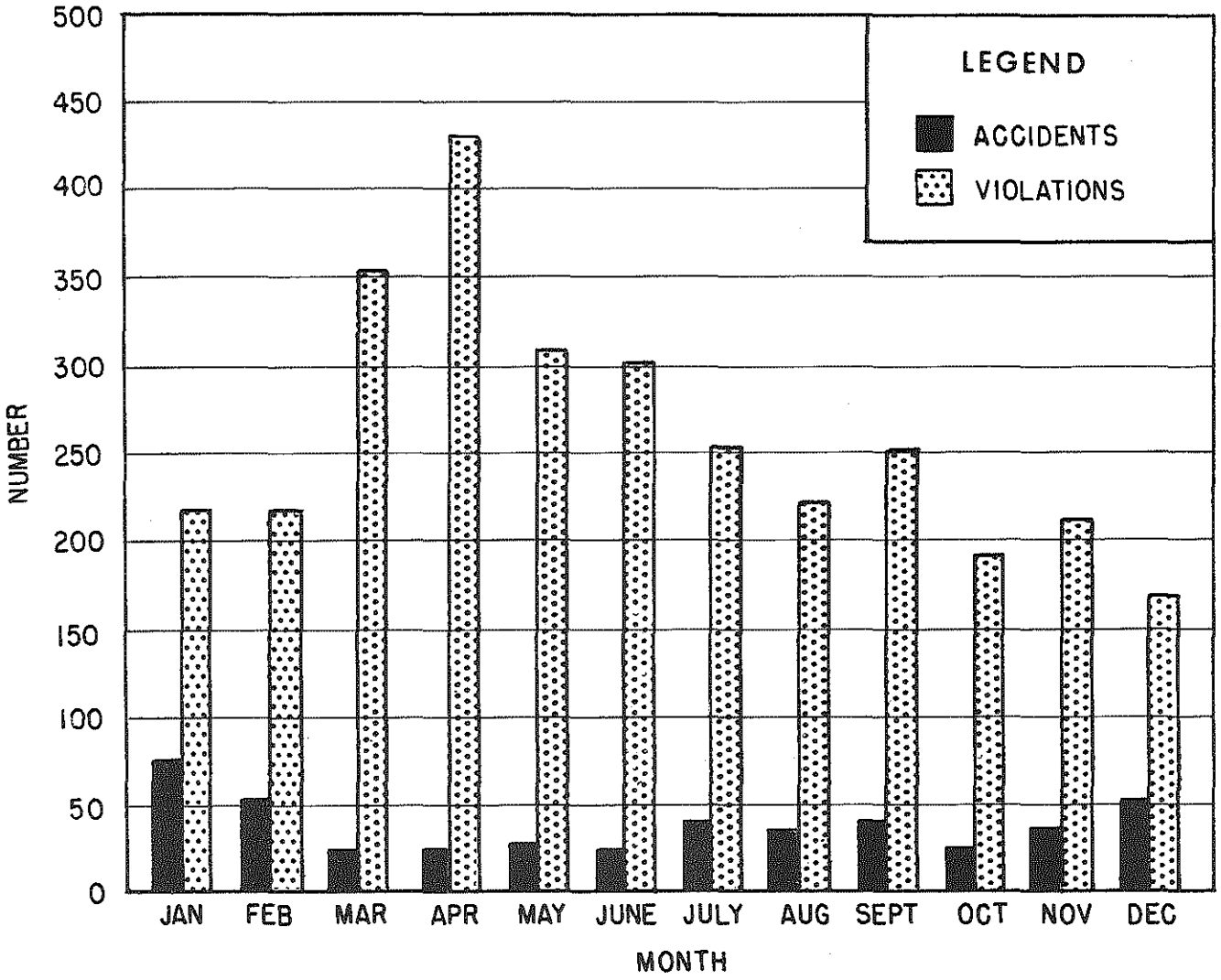


PLATE 4

Table III

VIOLATIONS FOR WHICH SUMMONSES WERE ISSUED

Violation	1957		1958	
	No.	%	No.	%
Failure to yield right of way	317	10.8	277	8.9
Following too closely	287	9.8	187	6.0
Disobeyed traffic control	428	14.6	543	17.5
Improper turn	81	2.8	49	1.6
Improper passing	45	1.5	57	1.8
Speeding	794	27.2	988	31.8
Drunk driving	57	2.0	58	1.9
Reckless driving	46	1.6	29	.9
All others	869	29.7	920	29.6
Total	2,924	100.0	3,108	100.0

Note: The increase of 8% in summonses issued in 1958 over the number issued in 1957 is directly reflected in the 29% decrease in the accident toll.

moments of carelessness, while other traffic violations are more deliberate.

Table IV shows the incidence of accidents by hours of the day and an observation of this table will reveal that the hours of heavy traffic accident incidence are also the hours of highest traffic volumes. Over half of the accidents which occur in the entire day happen during rush hours. This is clear evidence that the maximum amount of efficiency can be obtained from police enforcement activity concentrated in these periods. By utilizing police personnel to manually direct traffic during rush periods, they can serve the dual purpose of deterring motor vehicle violations by their presence and also be useful in directing traffic for the relief of congestion and the elimination of unnecessary delay.

The frequency of accidents by days of the week is shown in Table V. This table shows that over one-half of the accidents occurred during the last three days of the week. This again proves the natural relationship which exists between the frequency of accidents and traffic volumes. The heaviest concentration of enforcement activity should be aimed at these periods.

The month in which accidents occurred was also studied in an attempt to find factors which might lead to a reduction in the total. Table VI shows this data. Midland conforms to the normal traffic accident pattern inasmuch as the highest accident rate is found in those months when driving conditions are poor due to adverse weather and pavement conditions. The four months between October and March are the most hazardous to Midland drivers. An effort was made to determine whether the physical condition of the streets contributed to the accident experience. Although a certain portion of the accidents was attributable to slippery conditions, this condition was not deemed too serious. It is found that drivers are getting into trouble by not exercising proper judgment under adverse driving conditions. It will be necessary, however, to continue the present winter maintenance program at a high level of efficiency, so that winter driving conditions will not become a greater menace.

Ages of drivers involved in accidents were examined to determine how Midland compared with other cities of comparable characteristics. This investigation served to show the value received from the sound program of driver education in the Midland School System. Over the years it has been found that the age group 18-25 had the highest accident experience. In most cases, this group contributed up to as high as 50% of the totals, but it has been noticeable in the last few years that in cities in which a program of driver education has been conducted, this trend has leveled off and the accident experience has been more evenly distributed over the entire group between 20 and 60 years of age. Midland presently has a safety program directed at the younger students in the school system and continuing effort should be made in this direction to indoctrinate the younger student with the principles of traffic safety before he reaches the age when he will become a driver. This not only helps him as a driver but makes him more safety conscious as a pedestrian. In 1958 eleven pedestrian accidents resulted in personal injuries. If a sustained effort is made to educate people to drive and walk safely, this segment of the accident picture can be almost completely eliminated in a short time.

The accident records reveal that the majority of the drivers involved in accidents on the streets of Midland reside in the immediate vicinity. A total of 545, or 55% were residents of the City of Midland, and an additional 161 or 17% from Midland County. From these figures we can readily see what effect a

Table IV

ACCIDENT OCCURRENCE BY HOUR OF DAY

Hour	1957	1958
12:00AM - 1:00AM	19	10
1:00AM - 2:00AM	10	5
2:00AM - 3:00AM	13	5
3:00AM - 4:00AM	4	4
4:00AM - 5:00AM	4	4
5:00AM - 6:00AM	1	1
6:00AM - 7:00AM	4	1
7:00AM - 8:00AM	59	23
8:00AM - 9:00AM	37	27
9:00AM - 10:00AM	29	16
10:00AM - 11:00AM	24	17
11:00AM - 12:00 Noon	45	33
12:00 M - 1:00PM	39	39
1:00PM - 2:00PM	31	29
2:00PM - 3:00PM	29	28
3:00PM - 4:00PM	55	38
4:00PM - 5:00PM	112	65
5:00PM - 6:00PM	74	58
6:00PM - 7:00PM	29	27
7:00PM - 8:00PM	20	18
8:00PM - 9:00PM	12	11
9:00PM - 10:00PM	13	11
10:00PM - 11:00PM	21	16
11:00PM - 12:00PM	19	12
Total	703	498

Table V

ACCIDENT OCCURRENCE BY DAY OF WEEK

Day of Week	Property Damage		Injury		Total	
	1957	1958	1957	1958	1957	1958
Sunday	38	44	21	11	59	55
Monday	84	44	22	16	106	60
Tuesday	68	55	15	4	83	59
Wednesday	72	63	12	10	84	73
Thursday	97	73	28	11	125	84
Friday	106	72	27	8	133	80
Saturday	102	72	11	15	113	87
Total	567	423	136	75	704	498

Table VI

ACCIDENT OCCURRENCE BY MONTH OF YEAR

Month	Injury Accidents		Persons Injured		Fatal Accidents		Total Accidents	
	1957	1958	1957	1958	1957	1958	1957	1958
January	10	9	16	12	0	0	84	80
February	7	11	10	16	0	0	43	55
March	13	3	16	3	1	1	53	27
April	11	1	15	1	0	0	49	26
May	13	6	15	13	1	0	65	30
June	9	8	11	12	0	0	60	28
July	12	9	20	9	0	0	55	45
August	10	5	28	8	1	0	62	38
September	12	6	18	9	0	0	57	43
October	19	1	35	4	0	1	64	29
November	8	11	14	21	0	0	46	41
December	9	3	14	5	0	0	65	56
Total	136	73	212	113	3	2	703	498

forceful campaign for traffic safety would have on people living in this area which can be so easily reached through existing information dispensing media. A program of this kind put on by the schools, churches, service clubs, radio and newspapers would effectively reach everyone. If such a campaign had been conducted in the past, it is safe to say that many of the accidents which occurred could have been eliminated because these people would have been forcefully indoctrinated with the necessity of following the rules of good driving.

Records are no longer kept of property damage accidents which involve damage under $100. For this reason, accidents caused by parking maneuvers are usually not reported unless they involve damage over this amount, or a personal injury. It can be safely assumed, however, that at least 30% of the minor or nuisance accidents in the business district have a parking maneuver as a basic cause. This parking maneuver adds to the congestion and creates an unsafe condition for vehicles in the lanes of travel. The incidence of this type of accident is another indication that the curb side parking must give way to better use of the existing street area, and off-street parking must be instituted in its place. Parking in off-street lots is safer since it separates slow moving traffic seeking parking space from the faster thru traffic.

Angle parking is a particularly heavy contributor to the accident toll and should be prohibited. This type of parking makes it necessary for the driver to back out of the parking stall with little, and in many cases, no vision whatsoever of oncoming traffic. This danger is much greater at and near intersections where traffic turning into the street would have no warning of a vehicle backing out of a parking stall and could easily become involved in a dangerous situation. Contrary to popular belief, this type of parking is a very inefficient method of utilizing street space. It requires a greater portion of the total width to be taken up in the storage of vehicles as well as requiring more maneuver space for entering and leaving the stalls. While this is acceptable in the off-street lot, it cannot be tolerated on streets already overburdened with traffic. The principal locations which need remedial measures are in the two blocks on Larkin Street and the area in front of the church on Gordon Street between Larkin and Ellsworth. Angle parking is taking place at business establishments in other areas on streets where no curb exists. These areas may be taken care of by use of signing to require parallel parking only.

Congestion must also be removed from the streets if a better safety record is to be established. While it is true that a congested street keeps speeding to a minimum, it also follows that this street contributes to the hazard by making drivers and pedestrians impatient, and prone to take chances they ordinarily might not take. A well regulated street will better serve to move traffic expeditiously and safely. If neither of these two elements is present, it is a certain indication that serious trouble exists.

Accidents occurring at intersections in Midland accounted for approximately 61% of the total accident toll. While it can readily be said that intersection accidents can have many underlying causes, the biggest single factor is the failure of one or more drivers to yield the right of way. In many cases, there is no clear-cut indication at the intersection as to which direction has the right of way. There are two signs which were designed to assign right of way to a particular direction at an intersection. These are the "stop" sign and the "yield right of way" sign. Certain streets which are arterial in their operating characteristics should be given preference over intersecting

streets. In order to indicate this preference, "stop" or "yield right of way" signs should be erected on the approaches to such streets. The driver faced with these signs is obligated to give right of way to the driver on the protected street. Certain psychological characteristics of the driver must be considered in the placement of these signs. In too many cases, complaints from residents in a certain area become the warrant for the installation of these signs. Installation on such a basis may lull the driver into a "boobytrap" if he finds the street on which he is traveling protected by a stop sign at one intersection. He may anticipate the same treatment at the next intersection and if such protection isn't present, the makings of a bad accident are present. This only goes to emphasize the importance of placing "stop" and "yield right of way" signs on a planned basis.

The present state law makes it impossible to use the "yield right of way" sign on approaches to state trunkline highways, but legislation enacted a few years ago made this sign legal on all other streets. "Stop" sign control should be reserved for arterial streets, but intersections of local streets which have developed enough traffic to create intersection control problems, can receive considerable relief from the use of the "yield right of way" sign. There are many places where the assignment of right of way to the direction of heaviest travel can play a big part in the reduction of accidents.

Because of the necessity of giving the driver a definite right of way message at an intersection, the four-way stop is frowned upon. We say this with full realization that some authorities consider this a "double-barreled" safety measure. In too many cases, a driver assumes right of way after he has made his safety stop with disastrous results.

Vision obstruction at intersections should be eliminated as part of the plan for accident elimination. It is unfortunate that there are areas in the city where vision is obstructed by buildings which would be impractical or impossible to remove, but this does not mean that the mistakes of the past should be allowed to recur in the future. Zoning ordinances must be effected and used to regulate this phase of the problem. Intersections having this type of problem can be aided by the use of proper controls, but their use should be looked upon as only a partial remedial measure.

Other types of obstructions such as landscaping which finds high hedges and/or low hanging tree branches causing sight obstruction, as well as billboards and other advertising material placed at intersections, are a direct contribution to the accident experience. It is not unreasonable to expect those responsible for these obstructions to remove them in the interest of public safety and welfare. Strict enforcement of ordinances now covering such hazards will be necessary if this type of hazard is to be eliminated.

Vision obstruction caused by parked vehicles is made specifically illegal by law which sets up definite distances inside of which no parking is permitted to encroach upon clear vision at intersections. Plate 44 in a later section of the report shows a layout for a typical intersection and the manner in which signs should be placed to handle the requirements of traffic. It is recommended that a careful check be made to determine if there are areas in which parking should be controlled to prevent a sight obstruction. Neighborhood grocery stores and drive-in establishments have been generators of this hazard and should be checked periodically.

Collision diagrams have been made for some of the higher accident intersections and show the number and direction of movement of vehicles and pedestrians involved in accidents. Plates 5 to 11 are collision diagrams of some of the high accident locations in Midland. Use of this type of diagram, when properly analyzed, gives us an indication of what is happening and reveals some of the underlying causes of the accidents as well as pointing out means which may be used to eliminate them. Recommendations made in this report have in part been made as a result of information brought out in these collision diagrams. It is felt that it would be a valuable help to the city if collision diagrams were prepared for the ten highest accident locations in the city each year so that some positive prevention measure could be taken at each location. The object would be to work toward removing these locations from the list in the subsequent year.

Recommendations

The Police Department in the City of Midland presently makes partial use of the accident spot map as an aid in accident prevention activities. A cumulative annual accident spot map is presently maintained on which are shown the fatal, personal injury, and property damage accidents by use of colored pins with various symbols. It is felt, however, that greater good can be accomplished if this is supplemented by use of additional maps in the spot map system as follows:

1. Work Maps

Smaller in size than the annual map, placed on wall leaves with one map for each change in personnel strength or one map for each four hour period of the day. They should contain accident experience for a three months period. Shape of a pin can be used as a legend for the type of accident and color for the type of violation. An additional map of the same size and time limitations and legend for violations should be used to record enforcement pressure and thus provide a comparison with the accident experience for these periods and will prove a valuable aid in assisting officers to direct their activities into the areas which need it most.

2. Special Spot Maps

There are many records that might be maintained and some that are already being used by the City of Midland which are of value only if the experience warrants their being kept up. Also, it must be recognized that they will only be of benefit if the information they provide is actually used rather than just being so much window dressing. Some of these are: a) week-day-experience, b) week-end experience, c) pedestrian accidents, d) residence of driver, and e) residence of pedestrian.

There should be close cooperation by the police with the safety education program which will make the public more traffic safety conscious and teach proper driver and pedestrian habits as well as help build support for the traffic control measures. They can best serve this program by providing the accident facts necessary for this education program and aid in the actual conduct of the activities of the program.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF SAGINAW AND EASTMAN ROAD

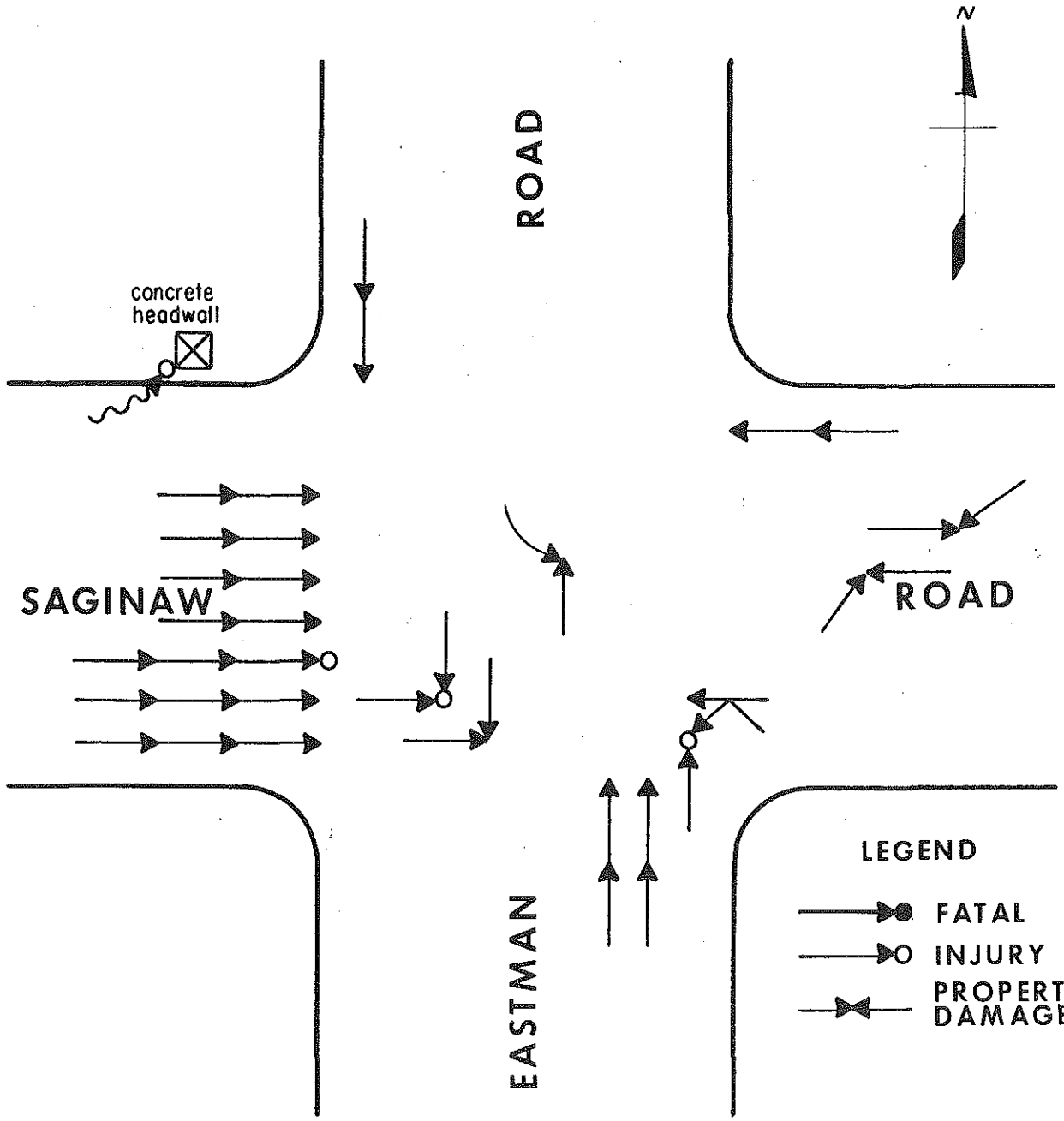


PLATE 5

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF SAGINAW RD. AND SUGNET

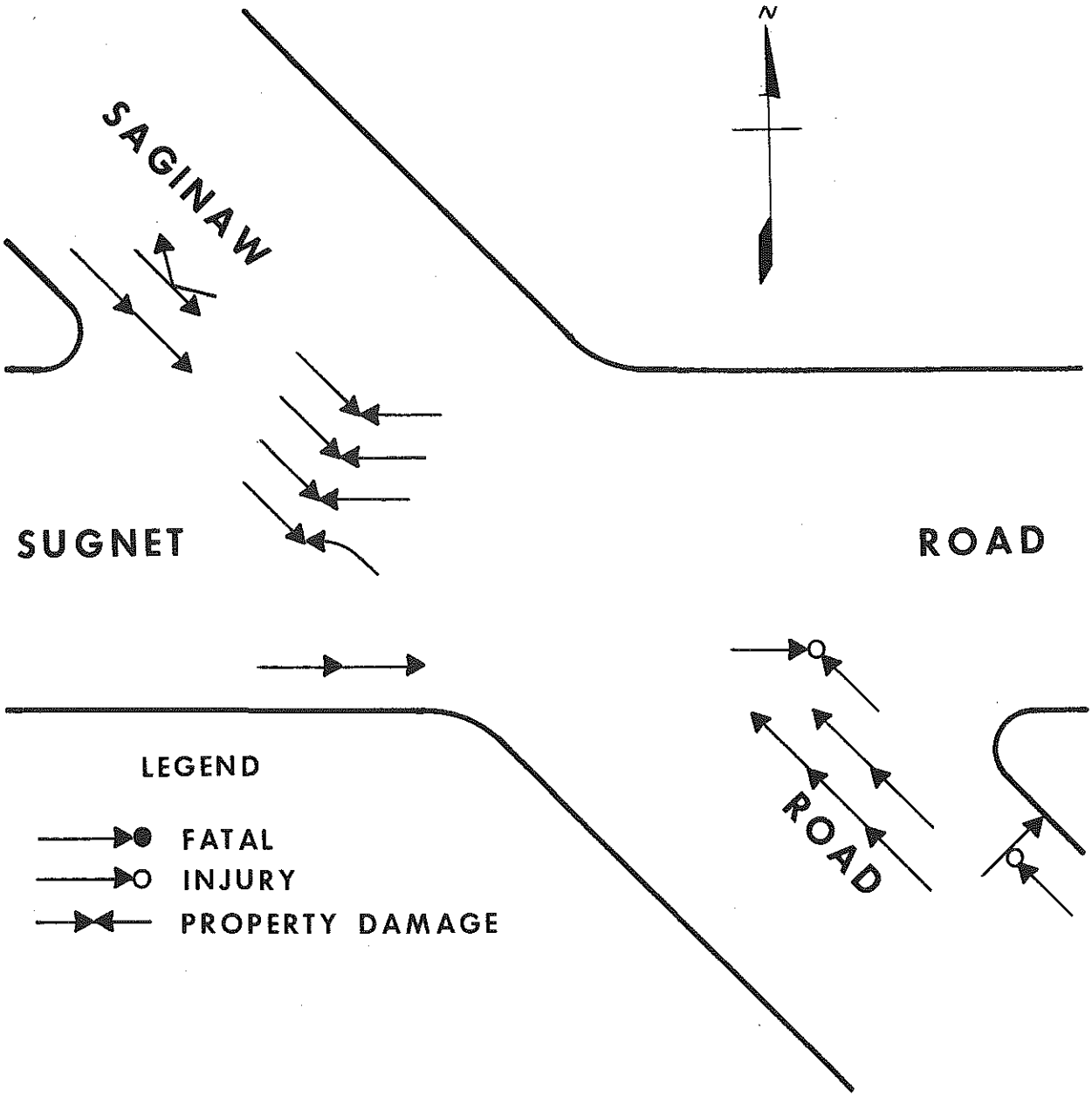


PLATE 6

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF SAGINAW RD. AND DARTMOUTH

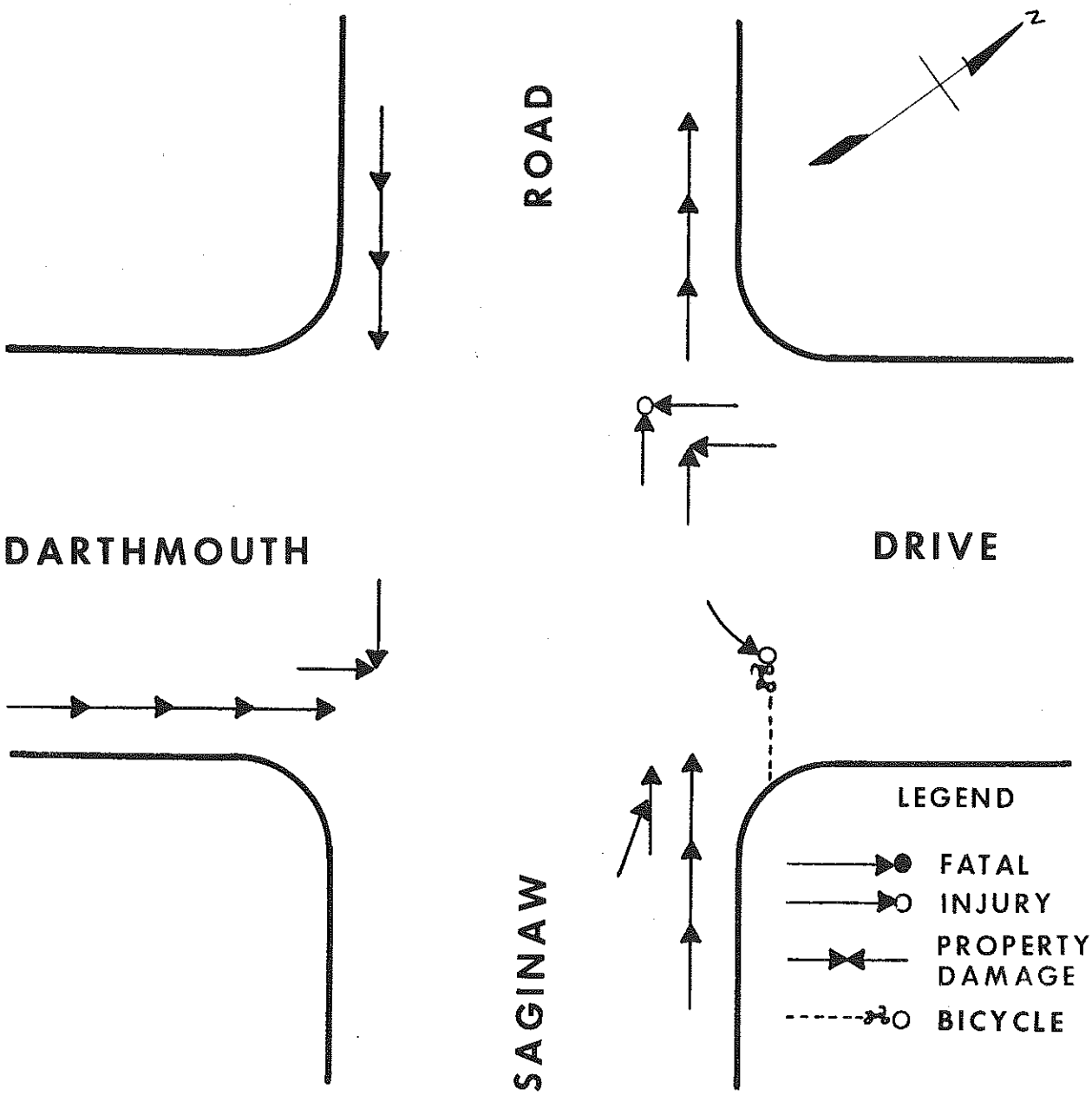


PLATE 7

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF SAGINAW RD. AND EASTLAWN

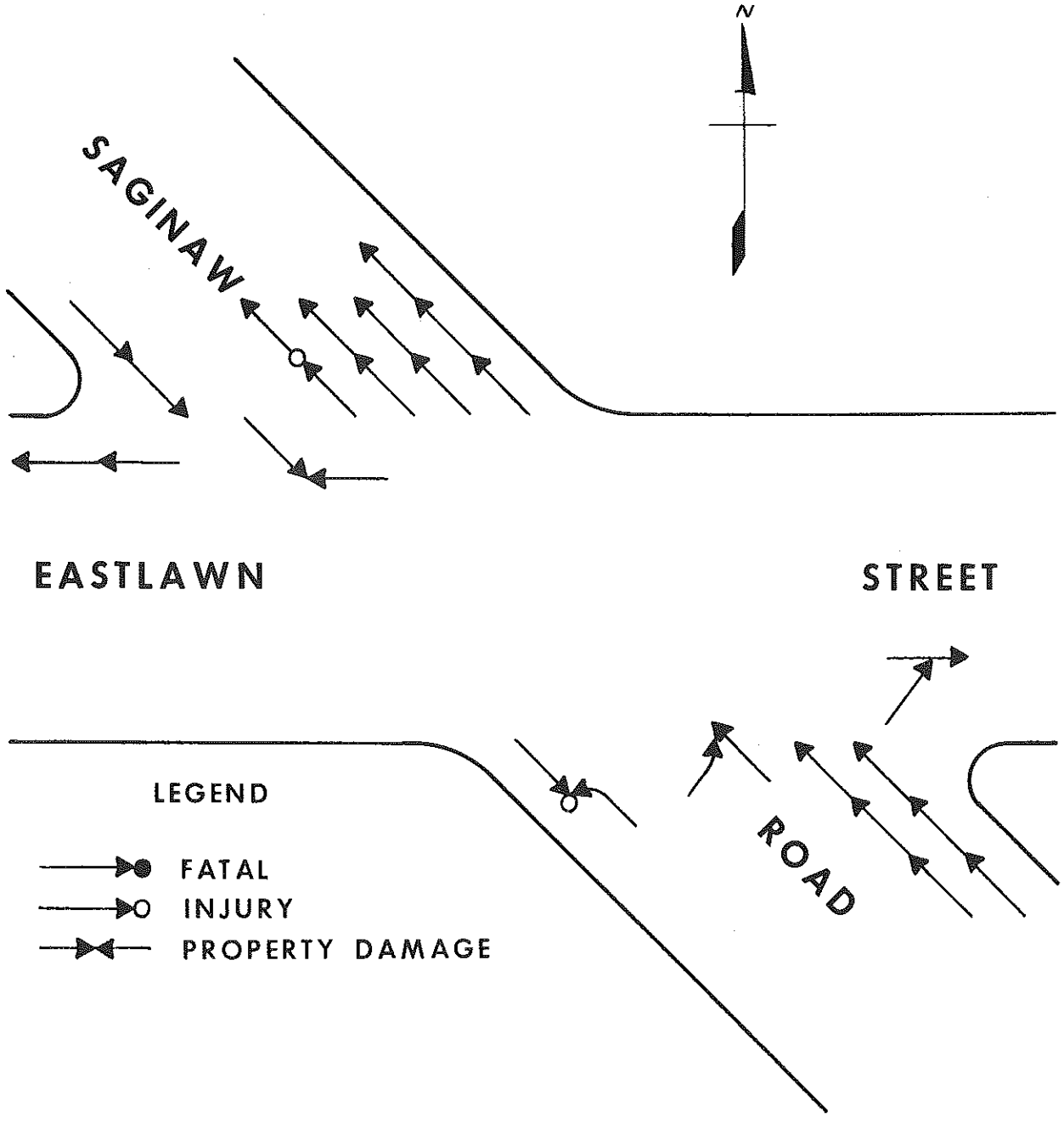


PLATE 8

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF SAGINAW AND BAY CITY ROAD

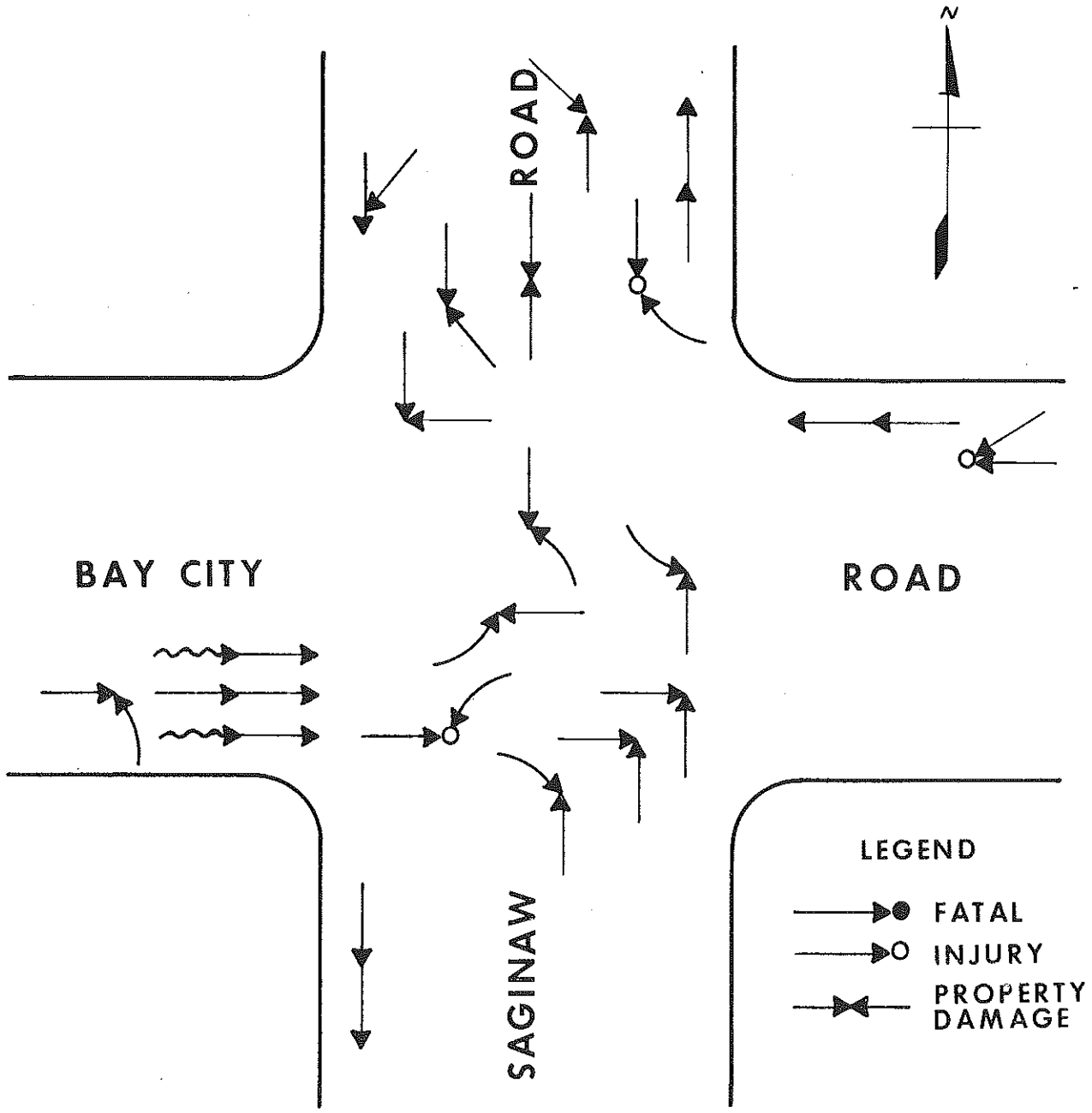


PLATE 9

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF BAY CITY RD. AND WASHINGTON

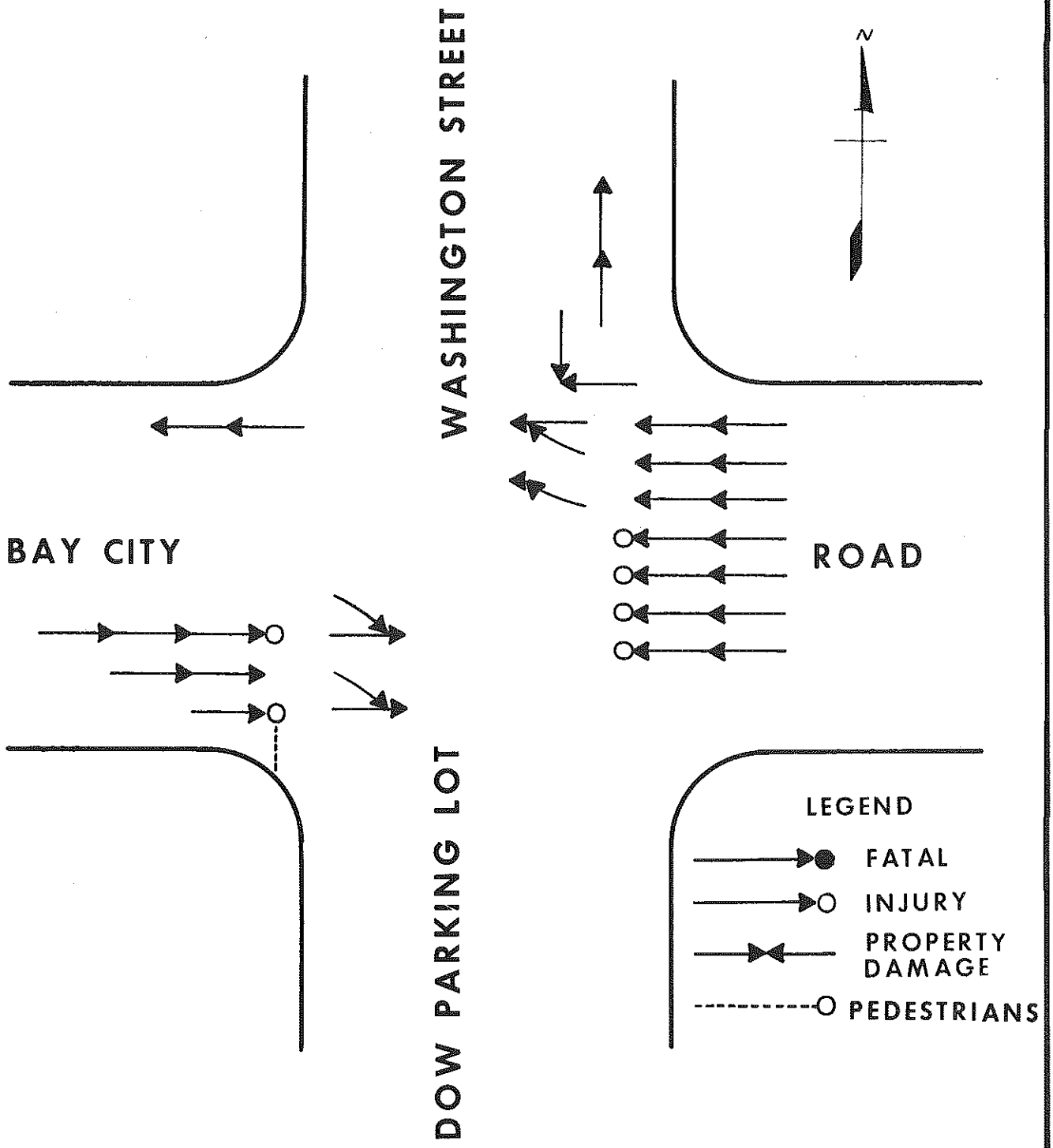


PLATE 10

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

COLLISION DIAGRAM

INTERSECTION OF ASHMAN AND INDIAN

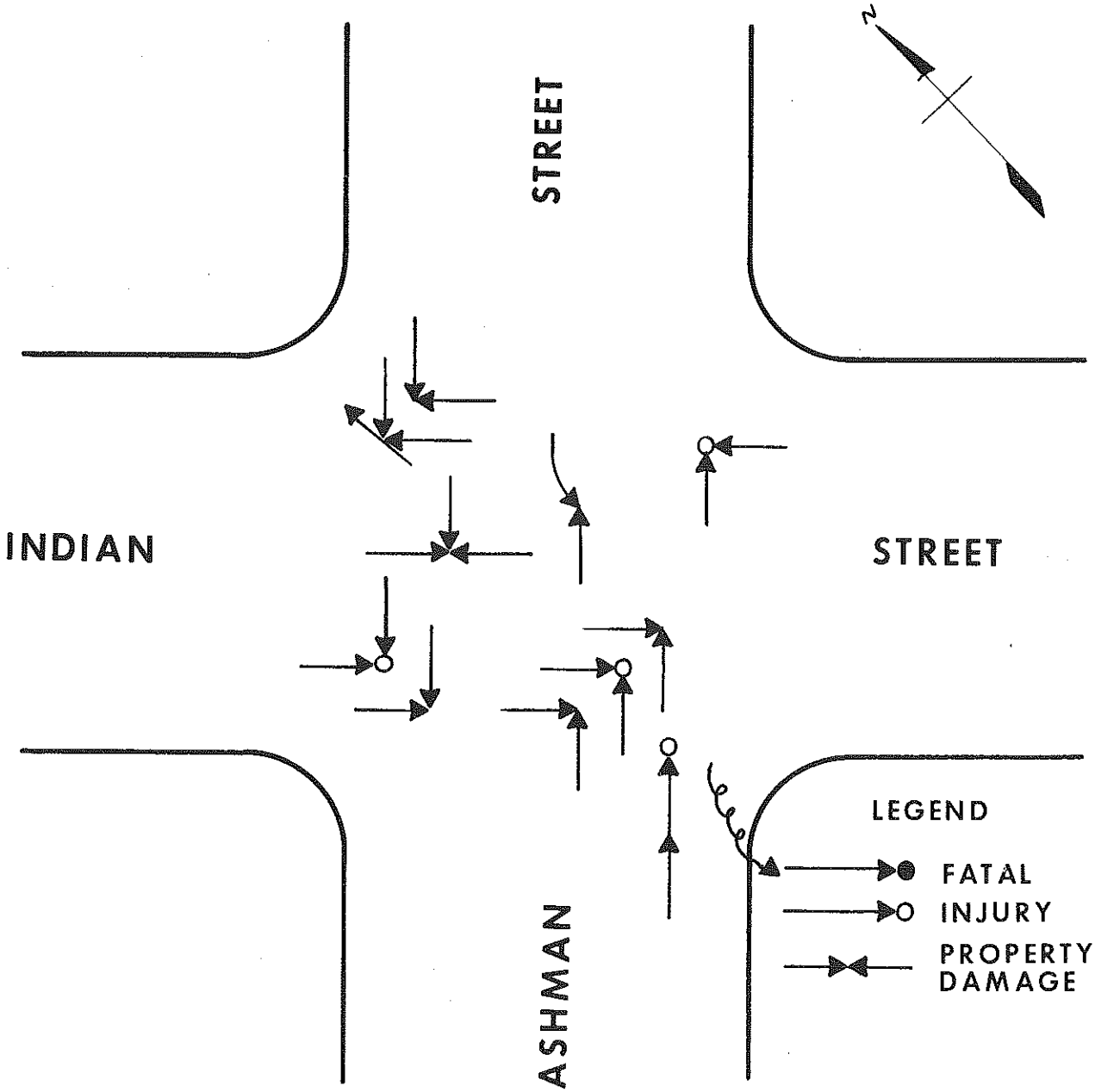


PLATE 11

Selective procedures in safety education as well as use of general propaganda training in traffic should be provided for all personnel assigned to traffic duties. Attendance of the supervisory personnel of the Police Department at regional or national police training schools which meet the standards of the International Association of Chiefs of Police can be a valuable contribution to a more efficient handling of traffic matters. Periodic refresher courses at spaced intervals are highly desirable.

School safety should be met by school officials by instituting a program of continuing safety education and project work as a part of the regular curriculum as approved by the National Education Association and existing state legislation dealing with such instruction. Use of schoolboy patrols at street intersections and on school busses also should be put into effect. A Junior Safety Council should exist in every school to carry on the program of traffic safety through extra curricular activity, with liaison maintained with the police on current traffic problems which have been determined through analysis of experience data.

The driver training program should be maintained and expanded. Qualified instructors should be provided for not only the children who have come of driver age, but also those adults who desire or have need for the training.

A program of public safety education should be conducted on a continuing basis through the use of every available channel. Newspaper releases, mail, radio publicity and posters can be used effectively in this campaign. Use of films which have been prepared for this purpose is also advocated.

A Uniform Model Traffic Ordinance for Michigan, released by the Michigan State Police, is available for use in comparing ordinances in Midland with those recommended for use as standards of uniformity. Uniformity is an extremely important matter, since the driver who is a stranger to a city and its ordinances cannot be expected to be aware of local rules contrary to general practices. Uniformity will result in better driving behavior; and, by having a model ordinance already prepared, the City can save itself a lot of tedious work already performed by others.

PARKING

The Parking Problem

The motor vehicle transportation system is comprised of three principal elements which are: movement of the vehicle, the surface over which it travels and parking. The first two elements are needed in order to permit people to satisfy their desire to travel from one point to another. The third element is essential, since it is impossible to wave a wand over a vehicle upon completion of a trip and make it disappear. The vehicle must be accommodated in some appropriate manner. The solution of the problem cannot be accomplished at the expense of the free movement of traffic nor can expensive street construction be utilized which does not have economic justification. A balance must be maintained between the movement of traffic and the storage of vehicles if the economy of the city is to be preserved or enhanced. It is the purpose of this traffic study to show how this can be obtained with the proper emphasis on each segment of the problem.

It has long been recognized that a relationship exists between the adequacy of parking accommodations and the use of the automobile, with the direct results of this relationship manifesting themselves in retail trade volumes and real estate values. The problem of moving and storing vehicles within the central business areas is more than one of irritation to drivers and concern to business people. It is also an economic problem, for the central business district is proportionately by far the most important segment of urban areas. Here are concentrated high valuations from which a substantial portion of the city's income is obtained. Normally, such districts represent from 18 to 24 percent of the total commercially assessed valuation of the entire city. In Midland, it represents 21 percent of the total assessed valuation of commercial property. If the area becomes so congested that customers are forced to shop elsewhere, the values within the central area will depreciate to the extent that the entire tax structure of the community could be jeopardized.

Within the past few years, there has been a trend toward decentralization of commercial development in cities of nearly every size. This decentralization has seen the establishment of regional shopping centers located in outlying districts where ample off-street parking space can be provided. This trend has shown its influence in Midland where we have seen development of this type taking place.

Midland has certain unusual characteristics that indicate a need for more parking spaces, improved to a somewhat higher standard than would normally be required in cities of its population. These are: its proximity to a larger city and shopping area; the large proportion of the total employed group living outside the community; and the general terrain. The latter is a strong factor in influencing the direction and development of the business district itself.

The presence of the first of these two characteristics makes it especially important that desirable and adequate parking accommodations be made available as soon as possible in order that the people of this area will be encouraged to do their shopping within Midland. The study of the parking situation in this city has been made with the purpose of creating an attractive atmosphere for doing business as one of its objectives so that additional sales improvement and associated benefits will be realized.

While it cannot be said that Midland's existing parking facilities are totally inadequate, this study has disclosed many areas in which an improvement is necessary to more appropriately handle today's load as well as the increased demands which will certainly be placed upon it in the future. In Midland, like in other communities, the use of certain buildings and land has changed, and establishments, which once generated little or no traffic, now have become a heavy traffic generator in the form of a store, office or shop. When these heavy traffic generators are confined to a small area as in the central business district, the resultant demand for parking space becomes acute. Increases in vehicle registrations have occurred yearly in Midland County, rising from 14,923 in 1953 to 19,313 in 1958. This, coupled with the everyday use of the area, means more people drive into the center of the city and compete for parking spaces.

With these things in mind, an analysis has been made of the existing facilities and parking habits and recommendations are made to treat the problem effectively. Plate 12 shows the existing parking facilities, both curb and off-street in the downtown business area.

Employee Parking

One of the most revealing and interesting facts of the total parking problem is found in the investigation of the parking habits of a very important group of parkers which enters the downtown area. This group is made up of the owners and employees of the businesses in this area, and their parking practices are extremely important to the effectiveness of a parking program.

In order to obtain desired information on parking needs and practices, a questionnaire was distributed to all businesses with the request that it be filled out as accurately as possible to aid in the analysis of the parking problem. A total of 200 questionnaires were distributed and 161 usable returns were received. Some of the returns were incomplete, of no value, or did not apply and so were discarded. Conclusive evidence was shown of one solution to the problem which may be used to help give relief to the parking situation in the downtown business district.

The tabulation shown in Table VI lists distribution by various categories and breakdowns; and, from this tabulation we can readily see the effect each group of drivers has on the whole parking situation. The questionnaires accounted for the parking habits of 1,235 people employed as follows: 521, or 42% in stores; 284, or 22% in offices; and the remaining 430, or 36% in miscellaneous lines such as restaurants, taverns, etc.

The most important fact revealed by this information was that 964, or 78% of this group drove their own cars to work. It is an established fact that if people are not strictly regulated they will park in a place most conveniently located to their place of employment. Unfortunately, this places them in competition for parking spaces which are also the most desirable for use by customers of their own or adjacent establishment. As proof of this point, the study revealed that 64% or 616 of these people parked within one block or less of their place of employment. Of the remainder, 266 or 27% more were within two blocks; and only 92 or a scant 9% three or more blocks away. Of equal importance is the parking facility used by these people whether it be in a metered stall on the street or a company owned lot or in a municipal parking

PLATE 12

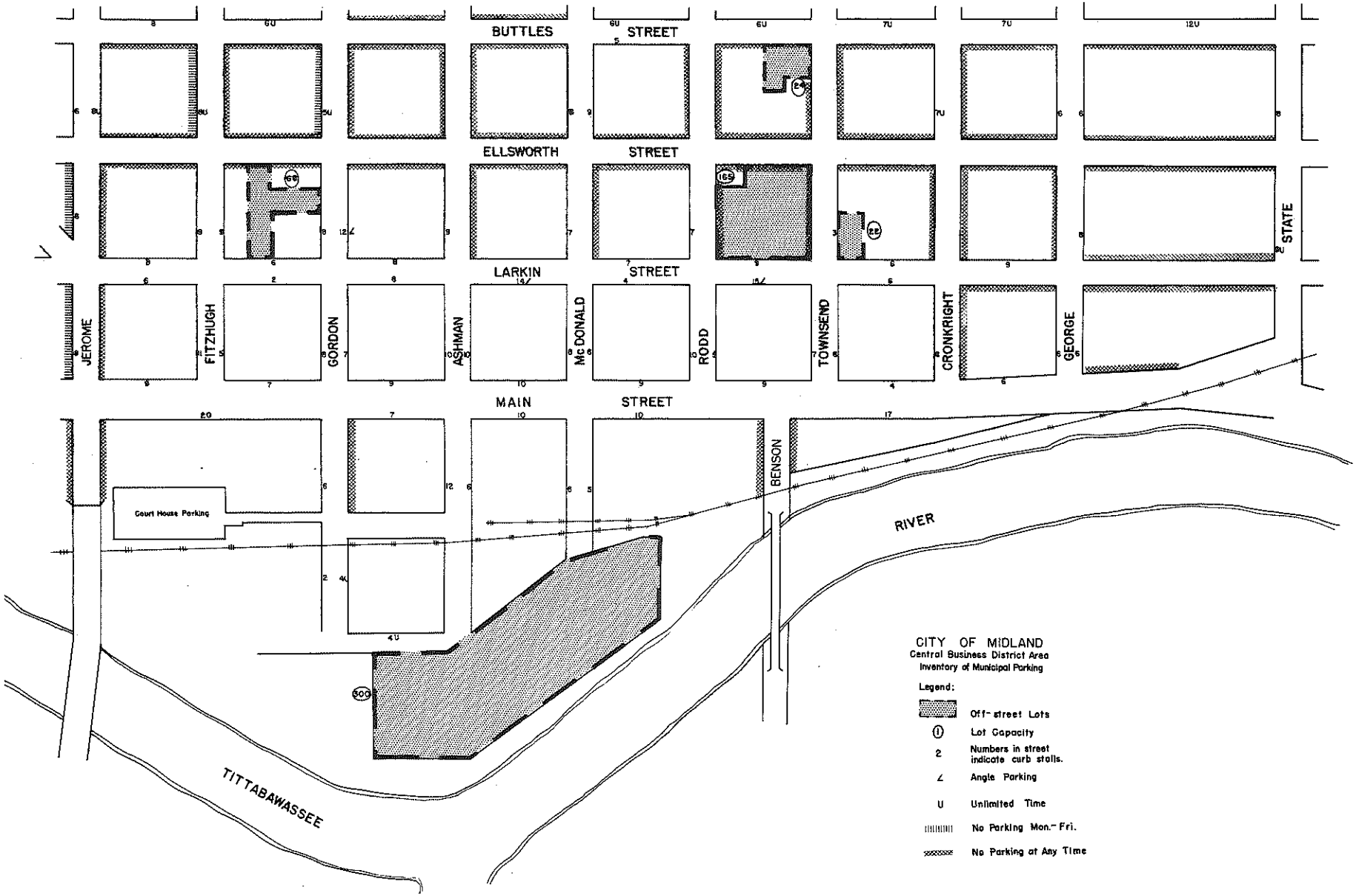

BUTTLES STREET
ELLSWORTH STREET
LARKIN STREET
MAIN STREET
JEROME
FITZHUGH
GORDON
ASHMAN
McDONALD
RODD
TOWNSEND
CRONKRIGHT
GEORGE
STATE
BENSON
Court House Parking
RIVER
TITTABAWASSEE
CITY OF MIDLAND
Central Business District Area
Inventory of Municipal Parking
Legend:
Off-street Lots
Lot Capacity
Numbers in street indicate curb stalls.
Angle Parking
Unlimited Time
No Parking Mon.-Fri.
No Parking at Any Time

Table VII

SUMMARY OF REPLIES TO EMPLOYEE PARKING QUESTIONNAIRE

Employment According to Type of Business

Type	Number	Percent
Store	521	42
Office	284	22
Other	430	36
Total	1,235	100%

Usual Method of Traveling to Work

Walk	78	5
Drive Own Car	964	78
Ride With Others	193	16
Total	1,235	100%

Where Car Is Parked

On-Street		
Metered Zone	51	5
Un-metered Zone	215	23
Company Owned Lot	343	36
Private Lot	89	9
Municipal Lot		
Metered	26	3
Un-Metered	240	24
Total	964	100%

Number of Blocks Between Parking Space and Work

One Block	616	64
Two Blocks	266	27
Three Blocks	69	7
Four Blocks	7	1
Over Four Blocks	6	1
Total	964	100%

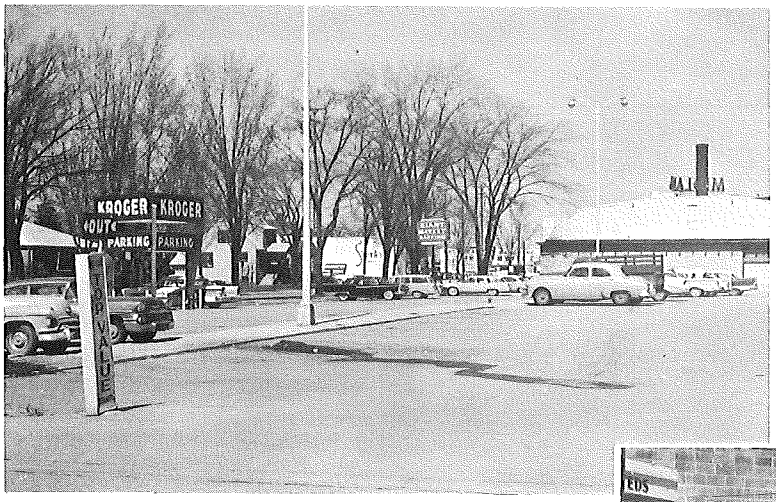
Total Questionnaires Returned	161
Estimate given by businessmen as to number of parking stalls required by their customers during peak periods:	1,747
Square feet of floor area devoted to retail sales:	354,095

lot. In Midland, it was found that curb-side, on-street parking was used by 266 or 28%; 432, or 45% in company owned or private lots; and the remaining 27% in Municipal lots.

An analysis of this information indicates the terrific impact this group has on the diminishment of parking facilities available to shopper-parkers in the downtown area. These people who actually contribute little or nothing to the overall economy and welfare of the area from which they derive their livelihood are, in effect, placing an unjust burden on this economy. With very little effort, a vast return in improved customer parking with a resultant increase in retail sales receipts could be realized. As an example; a total of 266 curb spaces are being occupied by these people when they could be used to far greater advantage at a greater turn-over rate by people doing business with stores in the area. If this number of spaces was made available to shoppers on the basis of average curb-space turn-over, which in Midland was found to be 5.4, an additional 1,436 shoppers could be parked on a daily basis. This is actually 83% of the number of spaces the businessmen themselves have estimated they would need to handle their customers during peak periods as shown in Table VI.

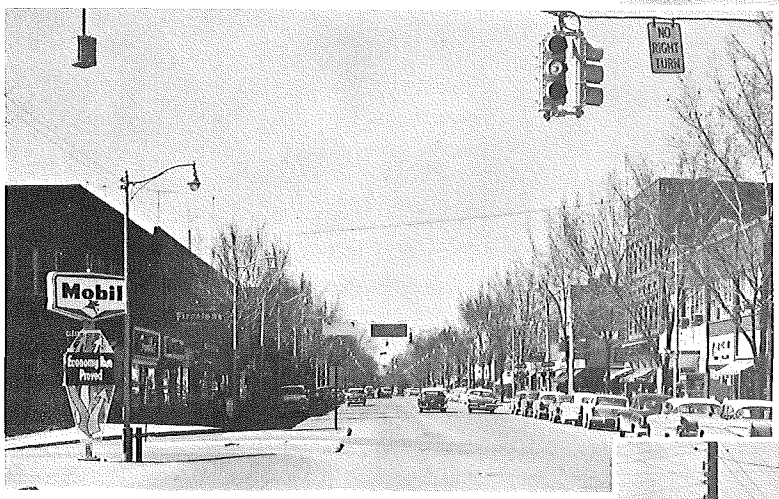
Employees naturally report for work before customers arrive in the downtown area and so assume first priority on the most desirable spaces. This fact has been borne out in the study which showed that 54% of the unmetered on-street curb spaces were found to be occupied before the time of opening in most businesses. At the same time, the municipal lots ideally located for employee parking but located further away from the area were found to be approximately 90% empty. These facts show very clearly that with some change in the parking habits and practices of the employees, a large number of choice parking spaces will be made available to customers in the central business area. National studies have shown that each parking stall in a downtown area can contribute $15,000 to $20,000 a year in retail sales.

Since the area presenting the greatest problem from the standpoint of parking difficulty was found to be the central business district, the greatest amount of survey effort was expended in investigating this area. However, other areas of substantial commercial development have also been carefully studied and appraised for parking operation. The Ashman Circle business section presents a problem involving parking. The investigation of this section showed that while there are certain times, which occur infrequently, during which the demand for parking space seems to exceed the supply, it is chiefly due to the fact that the parkers are not making best use of the existing lots. Parking on southwest Ashman street in the block immediately southwest of the Circle and on the driveway of the Circle itself presents a serious bottleneck to safe and expeditious movement of traffic, and should be eliminated. Plate 13 shows a picture of typical usage of the large parking lots in this area which can more than handle the added number of parkers now using the curb-side stalls if the proposed parking restrictions are placed in effect. The area directly behind the business places on the west side of the Circle is not developed to its highest potential and with very little effort and expense could be expanded and give added reserve space for parking. As in the downtown area, it was found in the study of this locality that several of the employees and owners of business establishments are making use of the most choice side spaces for all day parking. Here again is an area in which a simple change in parking habits can rectify and improve an undesirable condition.

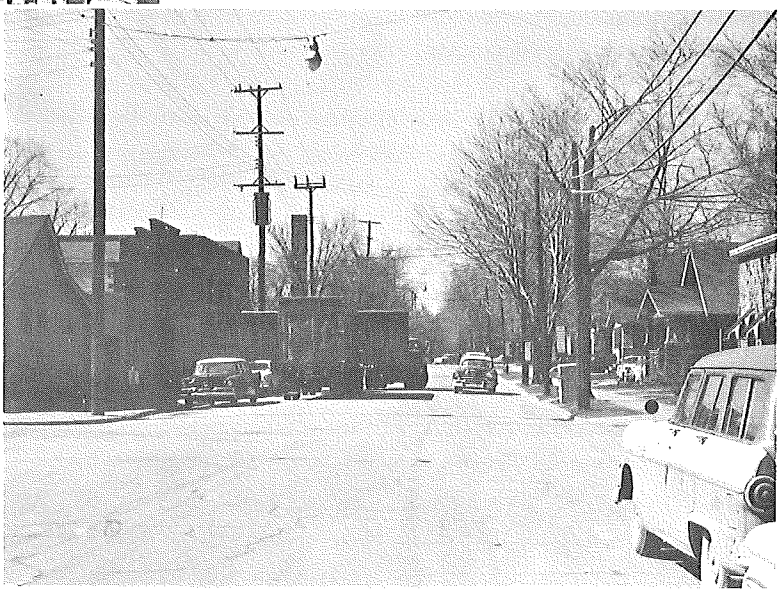


PARKING AMPLE AND LIGHTED

POOR DRIVEWAY DISCOURAGE USE



ILLEGAL PARKING BLOCKS TRAFFIC



LOADING AREAS NEEDED

PLATE 13

Recommendations on Parking Needs

The data gathered by actual count, observation and study of traffic and its behavior on the streets of Midland has pointed out very clearly that it will be necessary to make some changes in the allocation of space for parking entirely on certain streets in the downtown area and on some of the principal streets in intermediate areas where traffic needs require such treatment. In order to accomplish this change, it will first be necessary to provide the quantity of off-street parking spaces needed to replace those which were removed from the curb. To achieve this end, the following recommendations are made. These recommendations are based on the analysis of the data obtained from a complete and thorough parking study. Plate 14 shows the results of the Main Street Business District Parking Study taken in Midland during weekdays this summer. Critical shortages of parking spaces were found to exist in this area near the central core, while good parking facilities existed on some of the outer fringes. This central core area is bounded by Gordon on the north, Larkin on the east, Townsend on the south and Main on the west, Both sides of Main Street are included in this area. A "pie" chart is shown on Plate 14 for each block included in the study area. The diameter of the circle represents the number of curb parking spaces available while the different sectors of the circle represent the percent of vehicles which parked at a particular time interval. The unmarked or empty sector represents the percent of the total in which there was no occupancy of the parking stall.

In the entire central business area, the percentage of occupancy was 81%, while in the core or hub of the district, this went up to 91%. This is a very high percentage for a city of this size since the accepted standard which reflects saturation in a neighborhood is 85%. Although there are periods when the occupancy does not reach the values found in the study, it is also true that there are periods when the parking demands are even heavier. 91% represents an unusually high rate of occupancy and it is very doubtful if this can be improved since in the gathering of field data, there are bound to be found some empty spaces due to the turn-over of vehicles in parking stalls. The study revealed quite conclusively that during peak periods, the occupancy rate of the outlying areas improved although saturation was seldom reached in the fringe areas. This reflected the well-known fact that the average driver will waste considerable time seeking a parking place close to his intended destination whereas considerable time could be saved by parking further away and walking.

This core area comprises approximately 80% of the commercial development and yet contains only 27% of the total parking stalls. If this parking deficiency is permitted to go unsatisfied, there will transpire a deterioration of the business area which will be difficult to check once it gets underway. People are creatures of habit and once their custom of doing business in the central city is broken, return of their trade will be very unlikely unless drastic measures are taken.

There are different criteria used to determine parking space requirements, and there is a considerable difference in the methods. Basing needs on floor area devoted to retail sales, there is a need of 1,250 stalls for customer parking in Midland. An estimate based on population figures would indicate a need of 2,000 stalls. The distribution of these parking places is the important factor, since the downtown area is in need of 35% more parking places in the area bounded by Jerome, Ellsworth, Townsend and the railroad. In spite of this

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

MAIN STREET BUSINESS DISTRICT PARKING STUDY

Distribution of Parking Stall Capacity

On Street Parking Only

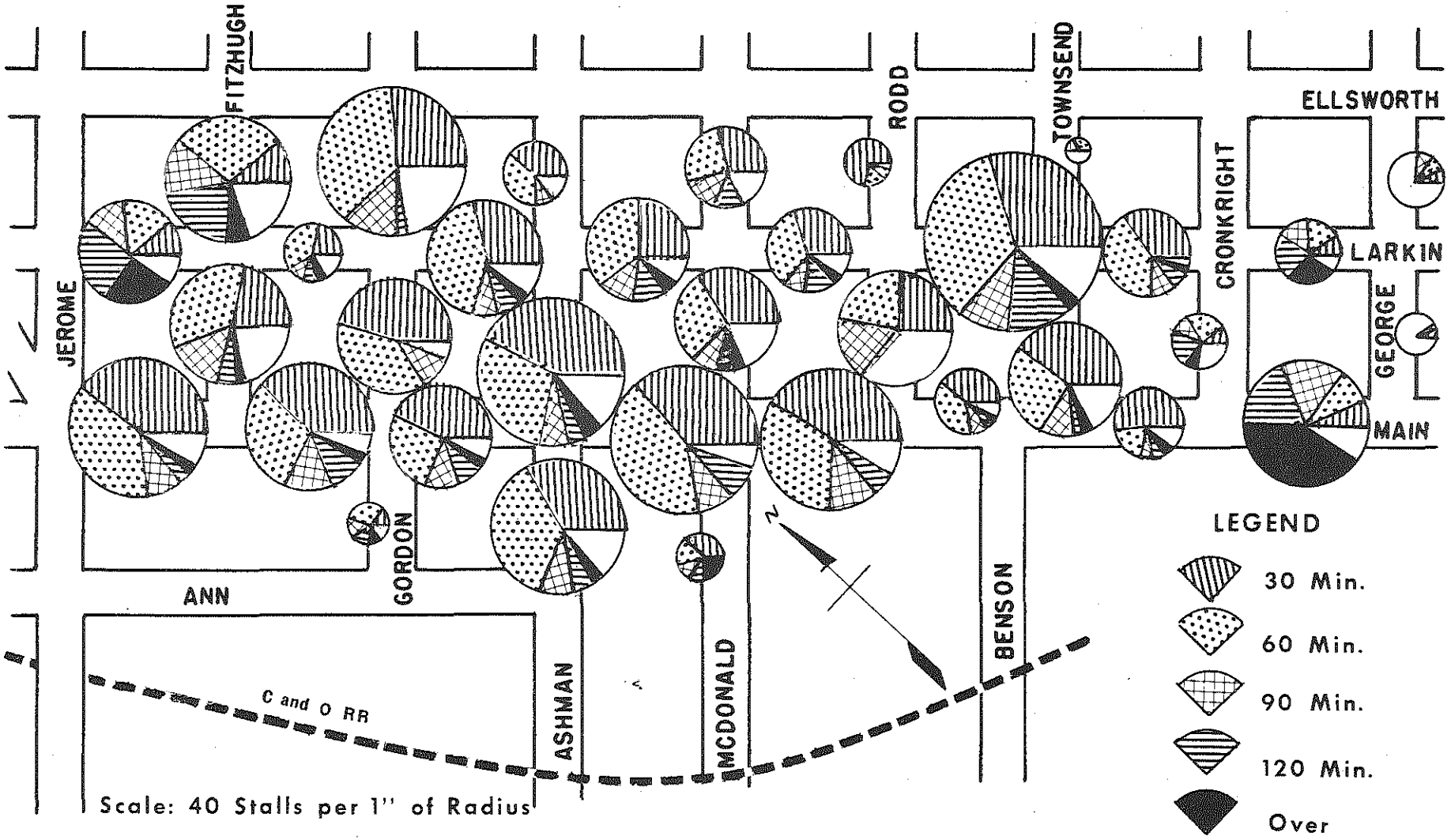


PLATE 14

deficiency, parking lots within a block of these areas have only partial occupancy. This condition is created by longer walking distances involved and the location of parking areas at cheaper rates nearer to the places of business. It is entirely logical to assume that people will walk a greater distance to obtain cheaper parking and conversely, he will not walk further for the privilege of paying a higher fee. There are some instances of this in Midland's present parking lot arrangements. The price of parking should be made to decrease as the walking distance increases. Also, curb parking can only be discouraged when the lots offer the lowest parking rates. We realize that this is in contradiction with practices in effect throughout the country. There seems to be a feeling that curb places are acquired for free while the purchase price of a parking lot must be returned from parking fee collections. Facts contradict this reasoning.

Parking space along a street is estimated to cost $1,500.00 per parking stall. This high cost reflects the waste involved in utilizing a high cost paving surface to park a vehicle. Added to this cost is the traffic inhibitions created by vehicles maneuvering into parking stalls. These same parking spaces can be obtained in off-street lots for considerably less cost except under unusual circumstances. This even includes the loss in removing a lot from the tax rolls by municipal ownership. If curb parking is to remain in an area where a new lot has been acquired, it is good logic to make these parking spaces pay the premium price and help pay the cost of the new lot. Under this system of planning, the lot will receive the parking usage and the interference created by curb parking will diminish. This will also make much easier the eventual removal of curb parking when traffic needs require such action.

In selecting locations for new parking areas in downtown Midland, we believe that cognizance should be taken of the areas of greatest need along with the proposed Downtown Redevelopment Plan. Since these two areas coincide with each other, the city would be wise to acquire new off-street parking sites in the areas which are to be devoted to parking in the redevelopment scheme. Four hundred parking places are needed immediately, plus the number of spaces which will be lost by curb parking removal. These sites where parking should be acquired are shown on Plate 43 in the section on the Downtown Redevelopment Plan. Even if this plan never materializes, the lots would be located in the areas of parking need. Our traffic planning was coordinated with the work of the City Planner in order that a two-fold benefit would materialize from this program.

The present rate of parking demand growth would indicate the need of expanding off-street parking facilities at the rate of 8% per year. This means that Midland must not only catch up, but also keep abreast of demand in its off-street expansion program. In considering new parking lot sites based on future business development, it is important to consider the street facility for handling parking lot traffic. If the downtown area expands, it is possible to envision the eventual union of this business area with the Ashman Circle Business area. The establishment of the Ashman-Rodd one-way street pair would offer an excellent location for new businesses. The area between these streets could contain businesses and parking lots which would have an excellent street system for handling traffic.

There are several important factors to be considered before acquiring property for off-street parking purposes. While small parcels of land are generally found available on the real estate market, they do not lend them-

selves to development into a parking area unless they can be joined together. In piecing these parcels together, straight aisles and parking rows should be possible. Big lots satisfy both parking and traffic requirements, but have the disadvantage of costing more money. A small lot, unless ideally dimensioned, cannot be utilized as efficiently as a big lot since waste areas occur around the perimeter of the lot. This results in less parking spaces per area. Small lots also require individual driveways, each of which create interference with traffic on the adjacent street. By acquiring a single, large area for parking, the driveway interference can be minimized.

Parking areas receive much better usage if motorists are directed to them by proper signing. This is particularly true for strangers. Attempting to sign for a system of small parking lots would be almost as confusing as no signing at all.

One of the biggest points in favor of a large parking area is the fact that a motorist has a greater probability of obtaining a parking place than he would in a small lot. This gets him off the street in a hurry and reduces traffic interference. At a small lot, his chances of finding a space are reduced proportionately to the number of stalls available and oftentimes means that he must travel from lot to lot. The generation of this traffic created by "cruising" is also one of the big arguments against curb parking which requires a motorist to travel a long distance in order to find a vacancy in a small number of parking spaces. Assurance of finding a parking space in a bigger parking lot also encourages the use of the facility.

Parking lots should be made as accessible as possible. This is true both when the motorist is driving to and from the lot and when he becomes a pedestrian after he leaves his vehicle. The path which he must walk as a pedestrian must not be too long nor must he be required to cross heavy traveled roadways without protection.

One factor often overlooked in establishing a new parking area is the need for providing users, particularly the women, with a path to their intended destination which does not go through undesirable and dark areas. Such areas are not only dangerous from the safety standpoint, but also provide a haven for vandals. Whenever a parking lot is located so that rear entranceways become shortest walking distance to a business, these areas should be made clean and attractive with lighting provided when night time usage is expected.

The lots should be well surfaced with either blacktop or concrete, and the surface kept clean at all times. The stalls and aisles should be well marked so that parking and maneuvering is facilitated. There is very often a tendency to squeeze too many stalls into an area with the result that careless or unskilled drivers will overlap parking stalls. This should be avoided by providing ample space for each vehicle. Stall lengths should be 22 feet long for modern vehicles while stall widths should range from eight to nine feet. The larger should be used in shopping areas where customers will be required to enter their cars with large packages.

During the course of the traffic study, it was noted that some of the most desirable parking lots in the Ashman Circle area had ruts and holes in the driveways which would all but break springs and shock absorbers. Plate 13 shows an example of a poorly maintained driveway from a parking area. This lack of good maintenance can be very discouraging to a motorist and forces him

to use curb parking spaces. This could hardly be called a fair trial of off-street parking and is no doubt reflected by the low rate of occupancy in the off-street parking areas of the Ashman Circle businesses. When large empty areas are frequently present in a shopping area parking lot, merchants should carefully check the condition of the lot to determine if this can be the factor. This can mean a vital loss of potential business.

Parking restrictions can be classified in two general categories. These are total parking prohibitions and time limit restrictions. The first type of control was receiving generally good observance in Midland. One area was noted to have considerable violation to the "No Parking" restriction. This was on the southwest side of Main Street between Rodd and Cronkright Streets. Extreme traffic congestion was caused by illegal parking practices in the block between Rodd and Benson Streets where Main Street is already overtaxed for traffic capacity. Plate 13 shows a photograph of this area in which a vehicle is illegally parked. Several of these parkers were noted to be of the "standing" variety where the driver remained in the car. This in no way makes the interference to traffic less damaging, and it is suggested that signs bearing the message, "No Stopping, Standing or Parking" be erected.

Time limit parking violations were recorded to the extent of 9 percent in the Main Street business area. This is quite normal and indicates satisfactory enforcement. It was noted that the 12-minute meters were violated to a considerable extent. Although this does not create any traffic problem, it is quite evident that more enforcement will be required if these metered stalls are to serve only the "quick stop" motorist.

It was found that "meter feeding" was occurring in some areas. The usual contributors to this practice are employees or owners of businesses. These people park their vehicles very close to the business and run out on an hourly basis and feed the meter. This defeats the intended purpose of metered parking and contributes greatly to the parking shortage in the high priority area. These people should be discouraged from this practice by the police checking time limit parking periodically and issuing violation tickets for exceeding the time limit. Mixing this type of checking with regular meter examinations will make the meters self enforcing. Establishing long term parking for these people in appropriate places will also play a big part in the elimination of the 'meter feeding' habit.

Angle parking can very seldom be justified on a street. In areas where there is a need for additional parking spaces created by this type of parking, there is usually a need for greater travel facility. Experience has proven the difficulty of trying to make a street handle moving traffic and also serve as an aisle for a parking lot. For this reason, angle parking should never be permitted on a major or arterial street. The angle parking which exists on Larkin Street is giving very little return for the damage it is doing. It is recommended that this parking be made parallel and that all angle parking be eliminated as soon as possible. Under no circumstances should new angle parking areas be created by setting back the curb for the purpose of building parking bays. It is much wiser to spend the money in off-street parking facilities.

Curb parking removal in many areas of Midland will be delayed if the proposed one-way streets are put in operation. Whenever lane volumes reach 350 vehicles per hour, planning should begin for the removal of curb parking. When

the figure reaches 450 vehicles per hour per lane, the parking should be eliminated on a two-way traffic operation. Ashman Street has reached the critical stage where parking should be removed unless the one-way operation proposed in a later section of the report is adopted. There should be no parking on Jerome Street from the bridge to Indian Street. There are already periods of parking prohibition so there will be little problem caused by a total parking ban. This will permit the pavement to be marked for four lane operation and thus more efficiently handle traffic.

Zoning for Parking

Zoning ordinances, properly applied, can be the most effective long-range method of meeting parking space deficiencies in any community. It is only common sense to compel the businesses and activities which create the need for parking to provide an adequate facility. Many of the traffic problems which exist in the cores of business areas are generated by businesses which are parasitic from the standpoint of providing parking. Businesses which were established before the automobile became of age can be forgiven for finding themselves deficient in parking. This is not true, however, of a recently established business which does not take care of its parking needs. The taxpayer cannot be expected to "bail" these places out by providing municipal lots. For the taxpayer's own protection, these business establishments should be compelled to provide their own parking facilities. Zoning ordinances for such purposes are very helpful, since they not only solve the parking problem of today, but also anticipate future requirements.

A growing number of communities have come to appreciate that the problem of catching up to present parking deficiencies is so serious that the problem can be magnified no further. New businesses must be regulated so that they do not add to an already bad situation. They must be independently capable of taking care of their own parking needs. It is interesting to note that in those communities where off-street parking and truck loading berths have not been used, buildings have been constructed without any thought being given to this matter. As a result, traffic on the surface street is strangled and the area is undergoing economic stagnation. This stagnation has contributed to shrinking downtown property values with the accompanying lessening of tax revenues.

While these ordinances are not a complete solution to the parking problem, wisely administered after careful drafting, they can be a valuable aid to the solution of the problem in the present and in the future.

It was found in a review of the Zoning Ordinances of Midland that some effort had been made towards meeting the parking and loading problem. Unfortunately, in the area of the most dire need of protection by such ordinances, we find that an exception had been made. Ignoring the problem under such circumstances is difficult to defend regardless of the conditions. The downtown area would most certainly respond to the zoning mechanism on at least a cooperative basis where property owners can group together to accomplish the acquisition of suitable off-street parking. Failure to follow such a plan can result in many economic difficulties for businesses in this area. The trade will go to those areas wise enough to provide the type and amount of parking required by the businesses.

Zoning ordinances should cover all new and substantially altered places of business and activities which require parking facilities. This guarantees that off-street parking facilities are made an integral part of development of the business on a permanent basis and gives assurance that this essential component will not be placed as a burden on municipal and private facilities.

Loading Zones

The ever increasing demands placed upon the street by through traffic requirements make it mandatory that conditions which suppress this traffic be eliminated or subdued. One factor which would be very beneficial in this direction would be the regulating of loading and unloading of freight which is performed on the curb of busy streets. Ordinance 411 of the city which requires the use of existing alleys for the loading and unloading of freight should be enforced at all times. Midland does not have a very extensive alley system; therefore, the benefit from such an ordinance cannot be received in all areas. Some cities are very fortunate in this respect and are thus able to keep loading and unloading off the curbs of streets in the business area.

Double parking for the purpose of loading cannot be tolerated, since this practice is very hazardous and creates an almost complete barrier to the movement of traffic. Except on the widest streets, traffic attempting to go around double parked vehicles are forced to pass on the left hand side of the centerline. One of the pictures on Plate 13 shows large trucks blocking off all but a small portion of the width of the street. These practices should be eliminated.

When there are no alleys means must be taken to provide loading areas at the curb. These zones can perform a good service, but they must be properly established and limited in number since they subtract from the availability of parking places. The Michigan Uniform Traffic Code presents a very good model ordinance on curb loading zones which applies to cities, towns and townships. This is listed under Section 2.30 entitled "Permits for Curb Loading Zones", which reads as follows:

> "The traffic engineer shall not hereafter designate or sign any curb loading zone upon special request of any person unless such person makes application for a permit for such zone and for two signs to indicate the ends of such zone. The traffic engineer upon granting such a permit issuing such signs shall collect from the applicants and deposit with the treasurer a service fee, in the amount specified by resolution of the ordinance making body, for a year or fraction thereof. The governmental unit may by regulations impose conditions upon the use of such signs and for reimbursement for the value thereof in the event of misuse or upon expiration of permit. Every such permit shall expire at the end of one year."

Curb loading zones may be established for businesses in an area by designating a section of two to three stalls in length for loading during certain hours and marked as such by signs placed at the ends of the zone. Loading facilities are urgently needed at the beginning and close of the business day. By permitting curb loading zones only during these periods, the areas can be used for parking during the remainder of the day. In Midland, as determined by the parking study, it will prove practical for these signs to have the legend:

LOADING ZONE--No Parking 7:30 AM - 10:00AM, 4:00 PM - 5:30 PM. This would prohibit parking in these zones to all but commercial vehicles between the hours shown on the signs. The rest of the time these spaces would be open to general use. It goes without saying that the enforcement of the use of these zones should be extremely rigid so there will be no misuse of the intent.

No remedy can be of any value if it is modified for any reason whatsoever; and, after provisions have been made to accommodate loading operations without interfering with traffic, all violations should be penalized on an equitable basis without regard for special privileges. The penalty for double parking for purposes of unloading should be especially severe, since this practice causes a disruption of traffic flow. Good enforcement of such an ordinance has been destroyed in many cities by political pressure. Certain types of loading and unloading were condoned; and, as a result, the whole program collapsed. There is a need to review loading zone permits due to changes which occur as businesses change location or loading requirements vary.

PEDESTRIAN AND VEHICLE VOLUMES

A good traffic plan must be based on factual evidence. Pedestrian and vehicle volumes are two of the most important types of traffic information which must be obtained before a development of such a plan can be undertaken. Design criteria, intersection control and future requirements all require this data if the traffic plan is to be assured practicability upon application. If we are possessed of accurate knowledge concerning the movement of vehicles and pedestrians, we are able to tailor the design of our traffic structure more efficiently to the traffic needs. Without this information, we would have to over design if we dare not risk an unsuccessful operation. This is expensive and unnecessary. Since traffic is subject to numerous fluctuations, we should design our traffic structure upward where requirements are highest and diminish where traffic needs subside.

Vehicle Volumes

Vehicle traffic volumes are collected by two methods; manual and machine. A mechanical traffic recorder can do a very creditable job of recording traffic volumes by various time increments. Turning movements at an intersection would require complicated mechanisms; therefore, manual methods were employed on the Midland Traffic Study.

Major traffic arteries were counted wherever important traffic transitions occurred. Secondary roadways were counted on a sample basis. Proper selection of counting stations plays an important part in the success of a good traffic study. Previous vehicle volume counts gathered in Midland permitted the selection of count stations on a sound basis.

Traffic volumes were gathered at various points on a 24-hour basis. The machine counts were taken either for the total 24 hours or by hourly totals over a 24-hour period. The manual counts were taken by 15- minute intervals. Since streets of certain characteristics have similar 24-hour traffic patterns, it is not necessary to count hourly traffic volumes at all stations.

Current traffic volumes are utilized to determine needed operating traffic capacities and signal timing. In determining future traffic requirements, other factors must be added to these traffic volumes. The first factor is the normal traffic growth which is anticipated due to the increase in the number of vehicles and traffic usage. The second is generated traffic which is that created by the new or expanded street facility which would not have transpired if the facility had not been provided. The third factor is development traffic which is created by the increased land use in the vicinity of the street. Future traffic requirements are generally plotted over a twenty year span.

Midland vehicle traffic volumes gathered during the present traffic study revealed several interesting characteristics when compared to traffic volumes gathered in the past. It is normal in the Michigan area to expect traffic volume increases around 8 percent over a year's span. Midland traffic was consistently exceeding this rate of increase on several streets. Some of the streets showing the largest increases were Saginaw Road, Poseyville Road, Ellsworth Street, Main Street, Ashman Street and Jefferson Road. Saginaw Road showed increases of around 80 percent since 1954, while Poseyville Road traf-

fic has tripled since 1946. It is quite apparent from these figures that normal growth factors should be avoided when plotting Midland's future traffic growth.

The reason for this individuality in Midland's traffic character is found in the growth of the industries represented by Dow and Dow Corning. This industrial growth has been so phenominal that, as a result, many workers who are employed in Midland live elsewhere. This imbalance between the number of people employed as compared to the number of people residing in Midland indicates a high rate of future traffic increases as more and more Midland workers move their families to Midland, while it is true that the workers who travel to their places of employment in Midland must make two trips during the working day with a consequent generation of traffic, they will still be making their daily trips over the most crowded portions of the local streets if they change their residence to Midland. Added to this traffic will be that generated by their families and those trips performed for purposes other than going to and from work. The high rate of industrial growth for the Midland area will probably continue if present prognostications are fulfilled. All these factors point towards a better than average rate of traffic growth in Midland's future.

The vehicle volume counts revealed several focal points for traffic congestion in the Midland area. One of the most serious problems is created at the Ashman Circle. In one small area, three streets carrying high vehicle volumes interchange their traffic with one another by means of a small traffic circle which is bisected in the middle by Saginaw Road. The concentration of traffic brought together at this location by Saginaw Road, Ashman Street and Jefferson Road creates a traffic problem which is in need of major corrective measures. A vehicle flow diagram for the eight hours between 8:00 AM to 12:00M and 2:00 PM to 6:00 PM is shown on Plate 15. The traffic volumes clearly indicate that either more street capacity must be gained or traffic must be diverted to other streets. There are several occasions, especially during the summer months, when the ultimate traffic capacity of this traffic circle is exceeded and congestion results. Saginaw Road is a state trunkline highway (US-10) which is one of the major tourist routes to the north. The combination of this tourist traffic with normal Midland traffic creates traffic congestion which focuses at this bottleneck.

Table VIII shows 24-hour traffic volumes taken at several locations in Midland. Plates 16, 17, 18, 19 and 20 show 24-hour volumes by hourly totals. The location of the highest traffic volumes are found on Ellsworth Street in the vicinity of the Ashman Circle. Althougn Ellsworth Street is a four lane roadway, many traffic problems are created by the large number of vehicles turning left off of this roadway. Saginaw Road suffers severe traffic problems due to the large number of vehicles attempting to drive on a two-lane roadway. Saginaw Road, Eastman Road, Ellsworth Street and Bay City Road are state trunkline highways and, as such, carry large volumes of traffic having origin and destination on opposite sides of the city. Other streets in Midland carrying traffic of longer trip lengths are Ashman Street, Jefferson Road, Cook-Main Street and St. Charles-Benson Street.

A traffic problem is created at the intersection of Jerome Street (M-20) and Main Street. This is illustrated by the vehicle flow diagram on Plate 21 for the 8-hour period between the hours of 8:00 AM to 12:00 M and 2:00 PM to 6:00 PM. Jerome Street, to the southwest of this intersection, passes over the only bridge leading to the area west of Midland. Since Main Street is one of

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

VEHICLE FLOW DIAGRAM
ASHMAN CIRCLE

8:00 AM – 12:00 M 2:00 PM – 6:00 PM

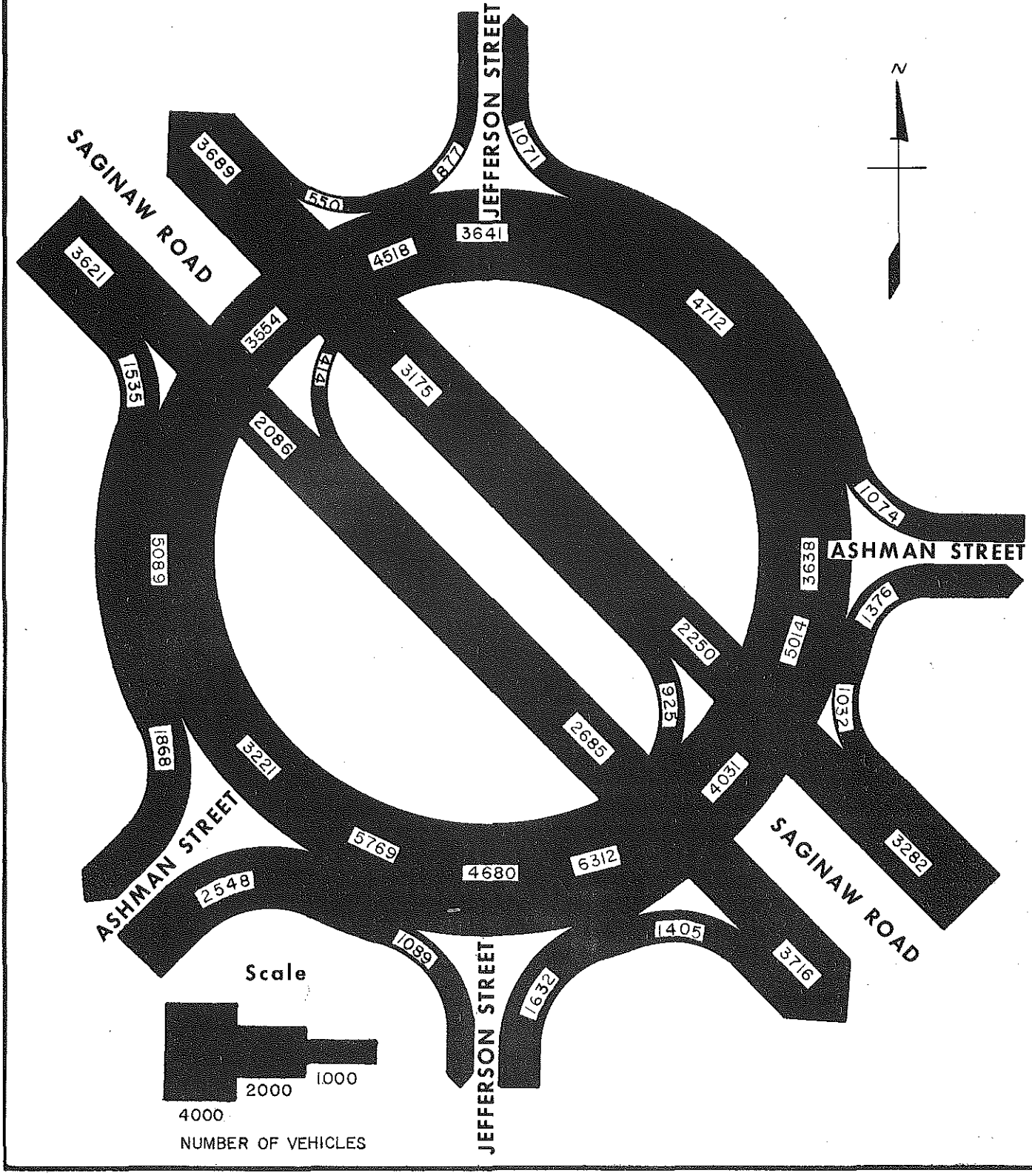


PLATE 15

Table VIII

CITY OF MIDLAND

24-HOUR VEHICLE VOLUMES

STREET	LOCATION	COUNT
Ashman Street	Between Larkin and Main	4840
Ashman Street	Between Ellsworth and Buttles	8430
Ashman Street	200 feet East of Ashman Circle	5257
Gordon Street	Between Main and Larkin	2526
McDonald Street	Between Main and Larkin	3387
McDonald Street	Between Ellsworth and Larkin	2452
McDonald Street	Between Ellsworth and Buttles	667
Rodd Street	Between Main and Larkin	3011
Benson Street	500 feet Southwest of Bridge	6903
St. Charles Street	At City Limits	6424
Townsend Street	Between Main and Larkin	3630
Townsend Street	100 feet Southwest of Ellsworth	3443
Cronkright Street	Between Main and Larkin	2425
George Street	Between Main and Larkin	1378
State Street	Between Ellsworth and Larkin	2626
State Street	Between Ellsworth and Buttles	872
Haley Street	Between Ellsworth and Buttles	1978
Haley Street	Between Saginaw and Virginia	1563
Haley Street	Between Saginaw and Washington	1568
Second Street	Between Saginaw and Walsh	1435
Main Street	Between Post and Revere	1043
Main Street	Between Jerome and Ripley	4099
Main Street	Between Jerome and Fitzhugh	7879
Main Street	Between Rodd and Benson	8327
Larkin Street	Between Jerome and Ripley	798
Larkin Street	Between Jerome and Fitzhugh	1505
Ellsworth Street	Between Jerome and Eastman	6949
Ellsworth Street	Between Jerome and Fitzhugh	10316
Ellsworth Street	Between McDonald and Ashman	13643
Ellsworth Street	Between McDonald and Rodd	13179
Ellsworth Street	Between State and George	15617
Ellsworth Street	Between State and Mill	15771
Buttles Street	Between Ashman and McDonald	749
Indian Street	Between Ashman and McDonald	1914
Carpenter Street	Between Ashman and Rodd	3644
Nelson Street	Between Ashman and Rodd	898
Saginaw Road	200 feet West of Eastman	11292
Saginaw Road	200 feet East of Eastman	9620
Saginaw Road	150 feet Northwest of Ashman Circle	14238
Saginaw Road	100 feet Southeast of Ashman Circle	13996
Saginaw Road	150 feet Northwest of Darthmouth	12221
Saginaw Road	Between Darthmouth and Eastlawn	13332
Saginaw Road	Between Washington and Eastlawn	10782
Saginaw Road	150 feet Southeast of Washington	11279

Table VIII (Cont.)

CITY OF MIDLAND

24-HOUR VEHICLE VOLUMES

STREET	LOCATION	COUNT
Saginaw Road	100 feet Northwest of Haley	11104
Saginaw Road	Between Haley and Second	11643
Saginaw Road	100 feet South of Bay City Road	9869
Eastman Road	300 feet South of Saginaw Road	6160
St. Andrews Road	110 feet West of Saginaw Road	2235
Sugnet Road	Between Saginaw and Woodlawn	1260
W. B. Ashman Circle	100 feet East of Saginaw Road	13746
E. B. Ashman Circle	100 feet West of Saginaw Road	12629
Jefferson Road	150 feet North of Ashman Circle	4001
Jefferson Road	150 feet South of Ashman Circle	6225
Washington Street	Between Saginaw and Eastlawn	1088
Washington Street	Between Saginaw and Michigan	1447
Swede Road	Between Ashman and Wyllys	1283
Abbott Road	200 feet North of Second	1567
Eastlawn Street	Between Washington and Virginia	1678
Wheeler Road	800 feet East of Jefferson	501
Darthmouth Drive	Between Saginaw and Airfield	3053
Darthmouth Drive	Between Saginaw and Bayliss	2495
Jerome Street	50 feet Southwest of Main	10825
Jerome Street	Between Main and Larkin	11002
Jerome Street	Between Ellsworth and Larkin	8950
Jerome Street	Between Ellsworth and Buttles	1208

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

HOURLY TRAFFIC VOLUMES

STATION NO.	1		2		3		4		5		6		7		8
DAY	Thur		Thur		Fri		Fri		Wed		Wed		Thur		Thur
DATE	8/7		8/7		6/6		6/6		8/6		8/6		6/5		6/5
TIME															
12–1 A.M.	52		93		97		232		236		207		308		336
1–2	18		28		14		39		57		49		69		73
2–3	14		23		8		19		24		22		29		29
3–4	2		5		9		22		26		23		20		23
4–5	2		5		6		14		17		16		37		37
5–6	4		14		21		45		48		46		72		69
6–7	34		66		309		492		586		581		639		671
7–8	246		717		1360		1020		1059		1049		1507		1498
8–9	160		379		314		565		659		679		814		871
9–10	208		377		244		499		671		661		722		712
10–11	176		301		285		484		645		642		689		725
11–12	267		498		381		633		959		891		958		956
12–1 P.M.	324		555		389		609		878		854		1037		1013
1–2	303		575		317		577		799		760		683		718
2–3	262		456		303		532		734		672		763		827
3–4	292		573		399		654		862		875		1108		1159
4–5	358		635		812		1101		1636		1595		1936		1941
5–6	357		740		410		768		1021		975		991		901
6–7	262		433		284		570		631		604		722		656
7–8	313		479		271		565		562		535		656		663
8–9	206		383		306		562		571		543		644		664
9–10	91		231		157		342		370		349		464		455
10–11	96		196		129		279		321		281		364		368
11–12	52		117		124		255		271		270		385		406
TOTAL	4099		7879		6949		10316		13643		13179		15617		15771

STA. NO.	LOCATION
1	Main Street between Jerome and Ripley
2	Main Street between Jerome and Fitzhugh
3	Ellsworth between Jerome and Eastman Road
4	Ellsworth between Jerome and Fitzhugh
5	Ellsworth between McDonald and Ashman
6	Ellsworth between McDonald and Rodd
7	Ellsworth between State and George
8	Ellsworth between State and Mill

PLATE 16

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

HOURLY TRAFFIC VOLUMES

STATION NO.	9		10		11		12		13		14		15		16
DAY	Thur		Thur		Fri		Fri		Fri		Wed		Fri		Wed
DATE	7/17		7/17		7/18		7/18		6/6		9/10		9/11		7/16
TIME															
12–1 A.M.	222		188		296		152		262		306		246		237
1–2	88		83		112		76		134		71		95		95
2–3	80		74		99		46		114		46		57		58
3–4	42		28		55		33		77		29		35		42
4–5	59		44		36		19		34		31		62		59
5–6	80		52		47		28		26		48		60		64
6–7	222		152		114		64		170		140		185		186
7–8	839		737		954		352		951		974		872		921
8–9	507		404		665		291		474		620		460		479
9–10	482		406		719		343		581		622		504		534
10–11	522		460		779		400		606		637		538		557
11–12	581		524		828		442		581		650		629		643
12–1 P.M.	544		509		870		457		854		891		709		769
1–2	695		518		888		420		556		618		574		601
2–3	815		592		789		405		613		652		513		533
3–4	821		603		924		370		804		932		615		636
4–5	901		809		1087		621		1001		1002		947		1006
5–6	872		715		973		584		875		964		786		844
6–7	799		566		896		394		777		874		670		670
7–8	556		494		805		390		713		828		634		692
8–9	548		546		742		364		629		751		512		502
9–10	440		480		657		302		609		701		399		457
10–11	350		350		501		237		415		500		390		392
11–12	227		226		402		205		365		445		291		302
TOTAL	11292		9620		14238		13996		12221		13332		10782		11279

STA. NO.	LOCATION
9	Saginaw 200 feet west of Eastman Road
10	Saginaw 200 feet east of Eastman Road
11	Saginaw 150 feet northwest of Ashman Circle
12	Saginaw 100 feet southeast of Ashman Circle
13	Saginaw 150 feet northwest of Dartmouth
14	Saginaw between Dartmouth and Eastlawn
15	Saginaw between Washington and Eastlawn
16	Saginaw 150 feet southeast of Washington

PLATE 17

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

HOURLY TRAFFIC VOLUMES

STATION NO.	17		18		19		20		21		22		23		24
DAY	Wed		Thur		Wed		Wed		Wed		Thur		Thur		Fri
DATE	9/10		9/11		7/16		7/16		7/16		8/7		8/7		6/6
TIME															
12–1 A.M.	225		235		146		5		29		218		233		304
1–2	94		90		73		1		7		64		77		44
2–3	76		83		39		0		6		48		58		11
3–4	43		47		37		3		3		20		26		10
4–5	53		57		31		5		1		23		25		19
5–6	70		76		89		6		2		71		67		39
6–7	161		175		165		8		23		239		291		163
7–8	879		974		1078		115		194		1138		891		251
8–9	545		584		553		55		54		588		554		535
9–10	495		538		484		49		46		575		494		320
10–11	513		556		481		46		40		488		599		364
11–12	573		609		568		32		87		507		561		572
12–1 P.M.	809		862		626		115		106		533		611		474
1–2	618		581		557		57		96		749		554		463
2–3	605		580		534		45		84		584		610		434
3–4	648		705		757		41		76		689		713		468
4–5	997		1001		999		91		103		1088		1084		1601
5–6	808		871		760		122		209		871		862		793
6–7	607		648		397		92		98		559		654		513
7–8	617		617		396		50		59		574		604		451
8–9	489		519		304		62		56		400		530		466
9–10	474		509		274		41		31		272		244		308
10–11	414		440		244		26		15		279		374		222
11–12	291		286		229		21		12		248		286		125
TOTAL	11104		11643		9869		1088		1447		10825		11002		8950

STA. NO.	LOCATION
17	Saginaw 100 feet northwest of Haley
18	Saginaw between Haley and Second
19	Saginaw 100 feet south of Bay City Road
20	Washington between Saginaw and Eastlawn
21	Washington between Saginaw and Michigan
22	Jerome 50 feet southwest of Main
23	Jerome between Main and Larkin
24	Jerome between Ellsworth and Larkin

PLATE 18

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

HOURLY TRAFFIC VOLUMES

STATION NO.	25		26		27		28		29		30		31		32
DAY	Fri		Fri		Fri		Fri		Wed		Wed		Fri		Thur
DATE	6/6		8/8		7/18		7/18		8/6		8/6		7/18		6/5
TIME															
12-1 A.M.	12		79		308		247		15		5		38		26
1-2	2		20		154		60		4		4		2		23
2-3	1		20		94		24		3		3		0		10
3-4	3		9		67		2		6		0		4		8
4-5	2		5		39		7		7		1		10		9
5-6	1		4		57		17		4		3		41		8
6-7	24		46		130		26		16		15		60		185
7-8	105		391		713		362		84		34		120		198
8-9	47		264		589		527		102		28		252		118
9-10	74		232		695		448		136		49		336		121
10-11	55		274		810		632		158		24		156		120
11-12	66		312		895		676		203		43		192		226
12-1 P.M.	83		397		925		944		227		54		271		219
1-2	69		224		849		642		221		48		212		147
2-3	66		256		819		580		209		36		180		140
3-4	64		290		750		819		216		39		204		215
4-5	125		402		1058		1262		224		68		300		407
5-6	105		420		963		1368		265		59		348		100
6-7	85		361		798		728		86		37		252		62
7-8	64		378		789		846		51		19		201		78
8-9	68		318		738		807		80		32		84		85
9-10	36		239		611		889		57		27		60		57
10-11	40		190		481		414		41		29		48		38
11-12	11		126		414		302		37		10		72		26
TOTAL	1208		5257		13746		12629		2452		667		3443		2626

STA. NO.	LOCATION	STA. NO.	LOCATION
25	Jerome between Ellsworth and Buttles	29	McDonald between Ellsworth and Larkin
26	Ashman 200 feet east of Ashman Circle	30	McDonald between Ellsworth and Buttles
27	Westbound Ashman Circle east of Saginaw	31	Townsend 100 feet southwest of Ellsworth
28	Eastbound Ashman Circle west of Saginaw	32	State between Ellsworth and Larkin

PLATE 19

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

HOURLY TRAFFIC VOLUMES

STATION NO.	33		34		35		36		37		38		39		40
DAY	Thur		Wed		Wed		Thur		Thur		Fri		Fri		Thur
DATE	6/5		9/10		9/10		9/11		9/11		8/8		8/8		7/17
TIME															
12–1 A.M.	12		42		30		16		22		52		128		143
1–2	3		9		6		7		7		8		14		50
2–3	4		4		2		4		3		4		33		21
3–4	1		9		5		3		5		2		5		11
4–5	2		2		1		2		4		0		6		14
5–6	1		2		11		18		2		7		3		17
6–7	39		27		20		21		31		27		43		98
7–8	36		379		253		165		159		308		550		687
8–9	37		147		104		78		86		211		305		285
9–10	63		146		99		54		71		189		207		239
10–11	22		115		83		66		65		160		253		288
11–12	59		143		157		68		71		237		289		258
12–1 P.M.	85		290		230		138		148		286		558		302
1–2	53		146		102		125		95		152		312		296
2–3	37		96		79		78		53		172		259		328
3–4	57		173		153		148		122		258		358		354
4–5	95		262		252		138		164		339		530		584
5–6	65		337		284		121		145		382		520		605
6–7	43		153		131		74		82		262		476		389
7–8	58		177		162		86		93		284		345		338
8–9	49		123		105		47		72		222		387		306
9–10	20		143		127		54		58		175		291		233
10–11	21		63		42		29		39		163		256		178
11–12	14		65		57		23		37		101		197		136
TOTAL	872		3053		2495		1563		1568		4001		6225		6160

STA. NO.	LOCATION
33	State between Ellsworth and Buttles
34	Dartmouth between Saginaw and Airfield
35	Dartmouth between Saginaw and Bayliss
36	Haley between Saginaw and Virginia
37	Haley between Saginaw and Washington
38	Jefferson north of Ashman Circle
39	Jefferson south of Ashman Circle
40	Eastman Road 300 feet south of Saginaw

PLATE 20

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

VEHICLE FLOW DIAGRAM
MAIN AND JEROME

8:00 AM — 12:00 M 2:00 PM — 6:00 PM

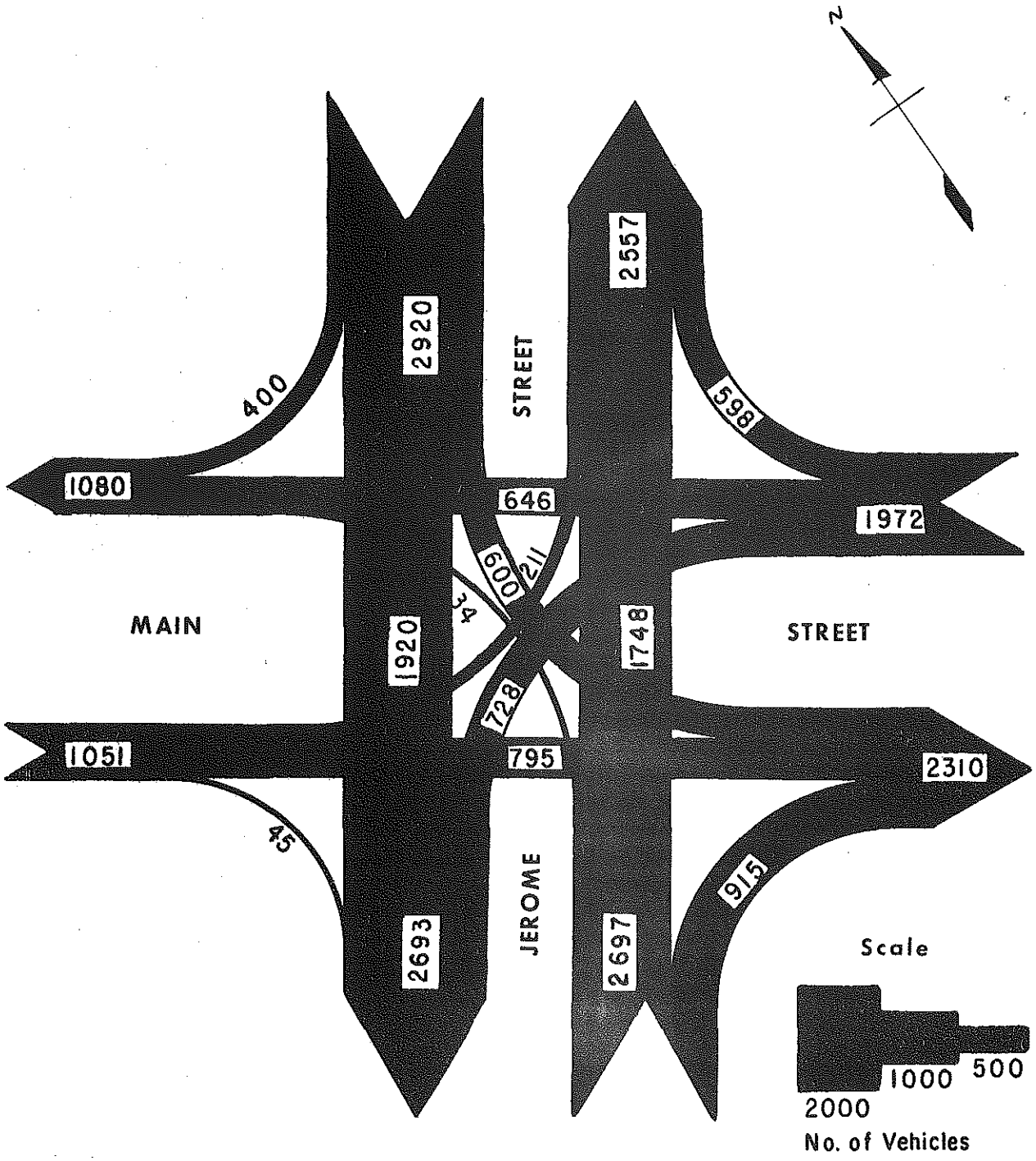


PLATE 21

the important business streets of Midland, a large amount of traffic turns from Jerome Street to Main Street. There is almost an equal volume of traffic turning from the northeast on Jerome Street to the southeast on Main Street. This large volume of turning movements under traffic signal control creates a congestion point.

The present system of traffic control of Main Street has revealed some abnormal distributions of directional traffic. Plate 22 shows a graphic diagram of 8-hour traffic between the hours of 8:00 AM to 12:00 M and 2:00 PM to 6:00 PM along Main Street from Ashman Street to Townsend Street. Proceeding from one street to another, it is possible to analyze this peculiar distribution. Northwest of Ashman Street, Main Street traffic is well balanced between both directions of travel. 2,006 as against 2,088 vehicles. Between Ashman Street and McDonald Street, however, there are 2,418 vehicles going southeast as compared to 1,583 vehicles going northwest. This is accounted for by Ashman Street being one-way to the southwest. A large number of vehicles (828) leaves Ashman Street and go southeast on Main Street into the business area of which the greatest portion lies in this direction. Both McDonald Street and Rodd Street are southeast of Ashman Street, and both are one-way in the northeast direction. This means that more traffic leaves Main Street in this area than can enter. Rodd Street deadends at Main Street; therefore, traffic can only depart on the outbound leg. Although McDonald Street has two legs with one feeding into Main Street from the southwest, more traffic departs than enters due to the southwest leg having its terminus in the parking lot next to the river.

As a result of these conditions, we find that Main Street traffic reverses its directional imbalance at Rodd Street. Northwest of Rodd Street we find that there are 1,660 vehicles flowing northwest on Main Street while 2,276 are flowing southeast. Southeast of Rodd Street, 2,523 vehicles are flowing northwest while only 1,585 are flowing to the southeast. Southeast of Townsend Street this directional tendency again shifts to the opposite direction. At this point, 1,405 vehicles go to the northwest while 2,535 vehicles flow to the southeast. This is caused by Benson Street traffic turning only right as it enters Main Street. It cannot enter Townsend Street since Townsend Street is one-way southwestbound at this point. This traffic must proceed southeast on Main Street.

A two-way street such as Main Street, which undergoes such directional imbalance in traffic flow from one block to another, is suffering from operational deficiencies which can have an adverse effect on business. This condition certainly indicates the need of corrective measures. It might be questioned that this unbalanced traffic flow is caused by the choice of the 8 hours taken out of the 24-hour day. This is not true since the 24-hour counts indicate the same tendency.

Plate 23 shows the percent distribution of weekday daily traffic in the Main Street business area. Although there are two peak periods between the hours of 7:00 AM to 8:00 AM and 5:00 PM to 6:00 PM, there is a consistently large volume of traffic from 11:00 AM to 7:00 PM. Naturally, the counts taken on Thursdays, which have evening shopping hours, revealed heavy volumes up to 9:00 PM, but the chart represents the composite average of weekdays.

A Similar chart was prepared for the Ashman Circle business area. This is shown on Plate 24. Since there is more traffic of an arterial character flow-

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

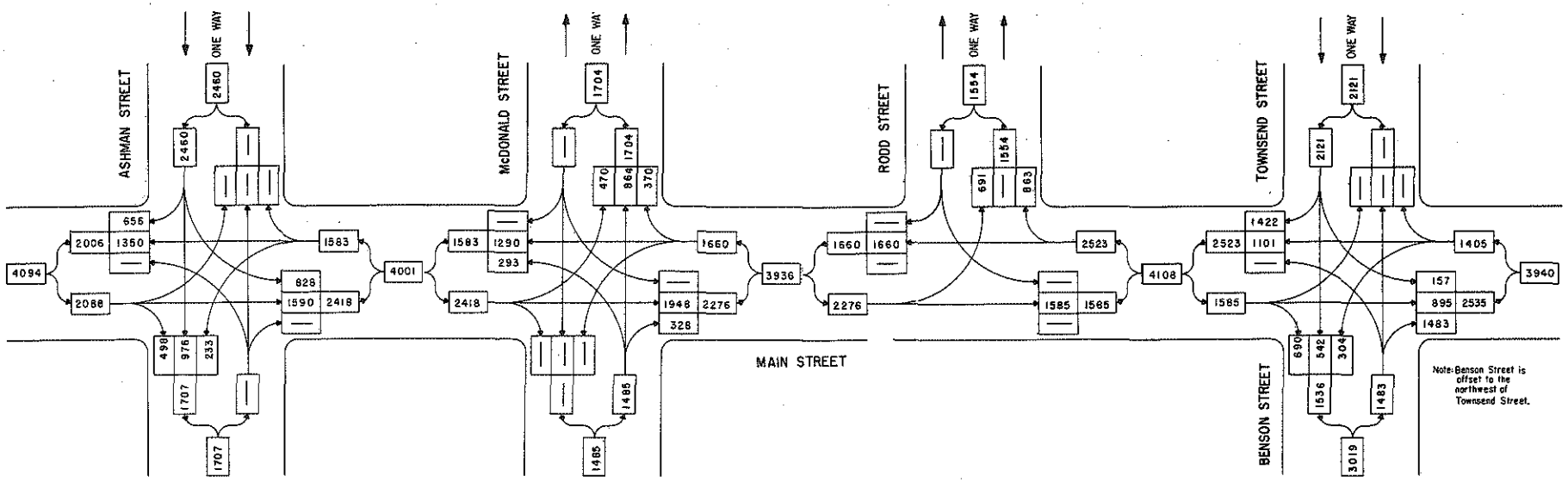
1958

MAIN STREET BUSINESS DISTRICT

WEEKDAY 8-HOUR VEHICLE TURNING MOVEMENTS

8AM-12M 2PM-6PM

PLATE 22



MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

PERCENT DISTRIBUTION OF WEEKDAY DAILY TRAFFIC
MAIN STREET BUSINESS AREA

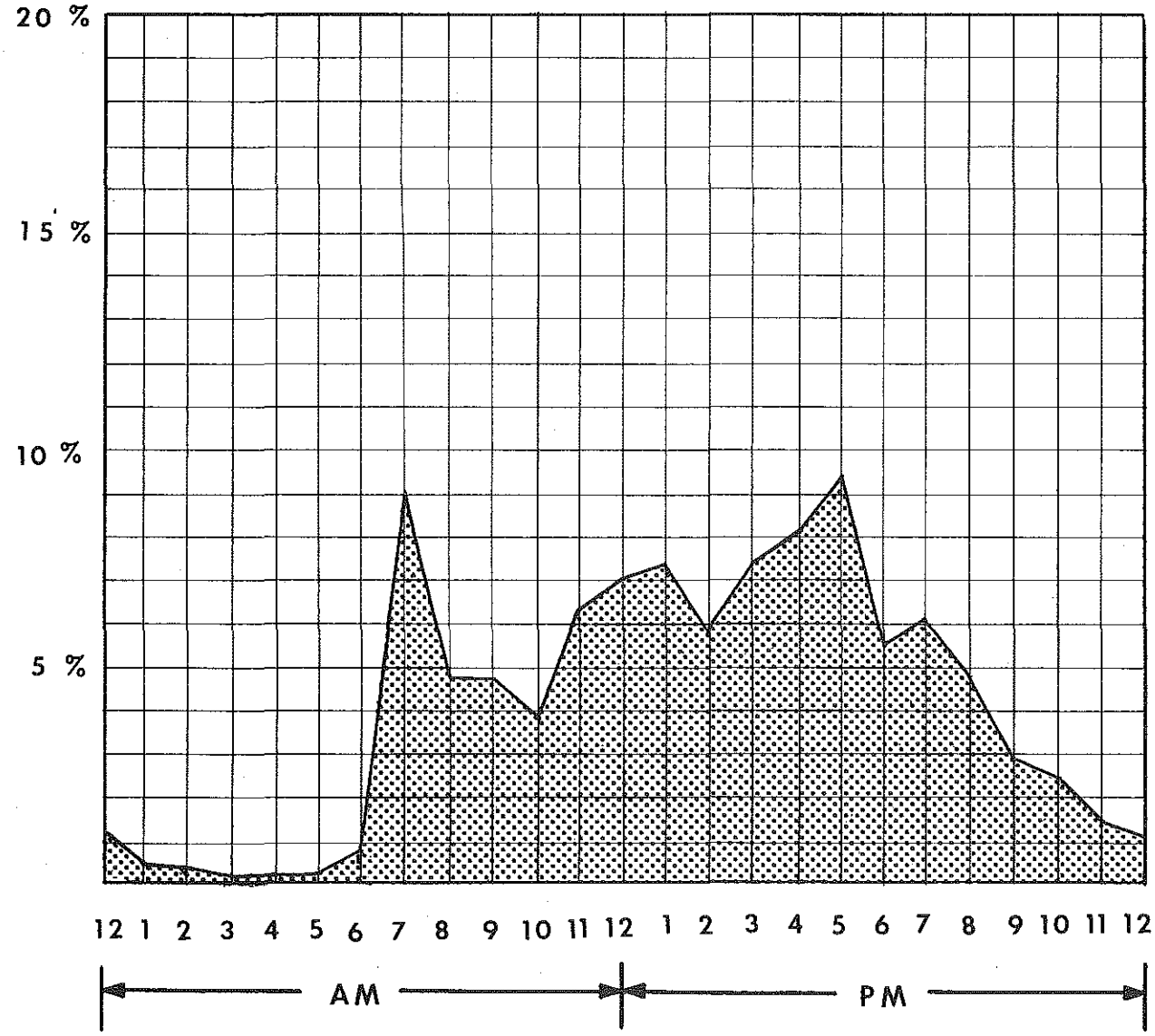


PLATE 23

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

PERCENT DISTRIBUTION OF WEEKDAY DAILY TRAFFIC

ASHMAN CIRCLE BUSINESS AREA

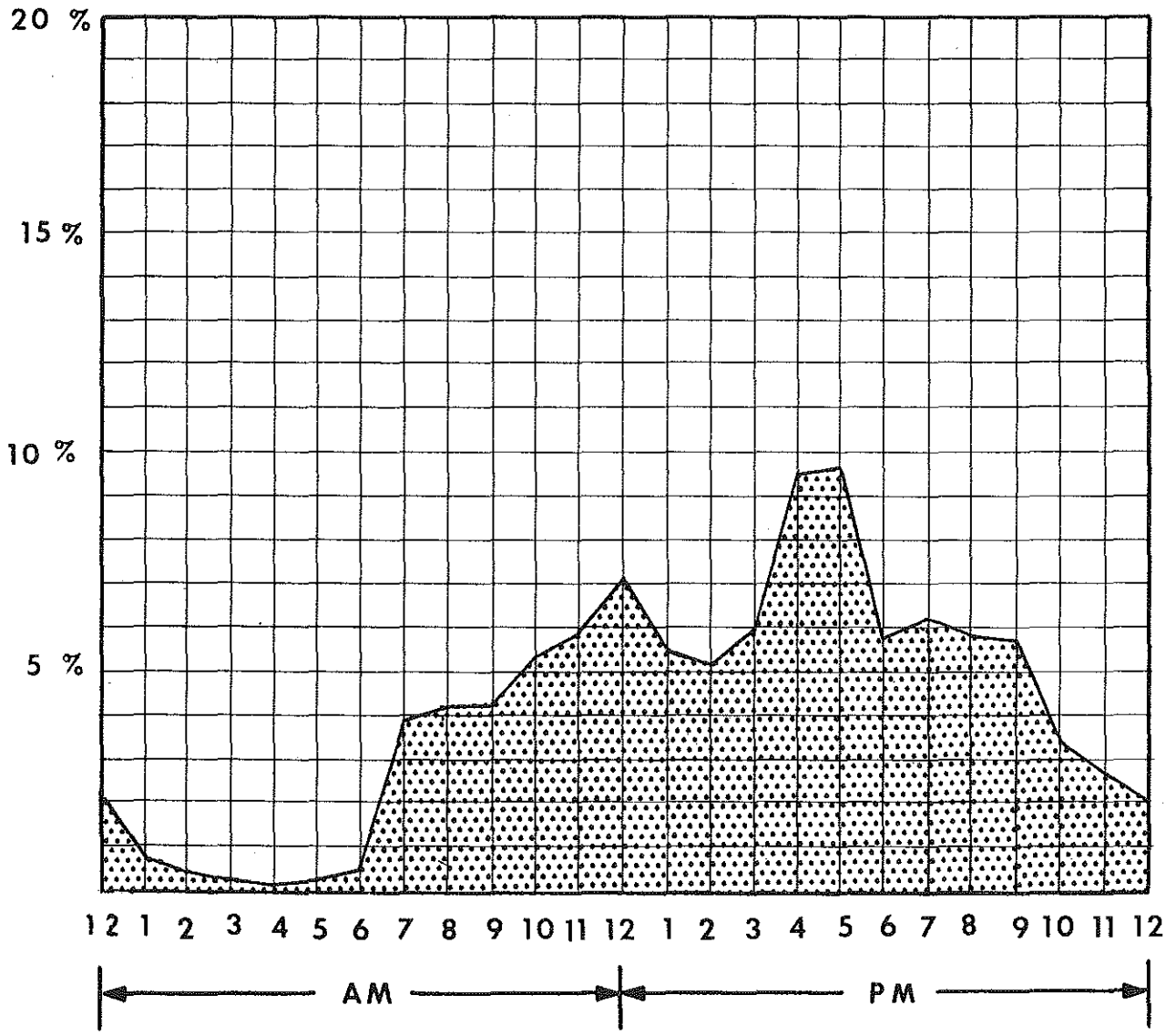


PLATE 24

ing through this area, we do not find sharply defined peaks. The strongest peak occurs between the hours of 5:00 PM and 6:00 PM where work to home traffic is mixed with shopping traffic and trunkline traffic through the area. This chart shows that any measures taken to improve traffic capacity must be taken over a twenty-four hour period due to the broad distribution of traffic volumes.

Another traffic problem of serious proportions revealed by the traffic volumes is at the Benson Street Bridge. This Bridge is of steel-truss construction and built near the turn of the century. It carries two moving lanes of traffic. Although the bridge is safe at the present time, loading restrictions are necessary because of its construction and age. Traffic counts revealed that this bridge is carrying around 7,000 vehicles a day on summer weekdays. One count showed 8,000 vehicles on a Friday in June. This traffic volume far exceeds the traffic carrying capacity of a two lane roadway. It is quite apparent that a four lane bridge is needed.

The problem magnifies itself when we consider that all of the traffic coming from Benson Street must enter Main Street at a 'tee' intersection. It was found by previous experience that the left turn from Benson Street to Main Street had to be prohibited since it interfered with the left turning vehicles entering Benson Street from Main Street. Even with this restriction in traffic movements, there is considerable congestion at this intersection. There is no question that it would be highly desirable for this traffic to enter the downtown business area at a location southeast of this point. This particular traffic problem will be discussed in greater detail in another part of the report.

Ellsworth Street is a route used very heavily by employees of Dow and Dow Corning. This is shown very vividly in Plate 25. This chart shows the directional traffic movement on Ellsworth Street on an average weekday in the summer. The southeast bound traffic movement shows a strong morning peak between the hours of 7:00 AM to 8:00 AM, while the northwest bound traffic shows a peak between the hours of 4:00 PM to 5:00 PM. This is the effect of workers coming and going to work. Not only is this traffic highly concentrated in the peak hours, but it is also highly directional. Both factors contribute to the inefficient use of the roadway.

Traffic coming and going from Dow Chemical Company naturally becomes more concentrated near the parking areas serving the plant employees. This is particularly bad in the area on Ellsworth Street starting at Haley and extending along Bay City Road to Saginaw Road. In order to plan for this traffic, a good understanding of the turning movements and volumes is required. We are able to base our traffic plan on the several fine vehicle turning movements taken by Dow Chemical Company people in the past which are confirmed and reinforced by our own traffic counts.

The new Dow Administrative Center now being constructed in the area bounded by Swede Road, Eastlawn Street (extended), Abbott Road and Second Street will be the generator of considerable traffic volumes in the future. It was necessary to take counts in this area as a basis of determining predicted street usage from this development.

A Highway Needs Study was being taken at the time of this traffic study. The City of Midland was required to provide the State Highway Department with

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

ELLSWORTH STREET DIRECTIONAL TRAFFIC
SUMMER WEEKDAY

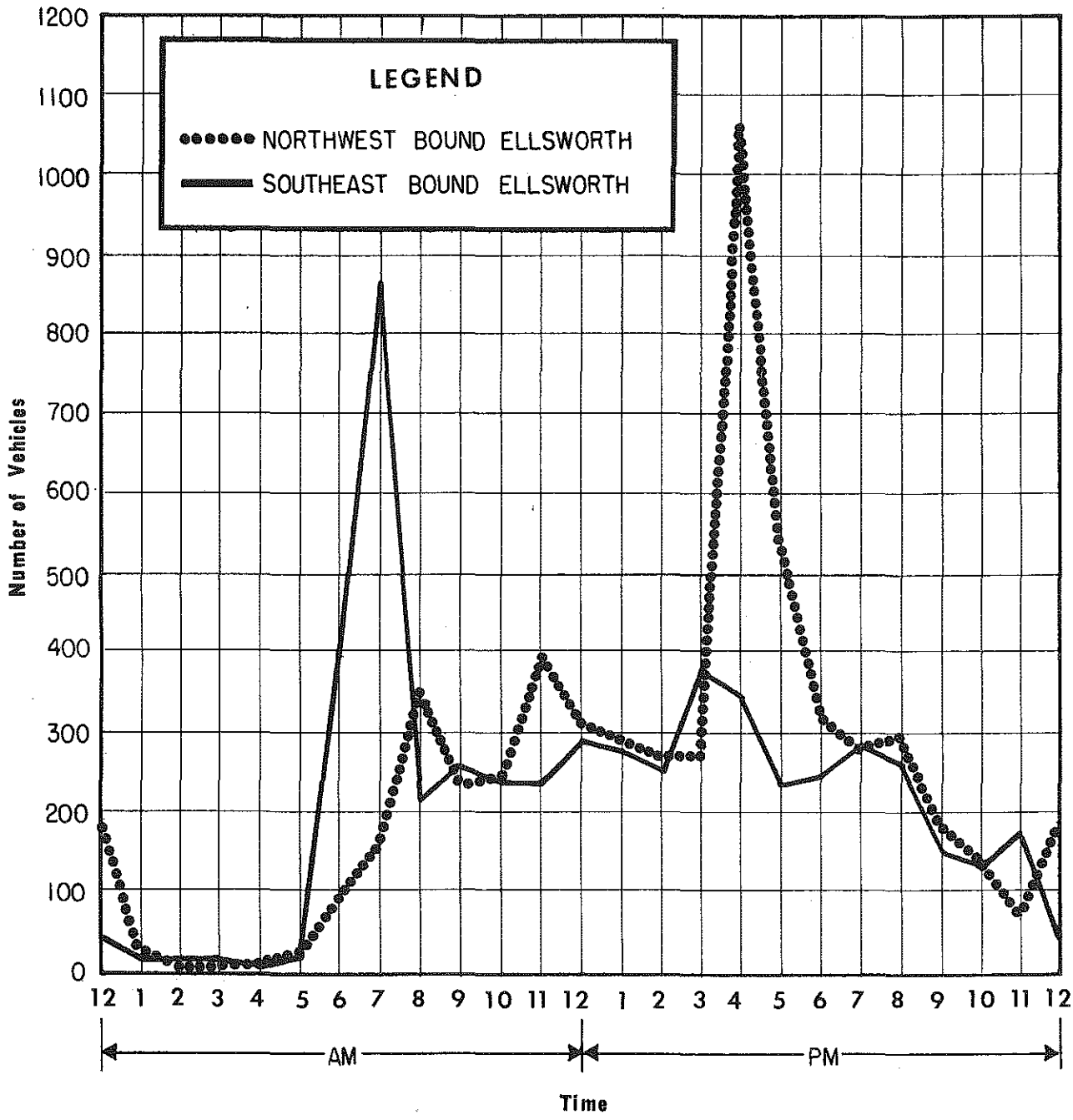


PLATE 25

information on traffic and construction for both the arterial and collector street system. This information gives the 1958 peak hour volumes, the practical capacity of the roadway for a one-hour period and the 1978 design hour volume. This information permits an efficient planning of a street improvement program designed to get the most results for the smallest outlay of funds. Central Traffic Services provided the city with the traffic information.

Pedestrian Volumes.

Pedestrians become a problem whenever they intermingle with a vehicle traffic stream. With the exception of the school crossings and the workers coming and going to their vehicles in the parking lots, Midland's pedestrian problem is concentrated in the downtown business area. In this area, they are present in such quantities that they must be subject to traffic signal control in the same manner as vehicles. Pedestrian counts were taken at the intersections of Main Street with Ashman, McDonald and Rodd Streets. Plate 26 is a flow diagram of these pedestrian crossings. These counts were taken in a one-hour interval. The largest volume of pedestrians was found crossing Ashman Street on the northeast side of Main Street. There were 866 pedestrians using this crosswalk in a one-hour interval. The largest number of pedestrians crossing Main Street was also at this intersection. There were 574 pedestrians crossing on the northwest crosswalk. The number of pedestrians diminish as we move southeast along Main Street. The large number of both vehicles and pedestrians at this intersection require special traffic control measures.

All pedestrian counts were taken by manual counts. By this method, it was possible to determine the number of pedestrians who were properly obeying the pedestrian signals, since all three intersections were controlled by both vehicle and pedestrian signals. For no apparent reason, most of the pedestrian signal violators seem to be concentrated at the intersection of McDonald with Main Street. These figures reveal the need of enforcement if the signals are to provide their proper efficiency.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

PEDESTRIAN ONE HOUR VOLUMES
MAIN STREET BUSINESS AREA

Average Weekday 3:00 PM — 4:00 PM

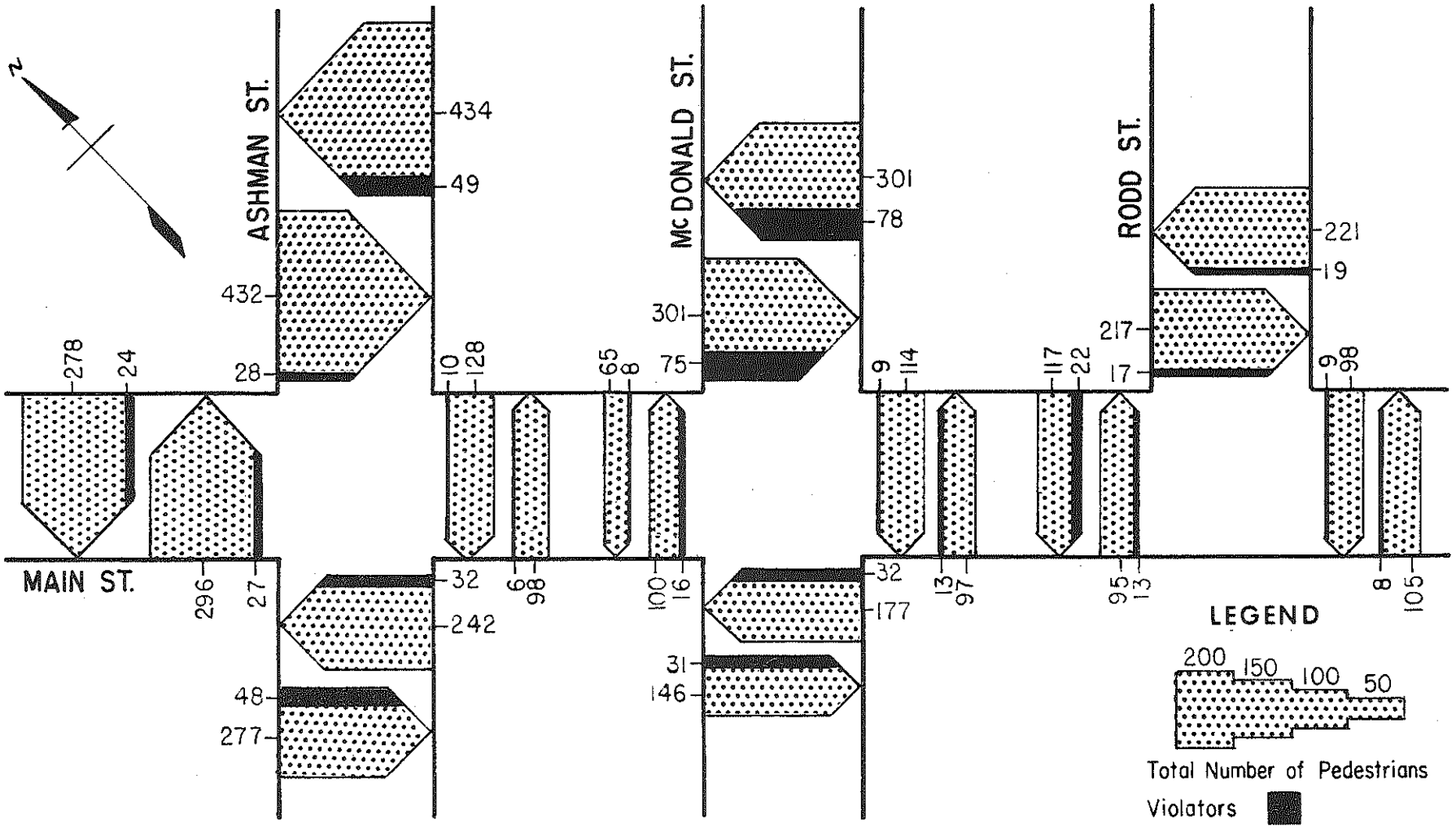


PLATE 26

SPEED AND DELAY

The definition of the word 'speed' and the word 'delay' seems to indicate that this chapter of the report is dealing with two opposites. Although this may be true, each one of these factors, if improperly controlled, can cause an adverse effect on the driver of a vehicle. Although we commonly accept the belief that speed and accidents go hand in hand, we do not always feel the same about delay. Delay can likewise cause accidents; and, besides, it can cause an economic loss. These economic losses are the additional operating costs of the vehicle, the loss to the driver time which could otherwise be spent in gainful financial venture and the loss of business caused by drivers avoiding an area possessing a consistent delay factor in the street system surrounding it. Accidents will likewise produce an economic loss.

Delays can cause accidents, since vehicle drivers in areas where delays are present desire to drive at a higher speed. When he must slow down, danger of a collision is always higher than in a well-regulated traffic stream. Delays also have an adverse effect on the driver's psychological behavior. Too many delays will cause some drivers to perform maneuvers which would never be considered under more pleasant driving conditions.

Speed is not a serious problem in Midland. This should not be interpreted as meaning that more attention to this problem can be forgotten. The section on Accidents revealed that in 6 percent of the Midland accidents, a violation of the posted or statutory speed was the cause of the accident. In order to reduce the problems created by excessive speeding, Midland should strive to establish logical and realistic speed zones and then provide good law enforcement so that the public is always conscious of its presence.

Vehicle Speed Studies

The purpose of taking speed checks is to locate the areas where excessive speeding is a problem and to use factual data for the establishment of speed zones. The speed with which the average driver will travel over a roadway is dependent on various conditions. The most important are the physical characteristics of the roadway, the presence of vehicle and pedestrian traffic, the weather, the condition of his vehicle and the posted speed. Several studies have shown that the latter condition is true only when the speed zone does not appear too illogical to the driver's senses. This means that extreme care must be taken in the establishment of a speed zone. Public resentment to enforcement of an abnormally low speed zone may result in a relaxing of enforcement of all speed zones, good or bad.

Sites for the taking of speed checks in Midland were selected by studying accident locations where speed was the cause of the problem and where the police have been finding the most disobedience to the posted speed zones. The locations selected were studied by marking out a speed trap 220 feet long. The time required by a vehicle to travel this distance was used to compute its speed. One hundred car samples were taken at each location. No checks were made when the path of a car was impeded by another vehicle or any other factors which would not be considered normal for the particular roadway being studied. Checks were made on Ashman Street, Swede Road, Washington Street, Carpenter Street, Jefferson Road, St. Charles Street, Saginaw Road, Jerome

Street, Main Street, Ellsworth Street, Eastman Road, St. Andrews Road, Eastlawn Street and Indian Street. Tables IX, X, and XI show the results of the speed checks taken on these streets.

Speed Recommendations

The first station studied was on Ashman Street 200 feet east of Boston Street. The posted speed is 25 miles per hour while the checks shows an average speed of 28.2 miles per hour. The 85th percentile speed was 31.3 miles per hour. At this point, it is well to discuss the meaning of the 85th percentile speed.

This speed is calculated for each location where a speed check is taken, since this speed is recognized on a national basis as the point at which the maximum speed should be established. In establishing a maximum speed, it must be remembered that the average speed is not expected to be as high as this value. Studies have shown quite conclusively that establishing a maximum speed at the 85th percentile limit does not have the effect of raising the average speed. This point has a real meaning when we consider that fifteen percent of the drivers are exceeding this value. Even if we apply a 'tolerance' factor and arrest only those drivers who exceed the speed limit by a certain amount, we would still find a sufficient number of motorists subject to arrest. It is a well-known fact that if too many people are guilty of a certain law violation, the law is difficult to enforce. The small difference between the 85th percentile speed and the average speed in Midland, especially at 35 miles per hour and under, show the reasonableness of these statements, Whenever it is necessary to post a maximum speed limit which is considerably under the 85th percentile speed, some sound supporting evidence should be provided. The average driver will exercise reasonable care and drive at a proper speed for conditions, unless there is some "boobytrap" in the roadway. It is very seldom that such a condition cannot be brought to the driver's attention by other methods or eliminated.

The 85th percentile at the speed station studied on Ashman Street would indicate a speed of 30 miles per hour. Since other portions of this report will deal with traffic control measures on Ashman Street, which will have an effect on speed control, this will be dealt with later.

Swede Road was checked for speed between Eastlawn Street and Airfield Lane. The average speed was 29.4 miles per hour, while the 85th percentile speed was 32.6 miles per hour. The present zone has a maximum speed of 25. This can be raised to 30 miles per hour and still require considerable enforcement to confine the motorists to these limits.

Washington Street was checked for speed between Eastlawn Street and Airfield Lane. The average speed was 29.1, while the 85th percentile speed was 34.0 miles per hour. The present zone is posted for 30 miles per hour. It is recommended that this zone be retained.

Carpenter Street, between Townsend Street and George Street, shows an average speed of 26.9 and an 85th percentile speed of 33.3 miles per hour. It is possible to raise this speed to 30 miles per hour, although Carpenter Road is designated as a major arterial street in the proposed major street plan and should experience increased traffic.

Table IX

MIDLAND TRAFFIC SURVEY
Central Traffic Services

VEHICLE SPEED SUMMARY

Light Conditions
Light X Dark

Weather
Clear X Cloudy Rain Snow

Pavement Condition
Dry X Wet Icy

Speeds in MPH	Station 1		Station 2		Station 3		Station 4		Station 5	
	No.	%	No.	%	No.	%	No.	%	No.	%
Over 50	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0
45 - 50	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0
40 - 45	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0
35 - 40	3	3.0	6	6.0	13	13.0	3	3.0	9	4.5
30 - 35	26	26.0	46	46.0	34	34.0	19	19.0	74	37.0
25 - 30	49	49.0	42	42.0	37	37.0	52	52.0	95	47.5
Under 25	19	19.0	6	6.0	16	16.0	26	26.0	22	11.0
TOTAL	100	100.0	100	100.0	100	100.0	100	100.0	200	100.0
AVERAGE SPEED	28.2		29.4		29.1		26.9		28.8	
85th PERCENTILE	31.3		32.6		34.0		33.3		33.3	
ESTABLISHED SPEED	25		25		30		25		25	

	Station	Day and Date	Time and Length of Count	
1.	Ashman 200 feet East of Boston	Fri. 9/12/58	12:45 PM to 1:20 PM	35 Minutes
2.	Swede Road Between Eastlawn and Airfield	Fri. 9/12/58	4:45 PM to 5:20 PM	35 Minutes
3.	Washington St. between Eastlawn and Airfield	Fri. 9/12/58	10:10 AM to 11:05 PM	55 Minutes
4.	Carpenter St. between Townsend and George	Fri. 9/12/58	1:40 PM to 2:50 PM	70 Minutes
5.	Jefferson Rd. between Second and Carpenter	Thur. 9/11/58	4:00 PM to 5:00 PM	60 Minutes

Jefferson Road, between Second Street and Carpenter Street, shows an average speed of 28.8 and an 85th percentile speed of 33.3 miles per hour. This is a major arterial street and should be raised to 30 miles per hour.

St. Charles Street, 1,000 feet north of the Chesapeake and Ohio Railroad tracks, shows an average speed of 35.4 and an 85th percentile speed of 39.5 miles per hour. It is recommended that the present 35 miles per hour speed zone be retained, since the parking lot entrances of the Dow Chemical Company are south of this location while just north of this point there are some intersections with poor alignment changes plus the Benson Street Bridge. More enforcement will assist in keeping the speeds down through this area.

Saginaw Road, 200 feet east of Sturgeon Road, shows an average speed of 43.2 and an 85th percentile speed of 52.7 miles per hour. This location shows the most marked spread between the average speed and the 85th percentile speed, which indicates that several motorists are travelling at higher speeds. This is proven when we find that 17 percent of the drivers sampled are travelling in excess of 50 miles per hour. Saginaw Road is US-10; therefore, the speed is established by the joint authority of the State Highway Commissioner and the Commissioner of State Police. The zone shows need of enforcement.

Saginaw Road, 500 feet west of Eastman Road, has an average speed of 41.1 and an 85th percentile speed of 48.1 miles per hour. The zone is posted for 45 miles per hour and is apparently working quite satisfactorily.

Jerome Street, 400 feet west of the bridge, has an average speed of 43.4 and an 85th percentile speed of 52.1 miles per hour. The zone is posted for 50 miles per hour, which is quite consistent with the speed check data.

Main Street, between Auburn Street and Hubbard Street, has an average speed of 27.2 and an 85th percentile speed of 32.1 miles per hour. These figures indicate the need of more enforcement to the present speeds. In view of the proposed traffic control changes proposed for this street, no speed changes are recommended under the present operation.

Ellsworth Street, between George and State Streets, shows an average speed of 26.9 and an 85th percentile speed of 29.7 miles per hour in a zone which is posted for 25 miles per hour. This seems to be working well, in view of the large traffic densities which are found on this route.

Eastman Road, 500 feet north of St. Andrews, has an average speed of 33.0 and an 85th percentile speed of 38.2 miles per hour. A speed of 30 miles per hour is indicated as being most satisfactory.

St. Andrews, between Jefferson Road and Washington Street, has an average speed of 27.4 and an 85th percentile speed of 32.1 miles per hour. If St. Andrews is to be a major arterial Street and constructed to arterial street standards, a 30 mile per hour speed limit is reasonable and proper.

Eastlawn Street, 700 feet west of Bayliss Street, has an average speed of 28.3 and an 85th percentile speed of 33.4 miles per hour. The present speed limit is 25 miles per hour. This can be raised to 30 miles per hour if the recommendations which follow are adopted.

Indian Street, between Ashman Street and McDonald Street, has an average

Table X

MIDLAND TRAFFIC SURVEY
Central Traffic Services

VEHICLE SPEED SUMMARY

Light Conditions
Light X Dark

Weather
Clear X Cloudy Rain Snow

Pavement Condition
Dry X Wet Icy

Speeds in MPH	Station 6		Station 7		Station 8		Station 9		Station 10	
	No.	%	No.	%	No.	%	No.	%	No.	%
Over 50	0	0.0	17	17.0	4	4.0	27	27.0	0	0.0
45 - 50	1	1.0	26	26.0	19	19.0	21	21.0	0	0.0
40 - 45	8	8.0	23	23.0	28	28.0	17	17.0	1	1.0
35 - 40	41	41.0	22	22.0	29	29.0	20	20.0	9	9.0
30 - 35	44	44.0	9	9.0	14	14.0	9	9.0	28	28.0
25 - 30	6	6.0	3	3.0	6	6.0	6	6.0	31	31.0
Under 25	0	0.0	0	0.0	0	0.0	0	0.0	31	31.0
TOTAL	100	100.0	100	100.0	100	100.0	100	100.0	100	100.0
AVERAGE SPEED	35.4		43.2		41.1		43.4		27.2	
85th PERCENTILE	39.5		52.7		48.1		52.1		32.1	
ESTABLISHED SPEED	35		45		45		50		25	

Station	Day and Date	Time and Length of Count	
6. St. Charles St. 1000 ft. N. of C & O R.R.	Fri. 9/12/58	3:50 PM to 4:15 PM	25 Minutes
7. Saginaw Rd. 200 ft. E. of Sturgeon Rd.	Thur. 7/17/58	10:30 AM to 11:10 AM	40 Minutes
8. Saginaw Rd. 500 ft. W. of Eastman Rd.	Thur. 7/17/58	2:40 PM to 3:14 PM	35 Minutes
9. Jerome St. 1000 ft. W. of Bridge	Fri. 7/18/58	10:10 AM to 11:00 AM	50 Minutes
10. Main St. between Auburn and Hubbard	Fri. 7/18/58	2:15 PM to 3:25 PM	70 Minutes

Table XI

MIDLAND TRAFFIC STUDY
Central Traffic Services

VEHICLE SPEED SUMMARY

Light Conditions: Light X Dark

Weather: Clear X Cloudy Rain Snow

Pavement Condition: Dry X Wet Icy

Speed in MPH	Station 11		Station 12		Station 13		Station 14		Station 15	
	No.	%	No.	%	No.	%	No.	%	No.	%
Over 50	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
45 - 50	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
40 - 45	0	0.0	4	4.0	0	0.0	1	1.0	0	0.0
35 - 40	4	4.0	29	29.0	3	3.0	7	7.0	3	3.0
30 - 35	9	9.0	43	43.0	15	15.0	16	16.0	10	10.0
25 - 30	45	45.0	22	22.0	49	49.0	46	46.0	40	40.0
Under 25	42	42.0	2	2.0	33	33.0	30	30.0	47	47.0
TOTAL	100	100.0	100	100.0	100	100.0	100	100.0	100	100.0
AVERAGE SPEED	26.9		33.0		27.4		28.3		25.3	
85th PERCENTILE	29.7		38.2		32.1		33.4		29.1	
ESTABLISHED SPEED	25		30		25		25		25	

Station	Day and Date	Time and Length of Count
11. Ellsworth St. between George and State	Fri. 7/18/58	3:45 PM to 4:25 PM — 40 Minutes
12. Eastman Rd. 500 ft. N. of St. Andrews	Fri. 8/8/58	9:00 AM to 10:45 AM — 105 Minutes
13. St. Andrews between Jefferson & Washington	Fri. 8/8/58	11:10 AM to 12:30 PM — 80 Minutes
14. Eastlawn 700 ft. W. of Bayliss	Fri. 8/8/58	2:30 PM to 4:15 PM — 105 Minutes
15. Indian between Ashman and McDonald	Sat. 8/9/58	9:30 AM to 10:50 AM — 70 Minutes

speed of 25.3 and an 85th percentile speed of 29.1 miles per hour. The present speed limit is 25 miles per hour and is quite satisfactory for the proposed usage of Indian Street.

One type of location which presents a problem in speed control is the school zone. It is well recognized that the presence of children on or along a highway is not consistent with higher vehicle speeds. It would appear that we are being inconsistent by recommending the raising of the existing speed limit of 25 to 30 miles per hour on Eastlawn Street in view of the large school located just east of Washington Street. A special school speed limit sign with a 'blankout' message and flashers is now being officially incorporated in the Michigan Manual of Uniform Traffic Control Devices. It is recommended that this sign be used on both approaches to this school so that a 25 mile per hour speed limit will be in effect only at those times when the students are coming from and going to school. The added attention gathering characteristics of this sign will give better protection than the present 25 mile per hour limit and yet permit the motorist to drive at the more reasonable 30 mile per hour limit during all normal periods of driving.

Midland is already acquainted with this sign, since they are installed at the school on Carpenter Street. It is unfortunate that this sign carries the speed legend '20', since this speed is illegal in Michigan. This speed can be posted no lower than 25 miles per hour, since this is the minimum speed on a public street in a residential area. This speed is not unreasonable when we understand that it is the maximum speed permitted and that the driver can further reduce his speed in case the actions of students adjacent or on the roadway require such action. Regardless of the maximum speed, a driver may never drive his car faster than conditions permit. In view of all these conditions, a 20 mile per hour speed limit is not logical.

Although every effort was made to cover the areas where excessive speed was a problem, it is very possible that this trouble can occur in other areas. The police department should make periodic checks at various locations where speed may be a problem. This will rid the drivers of any assurances that certain areas are immune to speed enforcement. The speed recording devices should not only be used for enforcement, but also to aid in the establishment of more logical speed limits.

Speed and Delay Studies

Speed studies indicate the running speeds of vehicles at a designated point, but this information may not always be an accurate criteria of the amount of time it takes a motorist to travel through a certain area. Many times a vehicle is required to make a complete stop. The motorist sometimes attempts to regain this lost time by excessive speeding in another area. These two widely separated speeds may balance out to a respectable travel time. In order to obtain a proper analysis of the time-travel characteristics along a certain route, a speed and delay study is taken. By this method, a test vehicle is driven in a traffic stream in as normal a manner as possible. The test vehicle passes the same number of vehicles that pass it and the speed limits are obeyed as closely as possible. Four routes were selected for these tests. These were Main Street from Revere Street to State Street, Ellsworth Street from Jerome Street to Buttles Street and Bay City Road from Buttles Street to Saginaw Road and Ashman Street from Ashman Circle to parking lot. All runs were made in normal traffic conditions.

Plate 27 shows the results of the speed and delay study taken on Main Street. The average speed from start to finish counting all stop times was 11.9 miles per hour for southeastbound traffic. This speed was 9.7 miles per hour for northwestbound traffic. The poor traffic signal progressive timing and lack of a uniform traffic signal cycle for all the signalized intersections accounted for two stops in each direction. Right and left turning vehicles, along with parking maneuvers, created interferences to the free movement of the test vehicle. The establishment of a uniform traffic signal cycle length, along with a type of traffic operation which will permit good traffic signal progression, will do much to improve the travel time along this street and also reduce the factors which create accidents. Proper timing of the pedestrian signals will permit left and right turning vehicles to move out of the way of through traffic.

Plate 28 is a graph of the speed and delay study taken on Ellsworth Street. Again we find that slow speeds are characteristic of the trial runs in both directions. The trip to the southeast averaged 11.9 miles per hour, while the trip to the northwest averaged 9.7 miles per hour. Traffic was quite heavy on Ellsworth Street when these runs were made, but the only stops were the ones required by the traffic signals. The heavy vehicle storage during the "red" phase of the traffic signals on Ellsworth Street caused traffic to slow down for a considerable distance behind these storage areas. This resulted in vehicles being unable to keep up the progressive speed for which the traffic signals were timed.

Plate 29 shows the graph of the speed and delay study taken for Bay City Road. This route is a continuation of Ellsworth Street, and the traffic conditions during the speed and delay tests were approximately the same. An Average speed of eastbound vehicles was 13.9 miles per hour, while westbound vehicles maintained 11.9 miles per hour. The traffic moving out of the Dow Chemical Company's parking lots located throughout this area caused traffic to move at these slow speeds. Most of these slowdowns were caused by turning movements entering and leaving Bay City Road. The traffic signals were operating on stop and go during this period. Traffic moves through this area quite smoothly when the signals are on flasher operation during non-shift change periods.

Plate 30 shows the graph of the speed and delay study for Ashman Street. considerable delays were experienced on this route, particularly in the vicinity of Ellsworth Street where traffic leaving the parking lot of a supermarket interfered with vehicles stored or moving through the traffic signal. There is little that can be done arout this, since the driveway is already directional onto Ashman Street. Southwestbound traffic moved at an average speed of 15.5 miles per hour, while northeastbound traffic averaged 14.7 miles per hour. Traffic volumes exceed practical capacity for the present street widths; therefore, the one-way plan offered later in the report should be seriously considered as a means of improving travel time through this area.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

SPEED AND DELAY STUDY

MAIN STREET

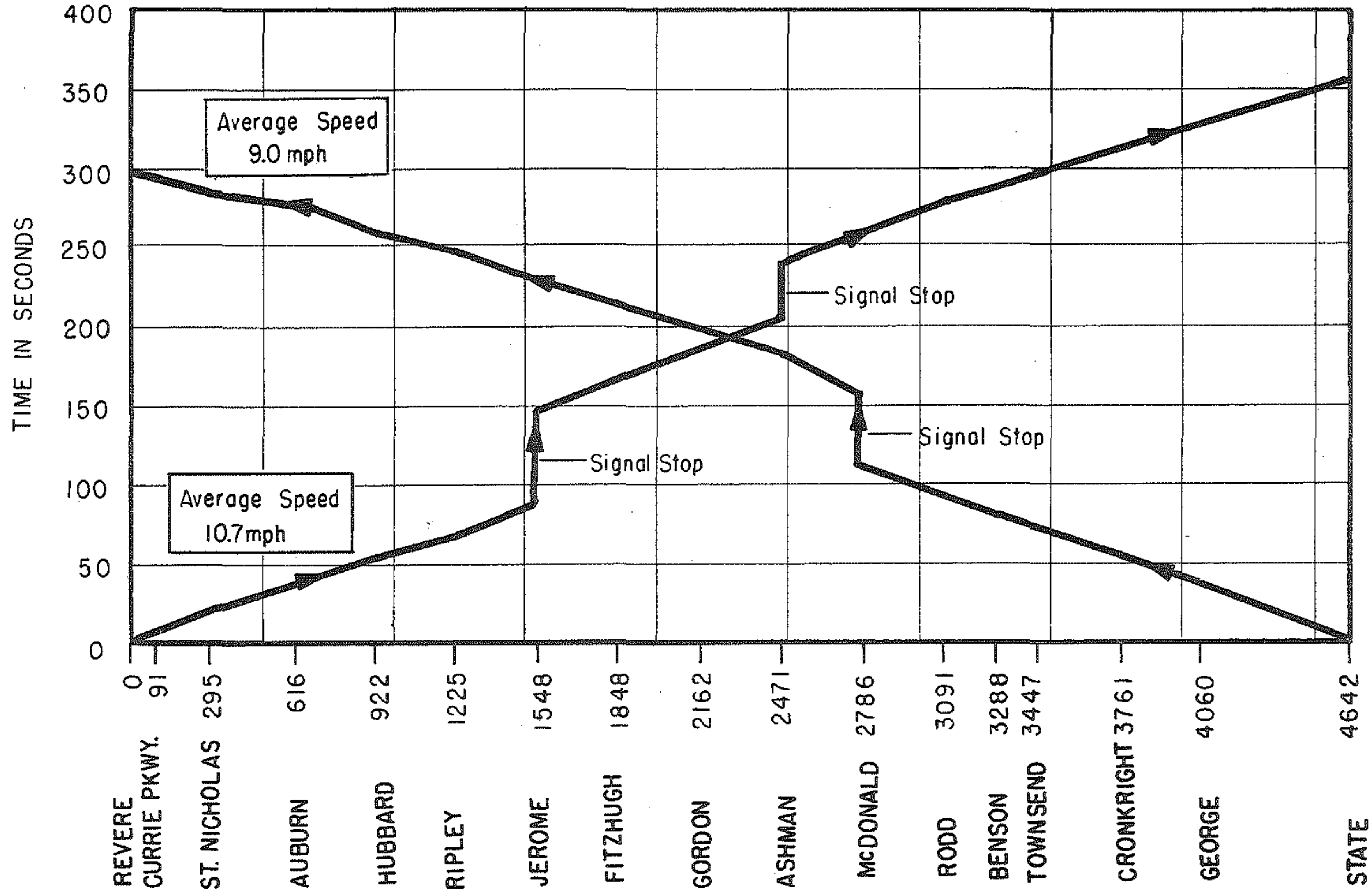
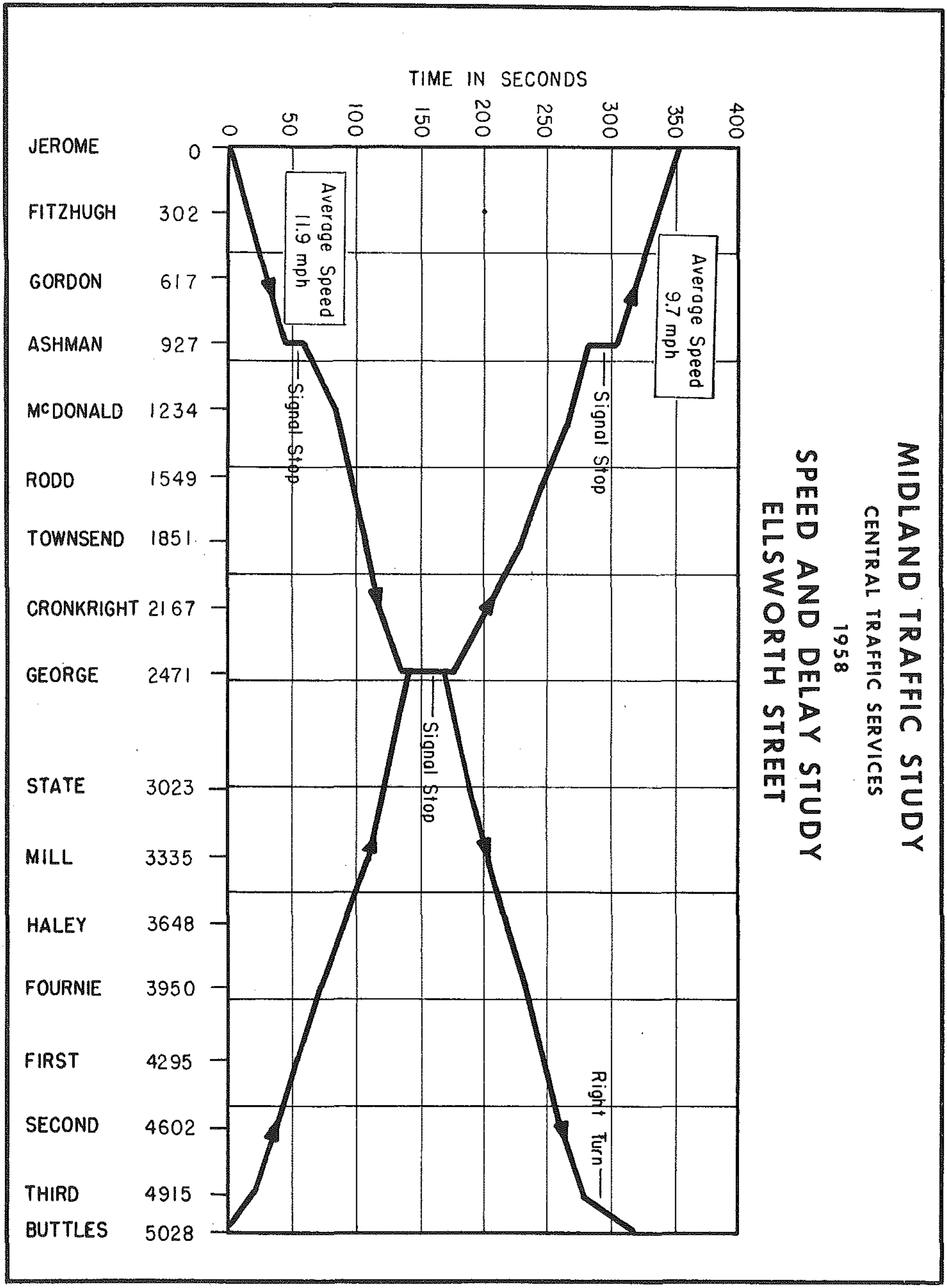


PLATE 27

PLATE 28



MIDLAND TRAFFIC STUDY
CENTRAL TRAFFIC SERVICES
1958
SPEED AND DELAY STUDY
ELLSWORTH STREET
TIME IN SECONDS
0
50
100
150
200
250
300
350
400
JEROME 0
FITZHUGH 302
GORDON 617
ASHMAN 927
McDONALD 1234
RODD 1549
TOWNSEND 1851
CRONKRIGHT 2167
GEORGE 2471
STATE 3023
MILL 3335
HALEY 3648
FOURNIE 3950
FIRST 4295
SECOND 4602
THIRD 4915
BUTTLES 5028
Average Speed 11.9 mph
Average Speed 9.7 mph
Signal Stop
Signal Stop
Signal Stop
Right Turn

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

SPEED AND DELAY STUDY
BAY CITY ROAD

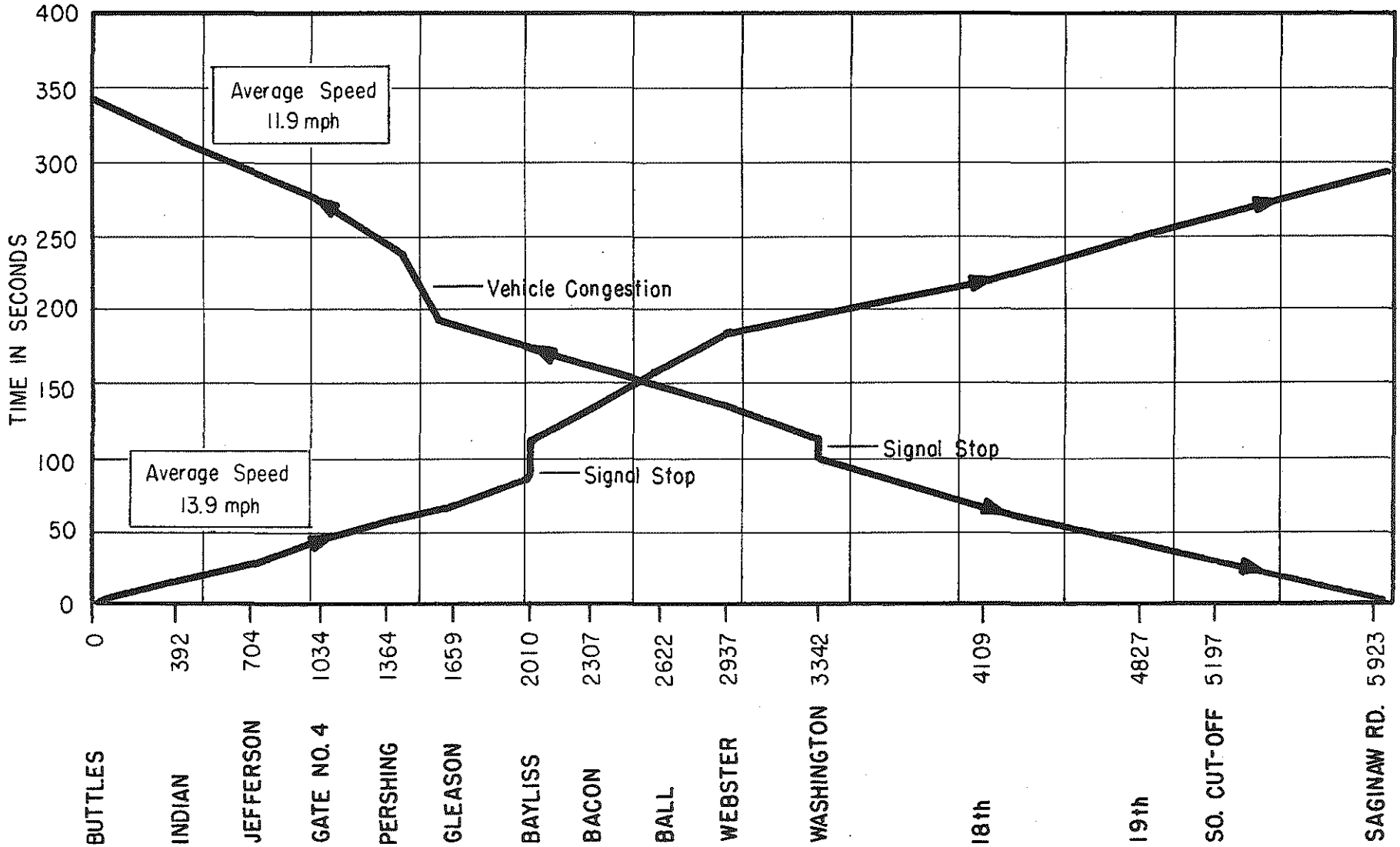
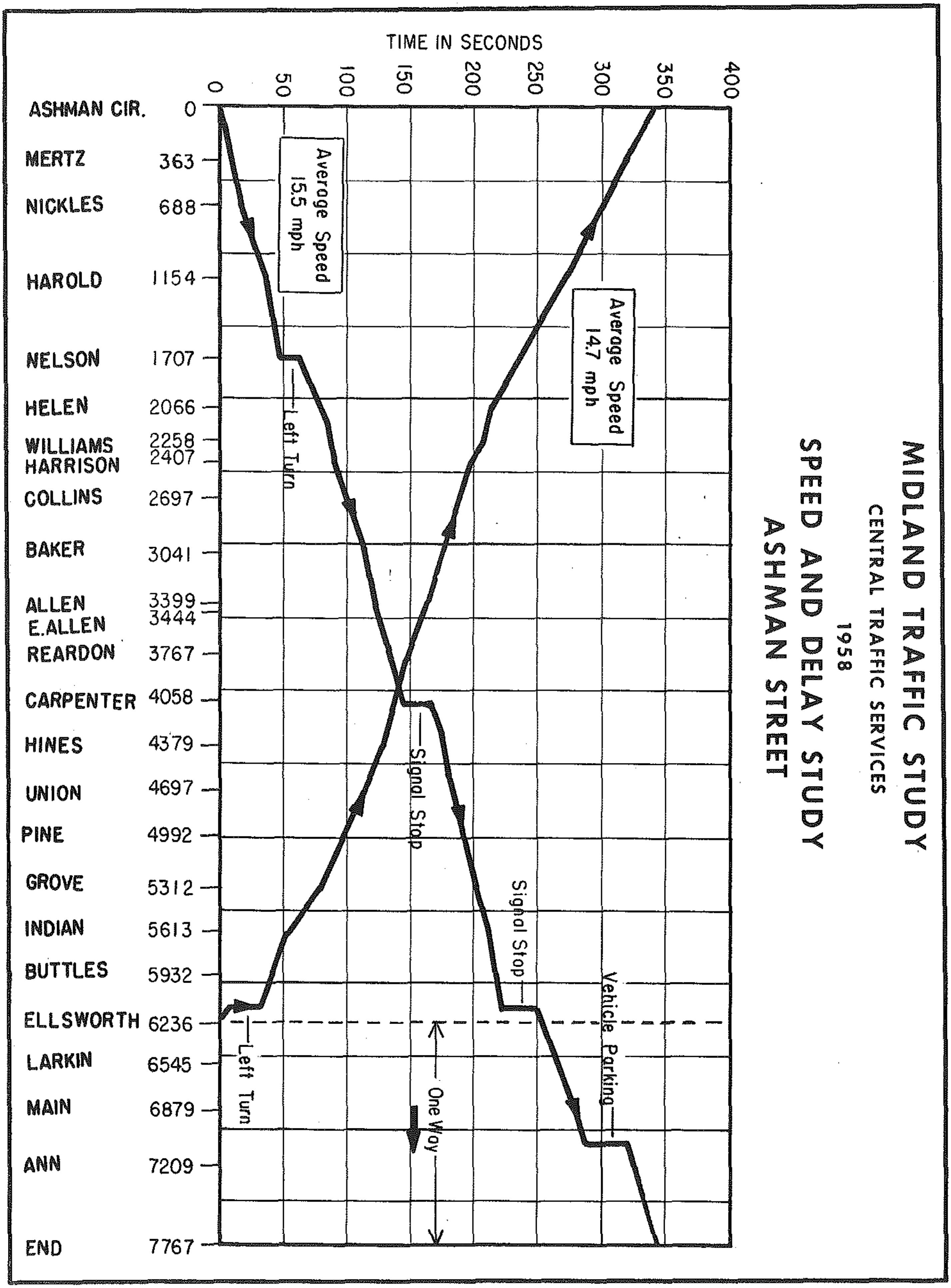


PLATE 29

PLATE 30


MIDLAND TRAFFIC STUDY
CENTRAL TRAFFIC SERVICES
1958
SPEED AND DELAY STUDY
ASHMAN STREET
TIME IN SECONDS
0
50
100
150
200
250
300
350
400
ASHMAN CIR. 0
MERTZ 363
NICKLES 688
HAROLD 1154
NELSON 1707
HELEN 2066
WILLIAMS 2258
HARRISON 2407
COLLINS 2697
BAKER 3041
ALLEN 3399
E.ALLEN 3444
REARDON 3767
CARPENTER 4058
HINES 4379
UNION 4697
PINE 4992
GROVE 5312
INDIAN 5613
BUTTLES 5932
ELLSWORTH 6236
LARKIN 6545
MAIN 6879
ANN 7209
END 7767
Average Speed 15.5 mph
Average Speed 14.7 mph
Left Turn
Signal Stop
Signal Stop
Vehicle Parking
One Way
Left Turn

TRAFFIC SIGNALS

The Existing System

The City of Midland has thirty signalized intersections which are in operation at the present time. The entire system was completely inventoried and it was quite apparent that the city has provided good, modern traffic signal controllers and heads at most of the intersections. Saginaw Road (US-10) and Bay City Road-Ellsworth Street (US-10BR; M-20) are state trunkline highways and therefore under the jurisdiction and operation of the Michigan State Highway Department. The traffic signal at the intersection of Jerome and Main Streets is also under the control of the State Highway Department.

There are two flexible interconnected traffic signal systems which are supervised by master controllers located in the city. One is the interconnected system which extends from the traffic signal at the north end of the Ashman Traffic Circle and Saginaw Road and runs along Saginaw Road to the intersection of this highway with Washington Street. The traffic signal controlled by the city and located at the intersection of Washington Street with Eastlawn Street is also connected to this system. The master controller for this signal system is located at the intersection of South Ashman Circle Drive with Saginaw Road. The second interconnected system lies along Bay City-Ellsworth Street and extends from the intersection of Bay City Road and Saginaw Road to the intersection of Ellsworth Street and Ashman Street. The master controller is located at the intersection of Saginaw Road with Bay City Road. The traffic signals located at the intersections of Ashman Street with Indian Street, and Haley Street with Indian Street, controlled by the city, are also interconnected to this system.

All of the traffic signals in the above two interconnected systems have three dials with the exception of the controller located at the intersection of Ashman Street with Indian Street. This controller has only a single dial. Each dial on a controller permits one time split, one cycle length and one offset. Good advantage is being taken of the flexibility in signal timing available at these locations.

There are five traffic signals located on Main Street at the intersections of Jerome, Ashman, McDonald, Rodd and Townsend Streets. These signals are located close enough together so that they must operate in synchronization with one another if vehicle progression from signal to signal is to be obtained. The timing in effect at present is very inefficient and one or more signal stops are necessary on any trip along Main Street through this area. The traffic signal at the intersection of Main and Jerome Streets is operating on a 65 second cycle while the signals at the other four locations are operating on a 75 second cycle. Since all of the traffic signals on Main Street are operating on a two-phase operation, there is no reason for this dissimilar operation. This variation in cycle length causes a different vehicle progression movement for every cycle change resulting in poor capacity and the encouragement of speeding.

The traffic signals at the intersections of Main Street with Ashman, McDonald, Rodd and Townsend Streets have one, three color, span-suspended traffic signal head for vehicle control and neon pedestrian signals mounted on posts at the far end of each cross-walk. This isolation of pedestrian signals

from vehicle signals is very sound practice which should be continued on all new pedestrian signal installations. The visibility of overhead signals can be improved considerably by the installation of dual heads for each signalized direction. This deficiency is quite apparent when these four traffic signal installations are compared with the one at the intersection of Main and Jerome Streets which has two signal faces in each direction. The same is true with the other traffic signal installations in Midland which have only one head for vehicle traffic.

The traffic signal head at the intersection of Saginaw Road with Eastman Road has an oversized optical system. Standard traffic signals have an 8 inch lens for each signal color while this signal has a 12 inch lens. This results in a much improved visibility to the signal. Under the operation of a single head, 8 inch traffic signal, this intersection was one of the high accident locations of the state. The present over-sized traffic signal head has reduced the accident record to a nominal amount for an intersection which carries such extremely high vehicle volumes.

The traffic volumes which pass through this intersection during week-ends in the summer reach such proportions that the signals must be placed on manual operation if any semblance of efficient traffic operation is to be maintained. For this purpose, a push button is wired and placed on the controller. A traffic actuated controller would perform a better job at this intersection than a fixed-time controller. Under this type of operation, vehicles actuate either magnetic or radar detectors which in turn regulate the green time of the signal. This permits those legs which have the most traffic to receive the longest green signal time. Except in extremely heavy traffic periods this would eliminate the need for a police officer who must regulate this traffic signal by manual control.

The signals at the intersection of Saginaw Road with North Ashman Circle Drive and South Ashman Circle Drive also have this manual control. It is not recommended that these two signals be traffic actuated since it is more important that they work in a fixed-time relationship for the purpose of vehicle progression with the signals southeast of Ashman Circle. The signal at the intersection of Saginaw Road and Bay City Road is also wired for manual control due to the extremely heavy traffic volumes which pass through this location. One of the dials of this controller establishes a three-phase operation for vehicles making a left turn from the south to the north. This dial is brought into operation only at the period when this left turn movement is heavy. During the remainder of the day this signal operates on a standard two-phase basis. The reason for this shift in operation is that three-phase operation would cause considerable congestion and delay at those periods of the day when traffic is heavier from the east, west and north. The opening of the new M-20 expressway to the east of this location has resulted in a shift of heavy traffic to the east leg of this intersection, particularly in the morning hours. This has required the State Highway Department to give all the time possible to the east-west movement of traffic. Further changes in the traffic pattern at this intersection can be anticipated as the expressway construction is extended into and around Midland.

Traffic Signal Operation

Traffic signals are often considered a cure for all traffic ailments re-

gardless of their cause. While many people do not share in this extreme belief, they cannot see any harm which might result from a traffic signal installation. We would be very negligent if we did not warn about the fallacy of this view. A traffic signal can cause some definite harm when we consider that while giving assignment of right-of-way to one traffic movement, another traffic movement is blocked. The signal is beneficial only when the assignment of right-of-way offsets the disadvantage of stopping vehicles which might not otherwise be stopped. A signal is also justified when it can produce a reduction in the accident experience of the intersection. Comprehensive accident studies are beginning to reveal quite conclusively that a traffic signal installation can often increase the accident rate of a location if installed under improper circumstances. Two types of accidents commonly associated with traffic signals are rear end and left turn. The first type of accident is caused by drivers stopping for signals being unable to judge their stopping distance properly with relation to the vehicle ahead of them. The second accident type is caused by left turning vehicles attempting to beat oncoming traffic through the intersection. There is little opportunity to perform a left turn at a traffic signal particularly when traffic volumes are heavy. This compels the driver to take chances which might not otherwise be taken.

This is not meant to infer that many traffic signals do not produce definite benefits, but rather to prove that a traffic signal installation must be determined by applying traffic engineering principles. A majority show of hands by persons not acquainted with its intricacies is not a good criteria for the need of a traffic signal in view of the money and problems involved. A traffic signal does offer benefits under the proper circumstances. It can offer right-of-way assignment advantages to intersections surpassing certain minimum volume requirements. It can reduce right angle vehicle collisions. It can offer speed control if the signal is timed properly with other traffic signals along a roadway. All of these benefits as well as the detrimental factors mean that several types of information must be acquired before a traffic signal can be approved for installation.

Warrants for traffic signal installations are outlined in the Michigan Manual of Uniform Traffic Control Devices. The warrants are broken down into two general categories, rural and urban areas. They cover fixed-time, traffic actuated and pedestrian signals. Since promiscuous traffic signal installations can create congestion and accidents, it is strongly urged that the conditions outlined in the Manual be fulfilled before a new traffic signal installation is considered.

Vehicle traffic can be influenced by successive signals when such signals are situated as far as one mile apart. If a platoon of vehicles can be kept in motion through a number of signalized intersections at a reasonable speed, we can obtain the greatest traffic capacity. The ability to do this without widening the street means an economic saving to the city. For this reason, it is important to consider the spacing of the signals with relation to one another when contemplating the installation of a new traffic signal. When establishing the timing schedule of a traffic signal, it is the objective to coordinate the signals in such manner that vehicles, when maintaining the proper speed, can move through successive signalized intersections without a stop. Not only can greater traffic volumes be handled by this type of timing, but accidents are reduced by taking the "stop" element out of the vehicle traffic stream to a great extent. This is in contradiction to the often aired notion that stopping vehicles at signals curbs speeding and thus enhances safety. Congestion is a high price to pay for adhering to this fallacious idea.

To provide for vehicle travel through a coordinated signal system without stopping when two directions of travel must be considered, is not simple and certain rules must be followed. On a two-way street, the distance between two signals can be no less than the distance travelled by a vehicle in one-half the cycle length of the coordinated signal system, while traveling at a prescribed rate of speed. This can best be illustrated by the following example: If the cycle length of the traffic signal system is 50 seconds and the desired speed through the area is 20 miles per hour, we determine the distance travelled by a vehicle moving at this rade of speed for one-half of 50 seconds, or 25 seconds. 20 miles per hour is the equivalent of 29 feet per second. Multiplying 29 feet per second by 25 seconds we obtain an answer of 725 feet. This represents the least distance between signals which will fulfill the stated conditions. A vehicle travelling in either direction can leave one signal at the beginning of the green interval and arrive at the other also at the beginning of the green interval, provided, the speed of 20 miles per hour is maintained or averaged throughout the distance of 725 feet. Since this distance is traveled during one-half of the signal cycle length, one signal operates alternate to the second signal.

In the above problem, if we had a third signal in the system, the closest it could be to the second signal while maintaining perfect vehicle progression would also be 725 feet. The third signal would be one-half cycle length apart from the second signal or one cycle length apart from the first signal. In the problem given, a signal can be placed at any integral multiple of 725 feet. Signals which are at odd multiples of this distance (1,3,5, etc.) are operating alternate to those signals which are at even multiples of this distance (2,4,6, etc.).

While the above rules of traffic signal progression on a two-way street are true, they are difficult to apply in practice. When developing a progressive traffic signal system, we often find the signalized intersections spaced an uneven distance apart. In attempting to accommodate these signals to a coordinated system we have only two factors which can be varied. These are speed and the cycle length of the traffic signal. Speed is generally the most inflexible of these two variables. Drivers cannot be forced to drive at abnormally slow speeds and safety does not permit higher speeds. Unfortunately the cycle length can only be varied to a certain degree. Short cycle lengths restrict the vehicle capacity of an intersection while storage space availability and reasonableness of 'wait' periods limit the use of longer cycle lengths. When neither of these two factors can produce a satisfactory vehicle progression, then we must consider the removal of the signal which does not fit the spacing pattern or change to a one-way traffic operation.

One-way streets offer a signal timing advantage over two-way streets whenever traffic signals are close together. Even on one-way streets, spacing of signalized intersections must be considered if we are to permit vehicle progression on two pairs of one-way streets which intersect from opposite directions. On a single one-way pair we need only offset each adjacent signal proportionate to the speed of a vehicle moving along the one-way street. Theoretically, this gives us an infinite number of cycle lengths and progressive speed combinations. If we wish to time one-way streets in a "grid" network, it is necessary that rules be followed similar to two-way streets but with certain advantages.

If we assume the most common and most desirable type of one-way grid

network which has one, one-way street pair intersecting the other one-way pair from the opposite direction so that traffic can circulate in the square formed by the intersecting streets in a counter-clockwise direction, we find that progression can be obtained in each direction if the signalized crossings are spaced the distance equal to that traveled by a vehicle at a predetermined rate of speed in the time equal to one-quarter of the cycle length of the signal. Translated into simple language this means that we can have signals in a one-way system twice as close as in a two-way system and still maintain vehicle progression in all directions. This is a very important factor when we consider that city business districts very often require traffic signals at each block. Since the block lengths are most generally less than 600 feet long, two-way progression at any reasonable speed is difficult if not impossible to obtain. Converting to a one-way operation in a proper manner means that this progression can be obtained resulting in a much better street capacity without any additional construction costs.

One-way operation under traffic signal control also offers one other very important benefit. This is illustrated in Plate 31. The intersection of two, two-way streets under traffic signal control produces 20 vehicle-pedestrian path crossings located in 8 separate conflict areas. These conflicts occur during the green signal phase for both signalized directions. The conflict of the right and left turning vehicles with pedestrians can be reduced with the installation of pedestrian signals. With these signals, turning vehicles will yield the right-of-way to pedestrians during the "walk" phase and make their turns unimpeded during the "don"t walk' phase which occurs while the green vehicle signal is still being displayed.

The second case shows the intersection of a two-way street with a one-way street. Under this operation there are 9 vehicle-pedestrian path crossings located at 5 separate points. The difficulty of a left turn from a two-way street onto the one-way street is generally quite difficult since there is a strong desire for this movement under those circumstances.

The third case shows the intersection of two, one-way streets. There are only 4 vehicle-pedestrian path crossings located at 2 separate points. These conflicts would be non-existant if there were no pedestrians present at the intersection. This same condition would also be true if the pedestrian crossings were confined to those crosswalks where no vehicle path crosses. Chain barriers can be used to block off the undesired crossings.

Additional traffic signal phases can sometimes be used to control important conflicts. Only under circumstances where these conflicts are of major importance can three or more phases be justified. The reason is based on two factors. One, additional phases require longer time cycles in which any one particular direction can only move a small proportion of the time. This results in a decrease in capacity for the routes going through this type of signal control. One intersection can be a "bottleneck" and limit the capacity for the entire route. Since multiphase signals require long cycle lengths, these signals are difficult if not impossible to accomodate in a coordinated, progressive traffic signal system. Because of these restrictions, this method of traffic control should be avoided unless other solutions are impossible.

During the course of the traffic study, we have been asked concerning the feasibility of using an "all-red" vehicle phase for the purpose of giving pedestrians an unimpeded walking interval. All the arguments used against

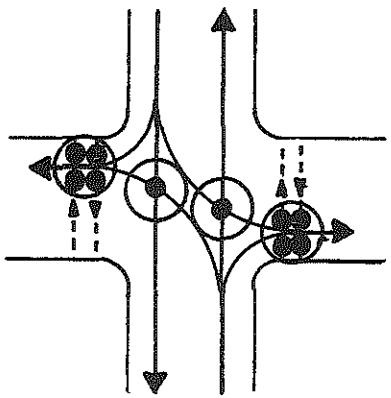
MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

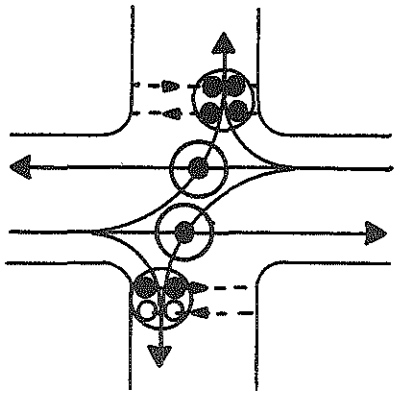
1958

PEDESTRIAN-VEHICLE CONFLICTS AT SIGNALIZED INTERSECTION

PHASE 1

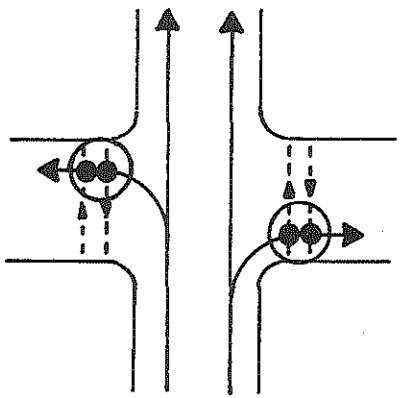


PHASE 2

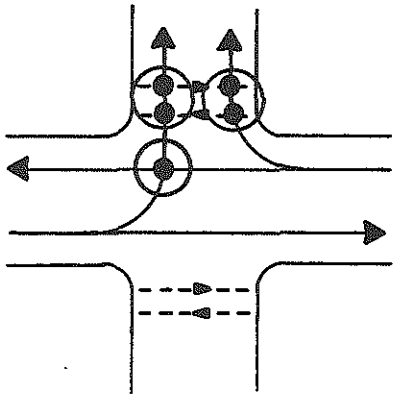


INTERSECTION OF
TWO, TWO-WAY STREETS
8 CONFLICT AREAS
20 PATH CROSSINGS

PHASE 1

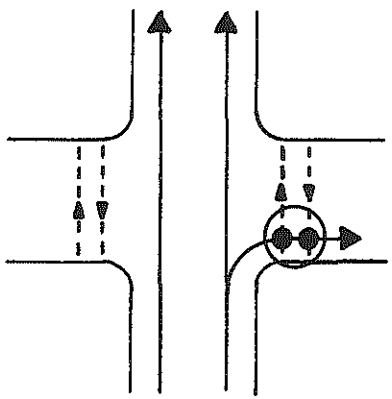


PHASE 2

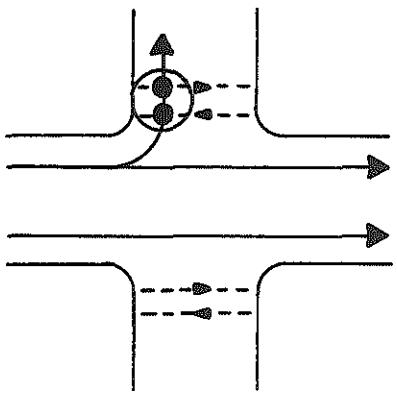


INTERSECTION OF
ONE & TWO-WAY STREET
5 CONFLICT AREAS
9 PATH CROSSINGS

PHASE 1



PHASE 2



INTERSECTION OF
TWO, ONE-WAY STREETS
2 CONFLICT AREAS
4 PATH CROSSINGS

PLATE 31

multi-phase signals apply in this case. Short block lengths in the downtown business area where pedestrian signals are installed do not provide sufficient storage space for the long wait periods required under long cycle lengths. Pedestrians also find the wait for a walking period disadvantageous under these circumstances. Since no well regulated street system can tolerate this type of control at every signalized intersection, pedestrians can be indoctrinated with dangerous habits. The present type of traffic signal and pedestrian control gives good protection to the pedestrian since the turning vehicles must yield to him when he is legally in the crosswalk. This system works much better when the motorist is given a little time near the end of each green period to complete or make right or left turns while the pedestrian is prevented from using the crosswalk by the display of the 'Don't-Walk' signals. The only way to prevent the motorist and pedestrian paths from crossing is by physical separations which necessitate either bridges or the rebuilding of a shopping area. These two methods require both large sums of money and considerable long range planning.

Another important factor in traffic signal operation is the time-split established for each signalized intersection. The amount of time assigned to each movement must be proportionate to the number of vehicles per lane which enter the signalized intersection. It would appear very simple to choose a total time cycle which would assure the passage of vehicles in both directions. Since the objective of a good signal operation is to assign right-of-way with safety and a minimum of delay, the problem becomes more complicated.

Longer cycle lengths although carrying the greater vehicle volumes also have the longest delays and vehicle storage problems. As already explained, cycle lengths in interconnected systems have to be the same throughout the system. This is not true at isolated signalized locations and here we have the opportunity to select the cycle length which assigns right-of-way in the most efficient manner.

Plate 32 shows a table which permits the selection of a cycle length when the lane volumes per hour are known. Lane volumes are used instead of total volumes since a signal approach leg with two lanes can obviously handle more traffic in the same time interval than can a single lane.

All lanes of traffic do not permit uninterrupted movements and factors retarding these movements should be considered when using this table. Left turning vehicles impede this movement, therefore, additional time must be permitted to offset this delay. Each left turning vehicle is the equivalent of 1.6 through-movement vehicles and they must be treated accordingly.

Large trucks also restrict venicle capacity at a traffic signal because they are more sluggish and require more time to get under way. The factor used for a truck is 1.5. Each truck is the equivalent of 1.5 passenger vehicles.

The tables are designed in terms of lane volumes per hour, but in areas where congestion is apt to occur at a traffic signal, lane volumes should be broken down to smaller time intervals. If the critical capacity of a signal is exceeded for even a small period of time involving a few cycle changes of the traffic signal, it is possible for congestion to continue for a much greater time due to the breakdown of normal traffic carrying capacities after the initial congestion point has been reached.

CENTRAL TRAFFIC SERVICES

DETERMINATION OF CYCLE LENGTH AND TIME SPLIT FOR TRAFFIC SIGNAL

Main Street Vehicles Per Lane Per Hour

Cross Street Vehicles Per Lane Per Hour

	300	350	400	450	500	550	600	650	700	750	800	850	900
90	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 66/34	35 66/34	40 66/34	40 70/30	45 70/30	45 74/26
100	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 66/34	35 66/34	40 66/34	40 70/30	45 70/30	45 74/26
150	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 66/34	35 66/34	40 66/34	40 70/30	45 70/30	45 74/26
200	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 66/34	35 66/34	40 66/34	40 70/30	45 70/30	45 74/26
250	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 66/34	35 66/34	40 66/34	45 68/32	50 69/31	50 70/30
300	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	30 60/40	35 63/37	35 63/37	40 65/35	45 67/33	45 67/33	50 66/34
350	30 57/43	30 57/43	30 57/43	30 57/43	30 57/43	30 57/43	35 60/40	40 60/40	40 60/40	45 63/37	50 64/36	50 64/36	55 66/34
400	30 54/46	30 54/46	30 54/46	30 54/46	30 54/46	35 55/45	40 58/42	40 58/42	45 60/40	50 60/40	50 62/38	60 64/36	65 65/35
450	30 50/50	30 50/50	30 50/50	30 50/50	35 52/48	40 55/45	40 55/45	45 56/44	50 56/44	55 60/40	60 60/40	65 62/38	70 63/37
500	30 46/54	30 46/54	30 46/54	35 48/52	40 50/50	40 53/47	45 54/46	50 54/46	55 55/45	60 57/43	65 59/41	70 60/40	80 62/38
550	30 43/57	30 43/57	35 45/55	40 45/55	40 47/53	50 50/50	50 52/48	55 53/47	60 54/46	65 54/46	70 58/42	75 58/42	85 59/41
600	30 40/60	35 43/57	40 42/58	40 45/55	45 46/54	50 48/52	55 50/50	60 52/48	65 53/47	70 53/47	70 56/44	85 57/43	90 58/42
650	35 37/63	35 40/60	40 42/58	45 44/56	50 46/54	55 47/53	60 48/52	65 50/50	70 52/48	75 52/48	80 54/46	95 55/45	100 56/44
700	35 37/63	40 40/60	45 40/60	50 44/56	55 45/55	60 46/54	65 47/53	70 48/52	75 50/50	80 52/48	90 53/47	100 54/46	115 55/45
750	40 35/65	45 37/63	50 40/60	55 41/59	60 43/57	65 44/56	70 45/55	75 48/52	85 49/51	90 50/50	100 51/49	115 52/48	
800	45 45/65	50 36/64	50 38/62	60 40/60	65 43/57	70 42/58	75 45/55	85 45/55	95 47/53	100 49/51	110 50/50		
850	45 34/66	50 36/64	60 36/64	65 38/62	70 40/60	75 42/58	85 43/57	95 44/56	100 46/54	115 46/54			
900	50 34/66	55 34/66	65 35/65	70 37/63	80 40/60	85 41/59	90 42/58	100 44/56	115 45/55				

NOTE: Corrective factors must be applied when commercial traffic and turning movements are present in the lane.

LEGEND

Cycle Length / Percent of Cycle

50 | 60 Main Street
40 Cross Street

PLATE 32

In using the table, the maximum lane volume per hour of any of the lanes served by the same "green period" should be used. It is reasonable to assume that the lesser lane volumes will be handled satisfactorily.

In going through a typical problem, let us assume a maximum of 750 vehicles per lane per hour on the Main Street and 550 vehicles per lane on the cross street (these volumes include adjustment factors for left turns and trucks). The table indicates that we would use a 65 second cycle. This is a minimum value for the cycle length because longer cycle lengths could pass this amount of traffic, but storage distance might prove inadequate or the delays may be excessive. There is a danger when the volumes per lane are quite variable, that there will be short periods when the cycle length derived from the above method will not be adequate. In this problem, we could take our volume by lanes on a five minute interval. By selecting the maximum volumes per lane per five minutes and multiplying by 12, we could use the table since there are 12, five minute periods in an hour. This would insure us against exceeding the limitations of the traffic signal for the selected cycle length. When using the minimum cycle length derived from this method, it may be necessary to increase it after setting in the field since delay factors and other conditions may not be consistent with theoretical values at every location.

Recommended Signal Timing Changes

The timing of the traffic signals in Midland is better than that found in most cities. The magnitude of the traffic problem compels a great deal of attention to this very important function. The signals located on the trunklines are the responsibility of the State Highway Department, therefore, the following recommendations will be concerned only with those signals under city control.

The biggest problem in traffic signal timing is to be found at the signals located on Main Street. As already mentioned, the city controlled signals at the intersections of Main Street with Ashman, McDonald, Rodd and Townsend Streets, are operating at a different cycle length than the Main and Jerome Street signal. This is undesirable and should be corrected. The Ashman, McDonald, Rodd and Townsend Street signals are operating "simultaneous" on a 75 second cycle. This is known as a "block system" and is considered satisfactory only when signals are not uniformally spaced and traffic volumes are so heavy that a storage problem develops. During periods when traffic is light, speeding will be encouraged with this type of operation.

Plate 33 shows a time-space diagram in which a progressive traffic flow is established for traffic along Main Street. The traffic signal at the intersection of Main and Jerome Streets becomes the restriction on the amount of green time available for Main Street traffic since the Jerome Street intersection compels the assignment of more green time than any of the other intersections along Main Street due to its heavy traffic volumes. Main Street is given 40% green time and 5% clearance interval time at this intersection in keeping with the vehicle volume distributions. The intersections of Main Street with Ashman and McDonald Streets are treated as one intersection and the signals are operated "simultaneous" due to their proximity. The signals located at the intersections of Main Street with Rodd and Townsend Streets are treated in like manner for the same reason. We are limited to the choice of

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

TIME-SPACE DIAGRAM

TWO-WAY OPERATION OF MAIN STREET

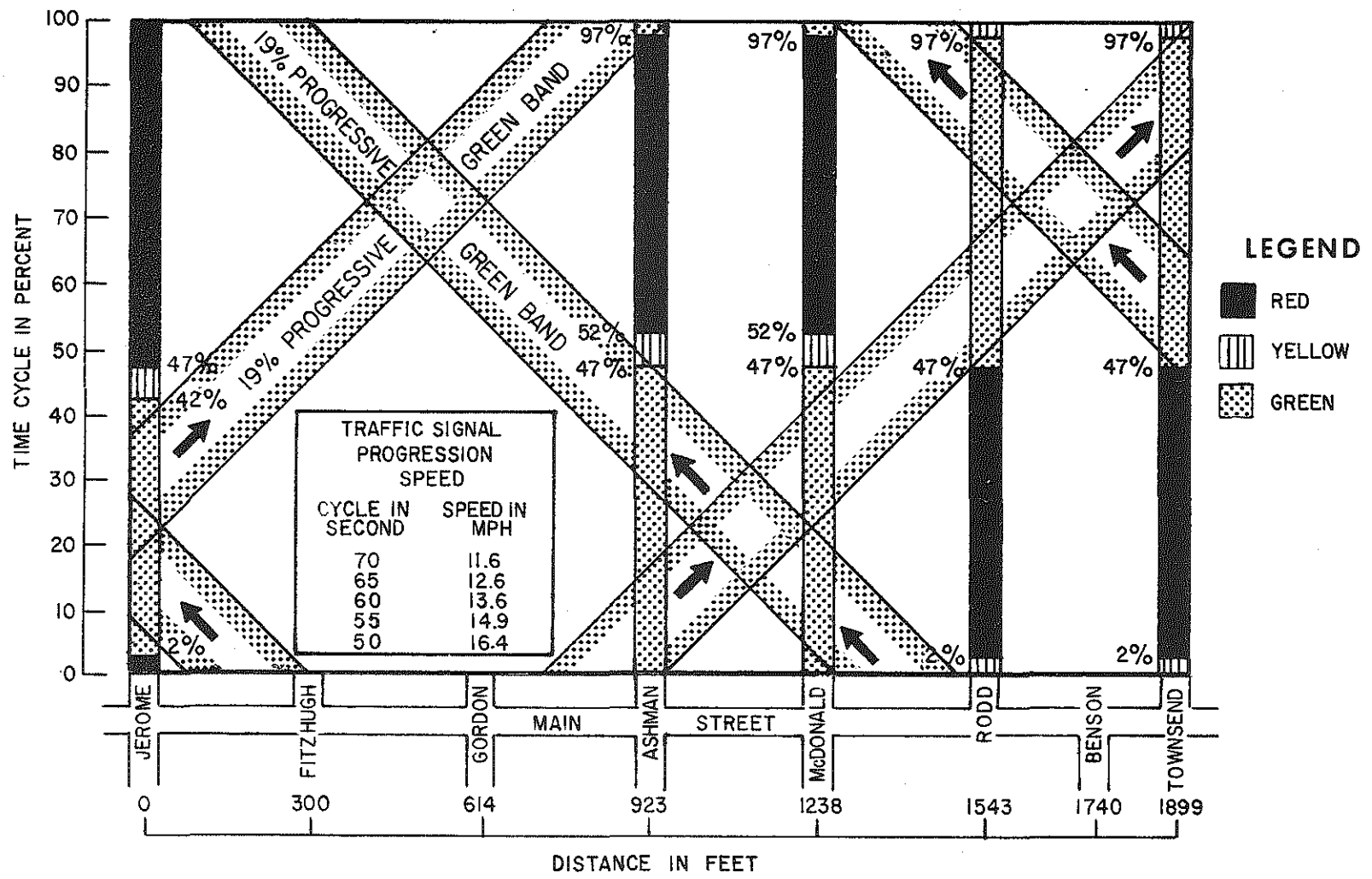


PLATE 33

cycle length which we can utilize since short block lengths along Main Street do not permit much signal storage area. Even by increasing our distance between 'perfect' progression points by operating on a "simultaneous" basis at the four proximate signal locations mentioned above, we can maintain a progression speed of only 11.6 miles per hour on a 70 second cycle. This speed becomes 16.4 miles per hour on a 50 second cycle. In the time-space diagram shown on Plate 33 we must establish the "perfect" progression point at or near Jerome Street due to the amount of green time being a minimum at this point. The other restrictions are created by the necessity of operating Ashman and McDonald, and Rodd and Townsend Streets as single intersections in order to obtain any semblance of a practical speed. By placing the "perfect" progression points near the center of these two pair of intersections, the most efficient progression is obtained.

An examination will reveal that the Ashman-McDonald traffic signals are spaced one cycle apart from the Jerome Street signal which means they are operating simultaneously with one another. Since the traffic volume at Ashman and McDonald Streets permits a longer green time on Main Street than at Jerome Street, we assign 50 percent of the cycle length to Main Street plus a 5 per cent interval while only 40 per cent green plus a 5 per cent clearing interval is given to Ashman and McDonald Streets. The Rodd-Townsend Street intersections are timed in the same manner because of the traffic distribution. This pair of signals is only one-half cycle length spacing from the Ashman-McDonald pair, therefore, they are operated in an alternate sequence.

The width of the progression band for traffic moving in both directions amounts to only 19 per cent with speeds being on the very low side if short cycles are not utilized. Although the Townsend Street signal is operated on a flasher schedule for most of the day, this only partially alleviates the problems caused by poor spacing of traffic signals. Basically the problem of signal progression is created by the Ashman, McDonald and Rodd Street signals being spaced too close together. Although undesirable from the standpoint of good progression traffic signals will be needed at these locations due to the heavy pedestrian movements.

Even though the present traffic signal timing schedule is offering no progression, the one shown on Plate 33 is admittedly no real cure to the traffic problem. In seeking the real solution to the traffic signal timing problem and considering the unbalanced distribution of traffic volumes along Main Street we arrive at the one-way street plan discussed in the Chapter dealing with Arterial Streets, Plate 34 shows a timing schedule which utilizes the advantages that a one-way street offers in the establishment of vehicle progression.

As already mentioned, we cannot provide progression in one direction and disregard it in the other. Since an Ashman and Rodd one-way system is being proposed, we must take this into account when figuring the progression along Main Street and Larkin Street. To meet this condition, the signals at the intersections of Ashman and Rodd Streets must be offset with each other 25 per cent of the signal cycle. This has been accomplished in the proposed timing chart. Since 40 per cent of the cycle length is all of the green time allotted at Jerome Street, this regulates the width of the progressive band. In the proposed timing, the intersections of Ashman, McDonald and Rodd Streets are shown with a green time of 45 per cent plus a 5 per cent clearing interval for

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

TIME-SPACE DIAGRAM

ONE-WAY OPERATION OF MAIN STREET

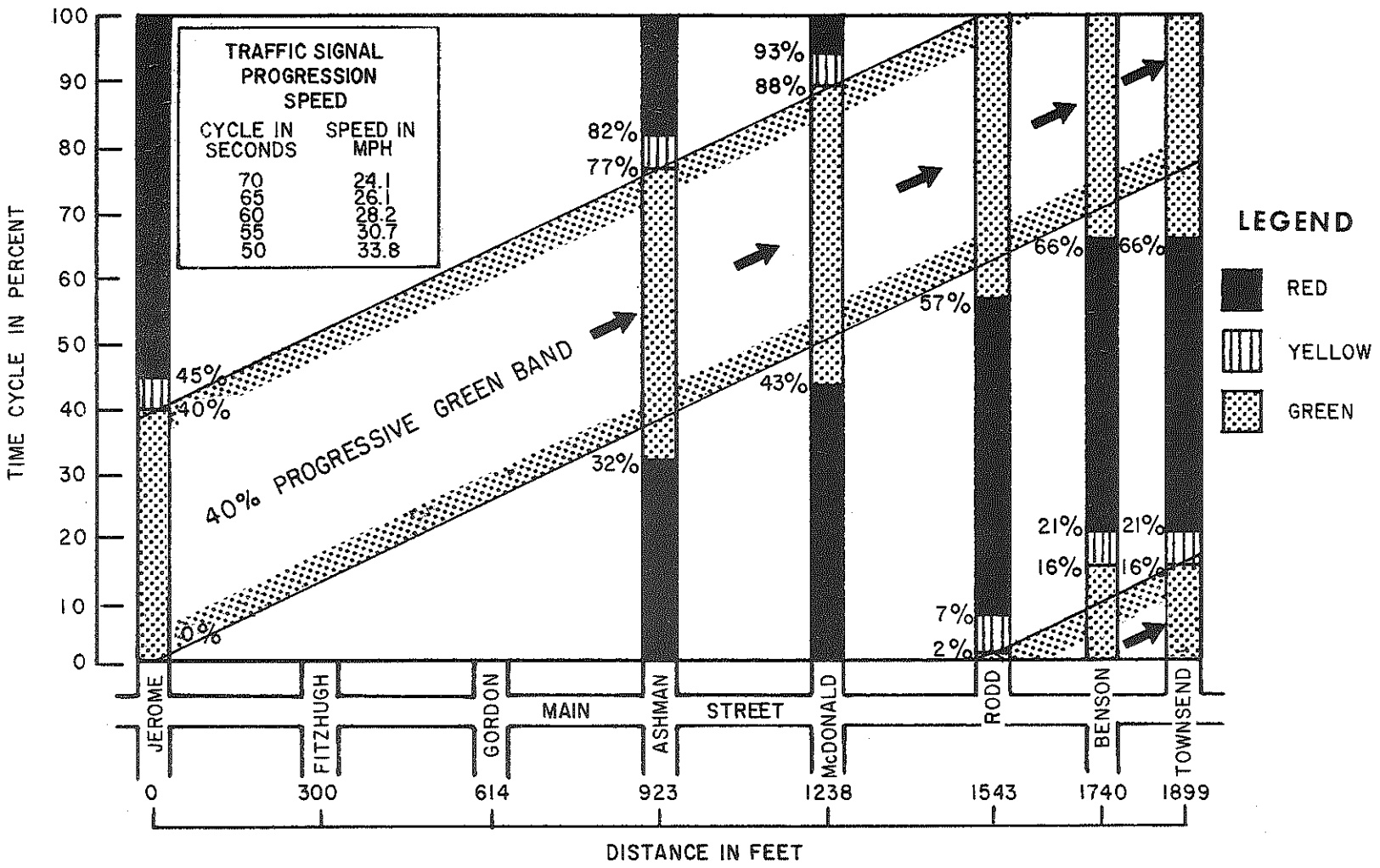


PLATE 34

Main Street. This could be increased to 50 per cent plus 5 per cent if needed in view of present traffic distributions.

Benson and Townsend Street intersections are shown with Main Street having a green period of 50 per cent and a clearance interval of 5 per cent. Benson Street is signalized under the one-way operation in order to permit traffic to flow from Townsend Street to Benson Street against the one-way traffic flow. A 5 per cent "all-red" interval permits this to be performed in safety.

Since more green time is being allowed to Main Street at the Ashman, McDonald, Rodd, Benson and Townsend Street signals, this time should be utilized in advance of the progression band coming out of the Jerome Street signal to clear out of the intersection before the platoon of vehicles travelling in the progression band arrive at the intersection.

The Larkin Street signals which will be needed on a one-way operation will be timed in a similar manner, however, they must be offset from the Main Street signals properly for progression to be possible on the Main-Larkin and Ashman-Rodd one-way street systems. By offsetting the signal at Larkin-Rodd 50 per cent from the Main and Ashman Street signal and the signal at Larkin and Ashman Streets 75 per cent, this grid progression will be obtained. This means that the green signal for northwest-bound Larkin Street traffic at the Rodd Street signal will come on 50 per cent of the cycle length after the green signal for southeast-bound Main Street traffic at the Main and Ashman Street intersection.

The speeds obtained from this time schedule range from 24.1 miles per hour on a 70 second cycle to 33.8 miles per hour on a 50 second cycle. Since we are able to utilize almost the entire green time for progression, it is possible to travel at much slower speeds than shown and still pass through the green light at each intersection without stopping.

Plate 35 shows a traffic signal timing chart for the signals along Main Street. This timing chart shows the relationship between the timing of the vehicle and the pedestrian signals. The present pedestrian signal timing in Midland is allowing the pedestrians to walk too close to the beginning of the clearance intervals for vehicles. It is the prime purpose of pedestrian signals to not only give greater safety to the pedestrian, but also to give turning vehicles a 'break'. A motorist will be much more willing to wait for a pedestrian in a crosswalk before he completes a turn if he is assured that there will be an opportunity to cross the crosswalk near the end of the green interval. The only way for this to be accomplished is to hold back the pedestrian for some time in advance of the vehicle clearance interval. The Main and Ashman Street intersection does not permit as much latitude in this respect as the other intersections due to the large pedestrian volumes.

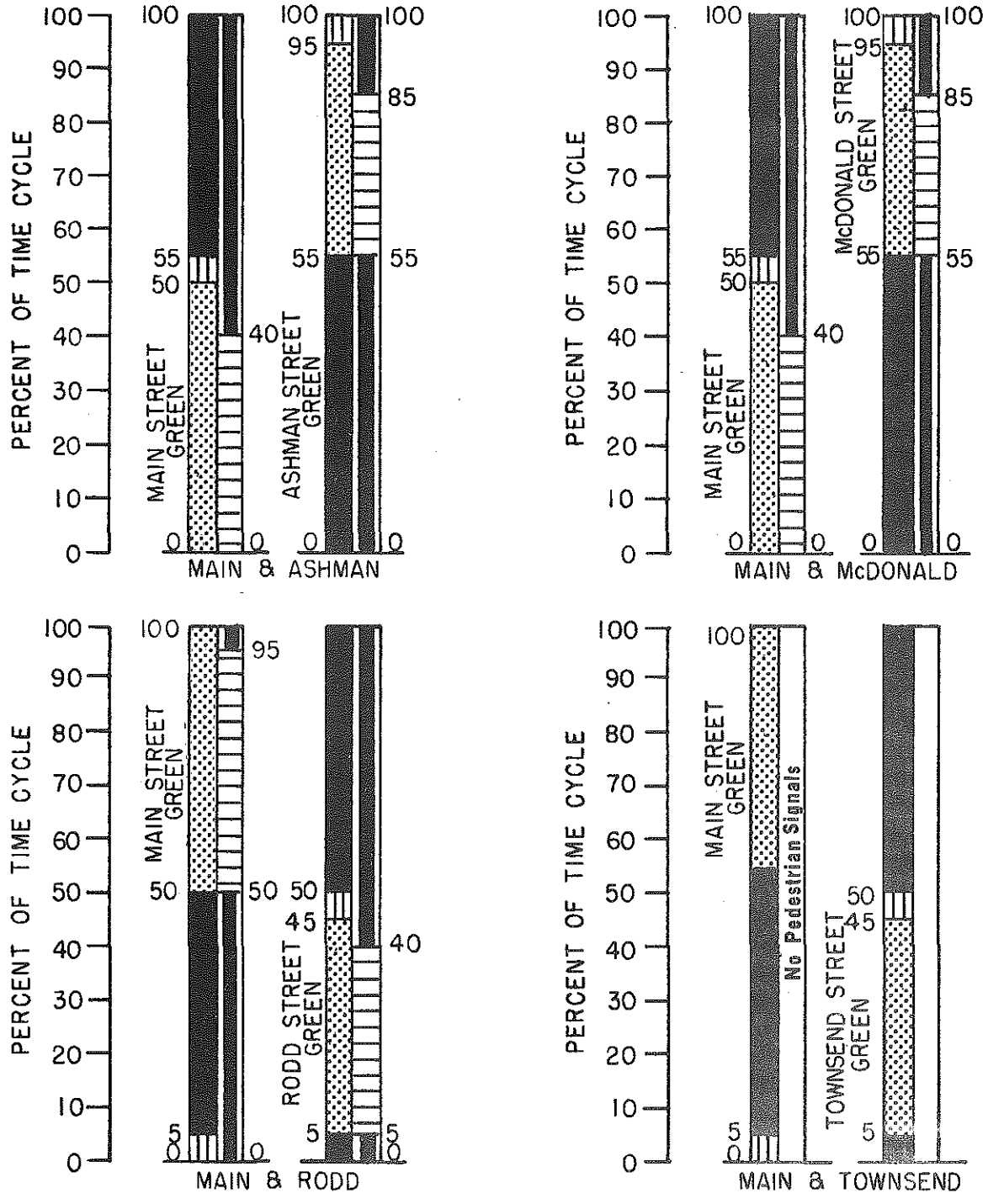
The timing of the traffic signal at the intersection of Main and Townsend Streets will have to be set in order to permit traffic to travel one-way to the southwest on Townsend Street and travel over to Benson Street against one-way Main Street traffic. The reason for this operation is explained in the section on Major Streets. This means that signal heads will have to be placed at Benson Street in order to hold back Main Street traffic from this intersection. By keeping this area free, traffic can flow freely from Townsend Street to Benson Street. Plate 46 in the section on Intersection Control, Signs and Markings, shows how this intersection can be signed and signalized.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

TRAFFIC SIGNAL TIMING CHART FOR MAIN STREET



LEGEND

Vehicle Signals

- RED
- YELLOW
- GREEN

Pedestrian Signals

- WALK
- DON'T WALK

PLATE 35

There are three signals located close enough together on Indian Street to be coordinated with each other. The signal at the intersection of Indian and George Streets should be operated alternate with the signal at Indian and Ashman Streets. The signal at Indian and Haley Streets should be operated simultaneously with the Indian and Ashman Street signal. While we can appreciate that these signals are not operated stop and go on a 24-hour basis and that they are not interconnected, it is possible for the signals to remain in step by synchronous action of the controllers. The controller can be wired in such manner that the time dial will be kept in operation even during flasher operation. Only the stop and go circuits in the controller will be deenergized during this period. When the controller returns to stop and go operation, it will do so only at the beginning of the green period on Indian Street. There will be no problem in keeping the traffic signals at the Indian-Ashman and Indian-Haley Street intersections in step since they are interconnected to the Ellsworth Street signal system. Although the signal at George Street is not interconnected at present this can be done, or it can be operated by synchronous action.

Any new traffic signal controllers which the city purchases should be of the expansible type. Even where there is little possibility of more than one time split or cycle length being necessary, this permits standardization of equipment and easy maintenance.

At some locations the timing of the traffic signals could be improved, but some of the timing faults are basic to the present street operations in Midland. These will have to be corrected if any permanent benefits are to be obtained. Timing needs can also change in a very short period and what works today might need to be changed for tomorrow's traffic. Signalized intersections should be checked periodically and traffic counted whenever a need is indicated for signal timing changes.

Signal Head Improvements

Traffic signal standards call for dual, three-color, vehicle signal heads facing each signalized direction. Several, but not all of the traffic signal installations meet this requirement. Unfortunately, the very fact that a high quality of signalization is provided at some locations, makes the single heads more hazardous. Dual traffic signal heads serve more than one purpose. On roadways where there are two lanes available on the intersection approach, one signal head can be obscured to vehicles in one lane of traffic by vehicles in the other. This is quite common where large trucks are present. Dual heads give a double safety factor in case of a lamp failure. Dual heads permit better visibility for drivers attempting to make a turn in the intersection.

The following intersections in Midland have traffic signals with only a single, three-color head: Saginaw Road and Eastman Road (oversize), Saginaw Road and North Ashman Circle Drive, Saginaw Road and South Ashman Circle Drive, Washington Street and Eastlawn Street, Jefferson Street and Haley Street, Indian Street and Haley Street, Indian Street and Fifth Street, Indian Street and George Street, Indian Street and Ashman Street, Main Street and Rodd Street, Main Street and McDonald Street, Main Street and Ashman Street, Buttles Street and the walk to the Dow Clock Room, Washington Street and Ashman Street.

The present pedestrian signals in Midland are of the neon blank-out type using the new colors prescribed by the Michigan State Highway Department. These are a blue color for the "walk" interval and an orange color for the "Don't-walk". These standards should be followed on any new pedestrian signal installations.

Recommendations for Improvement in Traffic Signal Operation

Since a traffic signal curtails the capacity of a street and poor operation creates hazards, it is important that certain practices be followed. Some of the factors which render present traffic signal operation inefficient should be modified or eliminated. The following recommendations are made with the objective of obtaining an efficient and safe traffic signal system for Midland:

1. A street which has only one lane for traffic moving in each direction should be expanded to two lanes on the approaches to a traffic signal. Widening is usually unnecessary in most cases since parking can be restricted for a sufficient distance back of the "stop-bar" so that a number of vehicles equal to that stored during one cycle length of the traffic signal can be accommodated. These lanes should be well defined by pavement marking and signing and the police should prohibit any standing, stopping or parking in the curb lane for any other purpose than stopping for the traffic signal.

2. All signalized intersections which possess pedestrian sidewalks should have marked crosswalks through the intersection to confine the pedestrians to a protected area which motorists must respect. Pedestrians must be compelled to observe the signals in the same manner as are motorists in order not to interfere with traffic movements. Where pedestrian signals are installed, the pedestrian should be cited for a violation if he leaves the curb after the "don't-walk" signal is displayed. This should not be misinterpreted as meaning that the pedestrian has no right to be in the intersection on a "don't-walk" signal provided he left the curb legally. It is for this reason that pedestrian signals should be set to turn the "walk" signal off soon enough so that pedestrians can clear the intersection and thus permit motorists to complete their turns. It is sometimes erroneously believed that the "walk" signal is timed so that a pedestrian can walk from one side of the street to the other while it is being displayed. Since a motorist must yield the right-of-way to a pedestrian, the pedestrian should be subject to legally observe a signal's indication.

3. Improve the visibility of traffic signal heads as discussed in this chapter.

4. Establish a one-way street plan offered later in this report since many of the basic faults of signal timing in Midland are solved by this type of traffic operation.

5. Interconnect and coordinate all traffic signals located within one-half mile of each other. Establish a grid system of timing so that all new signals can be determined by their adaptibility to the system. No new signals should be installed which will destroy progressive traffic movements in signalized systems. Midland's Arterial Street plan has been designed with this as one of it's goals.

New Traffic Signal Installations

Midland's fast growing population and traffic will require the installation of new traffic signals. Intelligent planning is the only way to control the location of these signals so they will fit a coordinated traffic operation plan. The new arterial street plan will require new signals on a stage development basis. In all cases, the minimum warrants outlined in the Michigan Manual of Uniform Traffic Control Devices should be followed.

During the course of the traffic study, we welcomed complaints from the public on their pet traffic peeves. Traffic signal needs or maladjustment in the present signals formed the basis for most of these complaints. The biggest difficulties were encountered on Ellsworth and Saginaw Road both of which are under State Highway Department jurisdiction.

Saginaw Road is slated to return to the city when the new US-10 By-Pass is completed around the city. This will be of expressway design and will afford considerable traffic relief to the present route with the removal of a large percentage of through traffic. The intersection of Saginaw and Eastlawn Streets apparently is developing into a major traffic problem due to three conditions present in the area. The new Dow Administrative Center lies to the east of this intersection and will generate an increasing amount of traffic. The High School is also east of this intersection and this is creating a vehicle and pedestrian problem. Added to these factors is the growth of a shopping area immediately north of this location on Saginaw Road. It is quite evident that traffic signal warrants are going to be exceeded. It is unfortunate that the intersection of Saginaw and Washington Streets lies a short distance to the southeast of this intersection. A signal is already installed at this location and another signal in proximity would destroy good vehicle progression. For the present, the State Highway Department should be consulted on this matter. In the future, some alterations are needed in the street pattern through this area.

The intersection of Saginaw Road and Haley Street also has traffic problems due to the large traffic volumes. Although this intersection does not have the growth potential of the Eastlawn Street intersection, it still has difficulties that will not diminish if left unsolved. The same procedure recommended at the Saginaw and Eastlawn Street intersection should be followed here.

The forming of one-way street pairs is going to require new traffic signal installations. Several people complained of the difficulty of crossing Ellsworth Street in the area from Jerome Street to George Street. Since the signals along this street are in a progression system, this means that traffic is coming from one direction or another and crossing is well nigh impossible during rush hours at non-signalized intersections. A one-way operation on Ellsworth has been in the planning stage for several years because of the problems mentioned in these complaints. Under a one-way operation, there will be definite gaps in traffic on the "downstream" side of a traffic signal. This will solve the right-of-way problems along Ellsworth Street.

Since Buttles Street would be the logical one-way pair to Ellsworth Street, this street will require signalized crossings. Two other new one-way street systems planned in this area are the Main-Larkin, Ashman-Rodd, and State-George Streets. New signal installations which will be needed because

of these one-way systems will be at Jerome and Ellsworth Streets, Ashman and Buttles Streets, Rodd and Buttles Streets, State and Ellsworth Streets, State and Buttles Streets, Larkin and Ashman Streets, Larkin and Rodd Streets, Larkin and George Streets, and Larkin and State Streets.

The intersection of Buttles with Jerome Street will not require signalization since most of the traffic conflict will be from traffic entering Buttles Street from the southwest on Jerome Street and travelling northwest. This will be required to enter the straight-through movement of Buttles Street, but since this traffic is one-way, the signal at Ashman and Buttles Streets should establish sufficient gaps in vehicle traffic.

The intersection of Jerome and Larkin Streets would be better without a signal unless the Eastman Road leg could be eliminated from the intersection. Under the present layout, even after a one-way operation is established, a three-phase signal would be required. The only solution to this problem is to establish a one-way operation along the Jerome Street axis. This is difficult to do and hardly justified at the present time. Any future redevelopment of Midland's downtown area should seek a solution for this problem.

The intersection of Saginaw and Rodd Streets would require signalization, but this plan should be coordinated with the proposed traffic changes for the Ashman Circle mentioned later in the report.

In the new arterial street plan, signals can be anticipated at the intersection of two major streets. New signals will no doubt be required in the vicinity of the Dow Administrative Center as traffic development grows. Likely locations for new signals in this area are the intersections of Abbott and Second Streets, Swede and Second Streets, Waldo and Second Streets, Haley and Swede Streets and Asnman and Swede Streets. These signals should conform to traffic signal installation warrants and should be placed in operation only when minimum requirements are satisfied.

All possible locations for new traffic signals have been given to the city as a part of the Highway Needs Study. Naturally, since many causes for traffic development can undergo unforseen changes, actual traffic signal needs cannot always be predicted. The complicated part of this planning is to have the major streets spaced and operated in such manner that vehicle conflicts requiring signalization can be handled with efficiency when the need arises.

MAJOR STREET SYSTEM

SYSTEM PLANNING

The continuous increase in motor vehicle travel has resulted in a tremendous strain on our existing road system. In the past when motor vehicle traffic was light, we could afford to be extravagant in our usage of the streets; but, now with the demand much greater than the average budget can sustain, we must go back and reappraise our usage of the existing streets so that the greatest amount of efficiency of traffic operation and safety can be obtained. One of the main purposes of the Midland Traffic Study was to obtain a street plan which would not entail any unneeded construction. It is equally important to eliminate any construction which could not satisfy a good traffic operations plan. It is all too common to find an expensive, wide street being built along a location where the limitations of intersection capacity permit little additional vehicle carrying capacity. By applying good traffic engineering principles to street operation and planning, a city can save many dollars in construction costs and reap the economic benefits which are obtained by shorter travel times and the reduction of accident rates.

Traffic conditions on a route play a big part in establishing the characteristics of development along its borders. Many businesses which formerly flourished on a street, suffered economic strangulation as the street became congested with traffic. Many slum areas in larger cities were caused by such condition. Businesses have the best chance for survival in those areas where traffic can move more freely and where sufficient parking spaces are available.

Before a major street system can be developed, it is necessary to determine the most important generators of traffic and to isolate traffic desire lines. The second step is to locate the areas of congestion on the existing street system. These steps were taken on the Midland Traffic Study. The vehicle and pedestrian volume counts, and speed and delay studies played an important part. With the combination of this information and the results gained from other field observations and studies, it is possible to analyze and develop an arterial street system. The splendid cooperation received from the City Planning Commission and the City Engineer's Office permitted the full benefits of the traffic information gathered in the study to be incorporated in the Arterial Street Plan recently adopted by the City Council.

Many of the recommendations made in this report are closely linked with other recommendations. Attempting to alter certain parts of the plan without considering the effects on the total operation could result in serious problems. It is particularly important that a new traffic operation be a success once it is applied in order to offset the criticism which generally accompanies it in the beginning. If a weak approach is made to the problem and key factors are omitted in the plan's application, lack of results can give substance to the critics. Whenever a traffic plan requires the uprooting of well established travel habits, there is bound to be opposition. Citizens of Midland must be broadminded and constructive in their criticism lest the things they are criticizing affect them adversely if left untouched. When sound traffic engineering techniques are applied, the changes required in the solution to the traffic problem are bound to be beneficial Every citizen should examine the plan for the effects it will have on him. Criticism should be

based on factual evidence, since opinion only places "road blocks" in the way of the solution to traffic problems.

Recommended Standards for Streets

Before new streets can be constructed or old streets reconstructed, we must have an ample knowledge concerning the type and amounts of traffic using the facility so that suitable widths, curb radii, intersection capacity and other needed features can be incorporated in its design. We have at our disposal design standards which have been established after years of practical studies and research. Classification of streets determine the standards which are to be applied. This means that the street system must be evaluated in order to determine the amount, type and speed of traffic using it, but does not necessarily mean that a street cannot be altered in its traffic characteristics if such a change is necessary for good operation. Very often a street acquires arterial characteristics because of poor planning in an area of incomplete development. Construction of an alternate route will remove this street from the arterial system.

A good major street should minimize the effects of private driveways, alleys and business entrances, even though no special control of access is exercised. Design speeds of such street should range from 30 miles per hour in built-up areas to 50 miles per hour in outlying areas. Parking should be immediately restricted unless such major street is slated for relocation or reconstruction in the near future and where parking will be entirely prohibited. This is only applying sound economic principles. The type of paved surface required for a major street is too expensive to permit its use as a parking area. Off-street parking facilities, in addition to greatly minimizing interference to traffic movements, are economically advantageous over the practice of permitting parking on a street. The only justification for permitting parking on a newly-constructed major street is where such construction was warranted on the basis of poor present pavement condition. In such cases, the roadway is reconstructed to a greater width in anticipation of future traffic volumes within the expected life of the pavement. Parking can be permitted only until such time as the anticipated traffic volumes materialize.

Lane widths on major streets should be not less than 11 feet wide, but should be preferably 12 feet wide. Modifications of existing streets will permit widths as low as 10 feet;, but, under this restriction, traffic capacities are lower than those with more generous widths. Continuous barrier curbs which are 6 to 8 inches high at pavement edges should be offset 1 to 2 feet from the edge of the through traffic lanes.

Plate 36 shows how an arterial street is used with and without parking. Many people think that a parked car requires only the space demanded by its physical dimensions. However, studies conducted on a nation-wide basis have shown quite conclusively that moving vehicles will not travel nearer a parked vehicle than 2 to 5 feet. As the speed of traffic increases, the influence area of the parked vehicle becomes wider. By recognizing this behavior pattern of motor vehicle operators and also anticipating the ultimate utilization of this parking lane for a future travel lane, a parking lane of from 10 to 12 feet in width should be provided. It must be kept in mind that even when the proper widths are provided for the parking of vehicles, traffic is impeded and capacity is decreased to a certain extent. In view of this evidence, it is

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

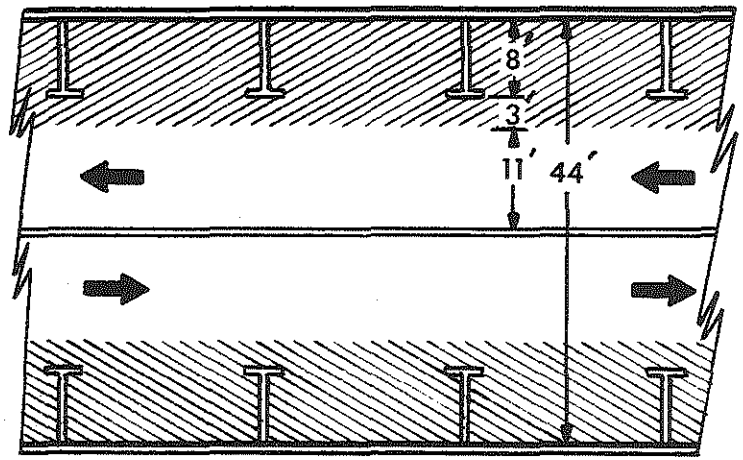
1958

ARTERIAL STREET USAGE

PLATE 36

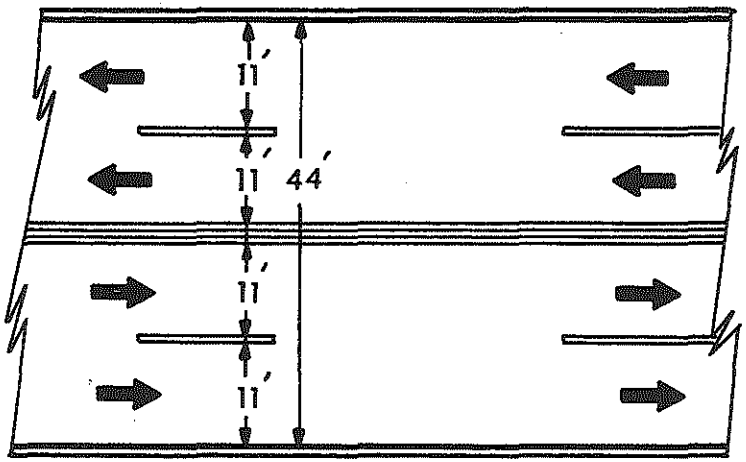
On Street Parking

Extent of parking influence shown by shaded area.
Two eleven foot travel lanes available for travel.



No Parking On Street

Four travel lanes available in each direction



very questionable as to how much curb parking a city can afford to maintain along an arterial street. Plate 36 shows how the transition can be made on a 44 foot wide pavement which is the recommended design width for an arterial street.

Under those circumstances when parking on an arterial street cannot reasonably be prohibited, such parking as is permitted should be parallel for obvious reasons of safety. Furthermore, curb parking should be prohibited for some distance from the intersection to provide for proper side street visibility and to improve intersection capacity.

Residential streets must serve the dual purpose of travel and parking. These streets generally require parking on both sides, especially where development has built up on both sides of the roadway. The minimum widths for residential streets where parking is permitted on both sides should be 36 feet. Although this width may seem quite generous in view of present practices of construction, vehicles pass each other with great difficulty and very slow speeds on such streets. When parking is permitted on both sides on streets of less than 36 feet in width, moving vehicles must thread their way in single file, thus reducing further their speed and capacity and increasing the pedestrian accident potential, especially as pertains to children who may emerge from between parked vehicles.

In planning new residential areas, real estate developers sometimes overlook the fact, if too extensive an area is served only by residential streets, that certain of these streets will be required to carry arterial traffic volumes at points where traffic funnels out of the area. Arterial or collector streets must be spaced according to area development. Failure to provide for them by no means prevents their development on an unplanned basis, and when ultimate necessity requires the application of traffic control measures, considerable resentment usually develops. Much of this difficulty can be avoided by anticipating future growth and intelligently planning for such conditions by designating arterial streets and developing an overall street plan in advance.

Improvement in Street Capacity

Midland's rapid growth means that existing street capacity must be increased if traffic deterioration of certain areas is to be avoided. Two such critical areas are the Main Street area east of the river and the Ashman Circle business area. Streets serving Dow Chemical Company's traffic are also in great need of relief. The Main Street business area has most of its traffic problems concentrated in the area bounded by Jerome Street on the north, Ellsworth Street on the east, State Street on the south and the river on west. The businesses in this area generate considerable traffic due to the drivers seeking parking places, loading and unloading activities and employees coming from and going to work. Contributing greatly to the traffic problem of the area is the Benson Street Bridge which feeds a large volume of traffic daily into the heart of the business district. The intersection of Main and Benson Street which handles this traffic is a "tee" intersection. This requires all traffic entering or leaving Benson Street to do so by turning movements. The Bridge is limited to two-lane construction which regulates the capacity, several traffic movements at this intersection have been restricted. There is little more that can be attained by this type of traffic regulation.

The section of the report on Parking makes several recommendations which will contribute to better traffic operation in this area. The Planning Commission is presently working on a Downtown Redevelopment Plan which will completely change the structure of this general area; and, of which, a comprehensive traffic plan should be an integral part. Inasmuch as present traffic conditions demand immediate relief, an extensive one-way operation as a means of improving traffic capacity is being recommended in this report. Further recommendation is being made for the construction of a new bridge to the southeast of the Main-Benson area to afford a crossing of the river without the necessity for the large volumes of traffic to weave and filter through the business area.

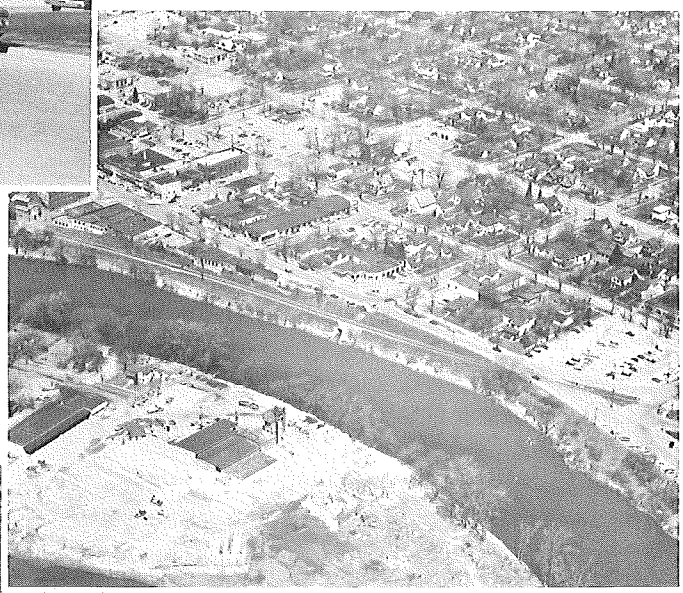
The Ashman Circle area was originally planned to be an attractive focusing point for traffic, whereby it could circulate by means of a rotary street. The plan of a true rotary was destroyed, however, when Saginaw Road was built to cut right through the middle of the island formed by the rotary. While the early planners thought that the idea of having traffic concentrating on a single location from all directions would be a boon to business, they never dreamed that the over-abundance of traffic which is now passing through this area would actually defeat their original intentions. Now, the traffic which has no origin or destination in the Ashman Circle area, is forced to travel through this congested location due to the arrangement of arterial streets. Once a traffic pattern like this is established, it is difficult to change. Any corrective measures must be well planned in order to keep existing travel desire lines open.

One corrective step which is already long overdue is the removal of parking on Ashman Circle. A photograph on Plate 37 shows the effect of this parking in restricting capacity. The lane capacity is critically inadequate in view of the large volumes of traffic entering from six different intersection legs. Added to this difficulty is the need for traffic signal control because of Saginaw Road cutting through the center island. No business man has the right to expect this parking to remain in view of the adequate off-street parking facilities in the area.

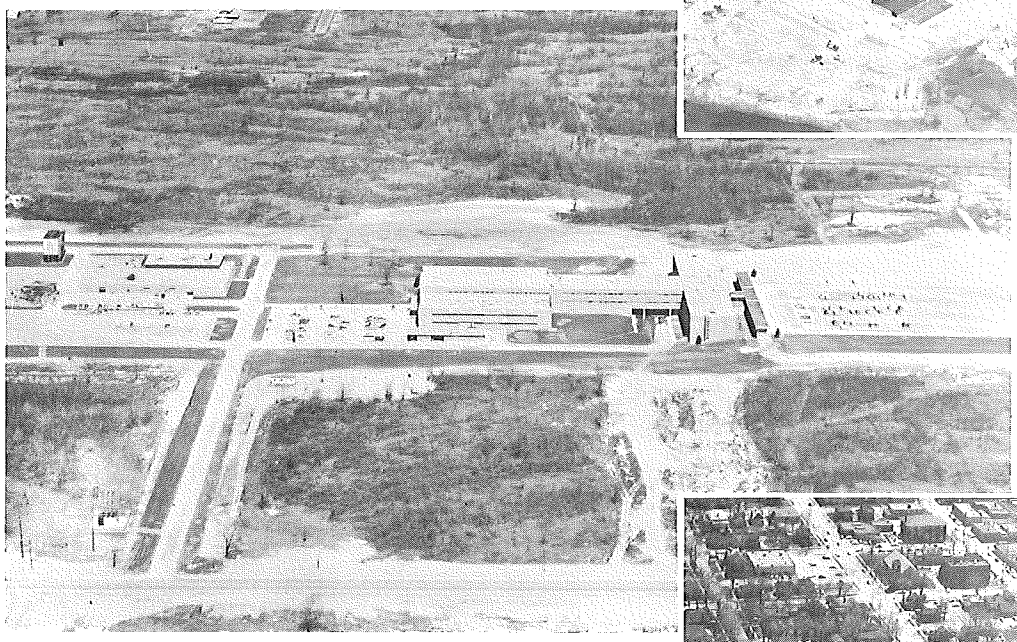
Another step towards alleviating the congestion in the circle is shown on the new arterial plan whereby traffic which would ordinarily be required to utilize the circle in proceeding to it's destination is afforded alternate arterial routes out of the circle proper.

As already mentioned, Saginaw Road will revert to city control when the new US-10 By-Pass is completed. When this has been accomplished, the plan for improving traffic operations at the Ashman Circle is as shown on Plate 38. Saginaw Street through the middle of the Circle will be closed off thus eliminating a traffic movement which is alien to the proper operation of a traffic circle. The success of a traffic circle is based on the ability of vehicles to weave through each other. Furthermore placing parked vehicles and traffic signals in the path of weaving vehicles violates one of the fundamental principles of good traffic engineering. The traffic island shown at the entrance to each leg at the traffic signal is not required to be curbed. This effect can be accomplished by painting or by placing rubber posts to outline the shape of the island. These posts are of recent development and were designed to prevent motorists from encroaching on a certain area but will cause no extensive damage if they are struck by a vehicle.

ASHMAN CIRCLE
NEEDS TRAVEL CAPACITY



SITE OF STATE-GEORGE STREET BRIDGE



DOW
ADMINISTRATIVE
CENTER

AREA NEEDS TRAFFIC BETTERMENT

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

PROPOSED ASHMAN CIRCLE REVISION

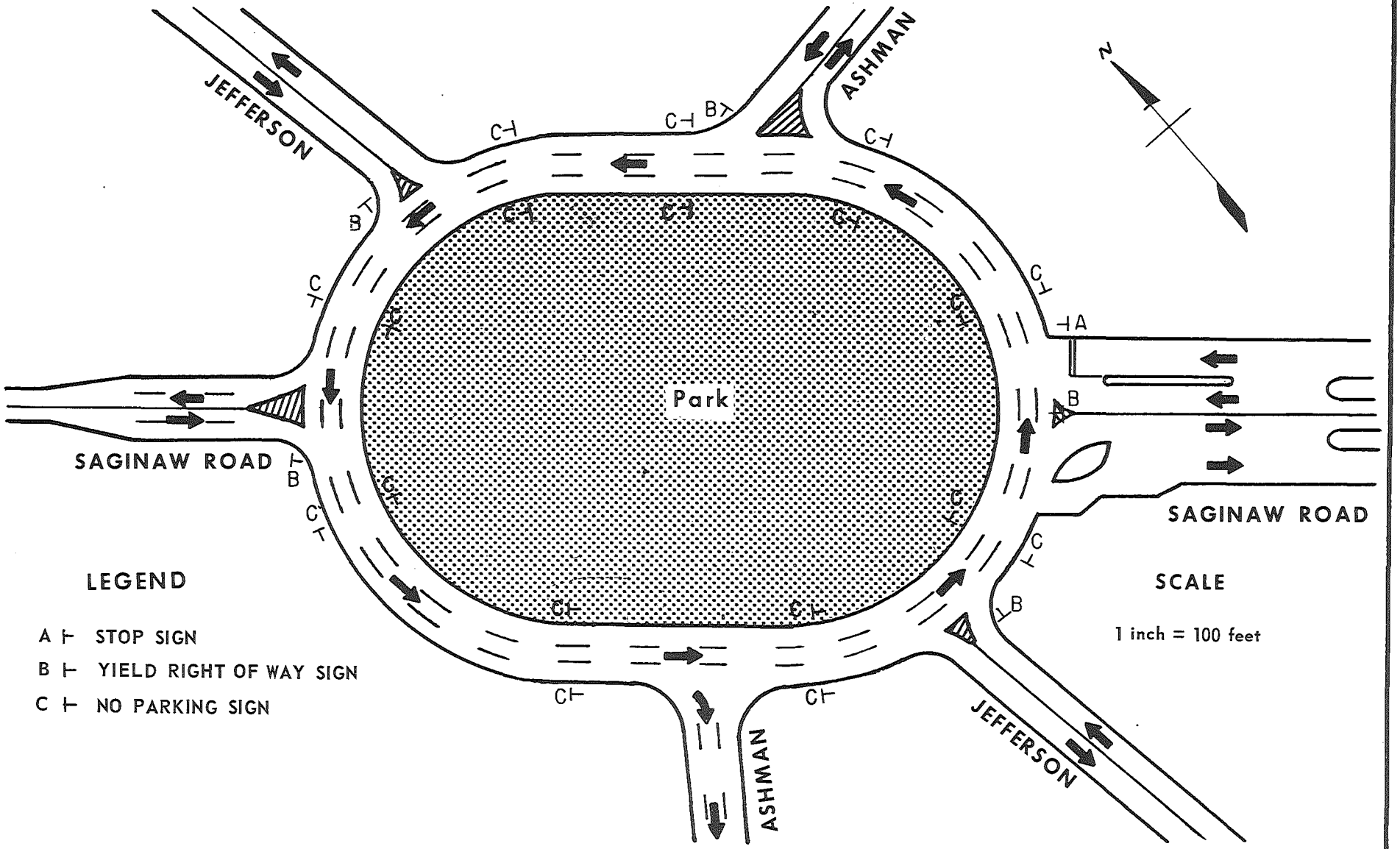


PLATE 38

Dow Chemical Company's traffic creates many problems in those areas where the vehicles park or pick up passengers. This Company has done an unusually fine job in taking progressive steps to correct it's own traffic problems. Most of the solutions to the existing problems are to be found in providing better vehicle paths and traffic control measures. The one-way street plan offered in this report is the key to the success of the traffic betterment plan.

One problem that requires attention in addition to providing one-way facilities is that created by the loading of passengers into vehicles along Bay City Road. The problem is particularly acute along this street since there is little opportunity to pick up passengers in the parking areas. All the parking lots of Dow Chemical Company along Bay City Road are of the 'ribbon' variety. This is especially true of those lying south of the roadway nearest the plant buildings. It would be unwise to establish a pickup area north of the road since this would create the problem of workers crossing the roadway, thus aggravating an already undesirable condition. The fifth lane built through this area was designed for passenger pick-up purposes. Unfortunately this lane was built continuous through the area thus traffic is using it as another travel lane. This has been responsible for a very hazardous condition.

The Dow officials have attempted to minimize this hazard by placing gates which are swung out from the curb during rush hours in order to discourage through traffic from using this lane. This blocking of the lane has been another benefit since it provides an accelerating lane for traffic entering the highway from the parking lot driveways back of the gates. The gates while accomplishing the job for which they are intended, offer certain hazards and require continuous tending and maintenance. A more permanent construction is needed for this problem. The gates block off the fifth lane during peak traffic periods, therefore, it cannot be argued that the fifth lane is needed for travel purposes in the off-peak periods. The varying usage of this lane is very apt to "booby-trap" some drivers. Permanent barriers can be constructed by the city when M-20 is shifted to the new location. These barriers can be formed by curbing which will make a protuberance into the fifth lane up to a distance of 2 feet from the edge of the outer travel lane. Delineators can be placed on these barriers for night time visibility. The barriers should be wedge shaped on the side facing oncoming traffic in the fifth lane so that it can ease into the adjacent travel lane. They need not interfere with normal drainage along the edge of the raodway since an open waterway can be built through the barrier or catch-basins can be installed.

One-Way Streets

The one-way streets which have been included in Midland's Arterial Street Plan form a solid framework which will insure it's success. Before discussing the reasons for the selection of one-way streets in Midland, it is well to discuss the general benefits which result from their usage.

The following are the benefits that can result from a well planned one-way street system:

1. They offer the most immediate and the least costly means of obtaining an increase in traffic carrying capacities. One-way streets can be established with few or no changes involving construction.

Most of the costs involved are needed for signing and signal changes. These costs are very small when compared to the costs which would be incurred as the result of widening streets.

2. Capacity of a one-way street is 33 per cent greater in a downtown area and 40 per cent greater in an intermediate area than two-way streets of the same widths.

3. Positive speed control and shorter travel times are acquired by the progressive timing of the traffic signals and the ability to pass slow moving vehicles in the additional lanes enhanced.

4. Intersection conflicts are reduced. This was shown on Plate 31, in the Traffic Signal Section.

5. Streets having an odd number of lanes can be fully utilized. On a two-way street of three or five lanes, the center lane, unless used for a specific purpose such as "left turn only", gives little additional traffic capacity.

6. Accidents are reduced by the elimination of head-on collisions and minimizing other directional conflicts. Night driving is safer because of the elimination of headlight glare.

7. Curb parking is simplified since the vehicle maneuvering for parking can be passed in an adjacent lane. Under similar circumstances on a two-way operation, the passing vehicle might have to stop and wait for traffic coming from the opposite direction.

8. Curb parking can be permitted for a longer period under a one-way operation than would be possible under a two-way plan due to the greater traffic carrying capacities of the individual lanes. This permits a longer period to acquire offstreet parking areas.

9. Pedestrian safety is enhanced since traffic signals will produce gaps in vehicle traffic streams which will permit safe crossings at non-signalized locations downstream from the traffic signal.

10. Due to a traffic signal giving much more positive gaps in traffic on a one-way as compared to a two-way street, the need for intermediate signal installations is considerably reduced.

It is only fair to mention the disadvantages as well as the advantages of a one-way street system. These are as follows:

1. Out-of-town motorists may experience some difficulty in finding their way unless good signing overcomes this difficulty.

2. There may be an increase of accidents in the period immediately after the installation of a one-way street system. These are usually minor in consequence and persist only until the motorists become acquainted with the new regulations.

3. Motorists may be required to make a longer trip after a one-way street system is installed. This distance is usually insignificant

except for very short trips. It is for this reason that a one-way street system should extend for a considerable distance. The lengthening of the travel path is generally the same for a short trip as a long trip. Short one-way streets should be avoided except for very special purposes.

One of the new one-way street systems which has already been approved is being built by the Michigan State Highway Department. The new M-20 Expressway which is being brought into the city from Bay City will end just west of Saginaw Road. At this point, it will go into a one-way street system and be brought to Ellsworth Street via First and Second Streets. This is an efficient way of getting traffic to Ellsworth Street, but from this point on, there is nothing left to travel over but a route that long ago reached its traffic carrying limits. Both First and Second Street will require traffic signals which cannot be fitted into a two-way progression pattern along Ellsworth Street. It is for these reasons that the long discussed one-way street system consisting of Ellsworth and Buttles Street should be brought to a practical reality. Ellsworth Street would handle southeast-bound traffic, while Buttles Street would handle northwest-bound traffic. The present width of Buttles Street along with its surface condition renders it inadequate for trunkline traffic.

Since the state trunkline portion of this route will extend only from Eastman Road to Second Street, the city is urged to continue the one-way operation over their own system. Ellsworth and Buttles can be continued to the southwest as far as Bay City Road. At this point, the one-way operation can be carried to the east over Bay City Road and Austin Street. Austin Street will have to be constructed in certain areas. Much of the right of way has already been obtained. Buttles Street will have to be connected to Austin Street, but the feasibility of this has already been determined.

Plate 39 shows all the one-way streets planned for Midland. The one-way system proposed along the Ellsworth-Buttles and Bay City Road-Austin routes will be of vital importance since it will be carrying traffic along the most important traffic axis in Midland. Several bad intersection problems will be solved by this proposal. The first intersection which has always been a problem under two-way operation is the intersection of Ellsworth and Eastman Road. Under the proposed one-way system, Eastman Road will be made one-way for southbound traffic only south of the Buttles Street intersection. All northbound Eastman Road traffic will come from Buttles Street. Hubbard Street and West Buttles Street do not require full access to this intersection, since this only introduces bad traffic conflicts even though the movements are light. The City Engineer's Office has prepared a plan which permits only a right turn from Eastman Road to either West Buttles Street or Hubbard Street. In reverse, only a right turn from these two streets will enter Eastman Road.

The intersection of Ellsworth Street with Eastman Road will be very simple under a one-way operation. Eastman Road will be one-way to the south through this intersection while Ellsworth Street will be one-way to the southeast. This removes several of the conflicts which now exist. There is one more step which can be taken which will make this intersection better. The left turn from northeast-bound Ripley to northwest-bound Ellsworth Street would have to be prohibited under the proposed plan which means that it would be just as simple to make Ripley a one-way street to the southwest. This could be continued as far as Main Street.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

ONE-WAY STREET PLAN

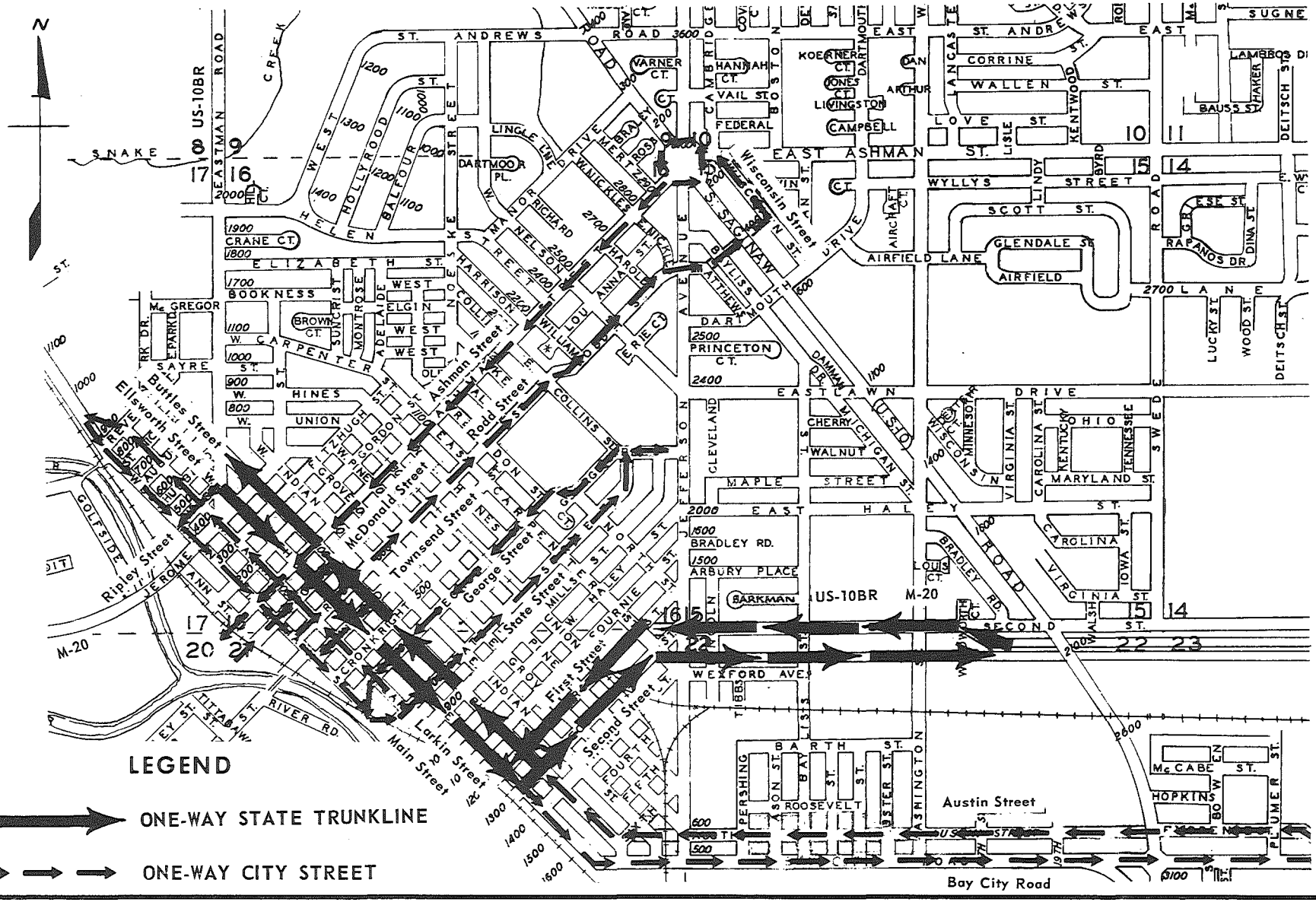


PLATE 39

A new entrance to the parking area which lies along the river is being proposed. This will run from the parking lot and pass underneath the Jerome Street Bridge and be brought to Main Street at the Ripley Street intersection. The proposed one-way on Ripley Street will make an excellent path to this parking area from the north. Traffic leaving the parking area by this route will have to make a right turn onto Main Street in view of the one-way operation proposed for this street. This will not interfere with traffic coming from the northeast on Ripley Street.

By making Ripley Street one-way to the southwest, there is little need for retaining the one block of Eastman Road which lies between Ellsworth Street and Jerome Street. This creates a bad five-legged intersection which cannot be signalized with any efficiency. This creates a traffic problem for Jerome Street traffic which will not be completely solved by the one-way operation. One of the usual cures for a five-legged intersection is to make the fifth leg one-way outbound from the intersection. This is impossible in this particular case, since this treatment was used at the Eastman and Buttles Street intersection.

The proposed changes in traffic operation will no doubt require changes in travel habits for residents living in this area. These plans have been carefully checked out to make sure that no unusual paths of travel are required or that some places are inaccessible to traffic. If Buttles Street were connected between St. Nicholas and Revere Street, it would be much easier for residents to circulate under the proposed one-way operation.

There may be some who question the wisdom of extending the one-way operation on Ellsworth-Buttles from Second Street to the east of Saginaw Road in view of this new highway being built. While this roadway will certainly give traffic relief, much of the traffic will still remain on the old location due to the large industrial development which lies along its length. The ribbon parking lots of Dow Chemical Company must utilize this route for ingress and egress and the one-way operation will eliminate many of the conflicts created by vehicles moving in and out of the many parking lot entrances. Since the new bridge which is being proposed over the Tittabawassee River will be northwest of First and Second Street, it would be illogical to expect traffic to turn off of Ellsworth Street to Third Street and then travel over to one of the roads going south to the Dow Chemical Company. Ellsworth-Buttles is the short, direct route and will see considerable traffic. The new expressway to Bay City will generate a lot of new traffic, which means both routes will be required to handle traffic volumes commensurate with their design limits.

The second new one-way street system proposed is the Main-Larkin route. Main Street will be one-way to the southeast, while Larkin Street will be one-way to the northwest. This system is urgently required due to the large number of over-capacitated intersections lying along its length and because of the unbalanced traffic flows which exist in the main business area. This system will also receive great benefits when used with the other proposed one-way streets in the area. This one-way system will be an ideal route for traffic entering and leaving the main business area via Cook and Orchard Drive. This is one of the few outlets to the entire area lying west of Eastman Road and failure to put good traffic capacity along this axis will mean the suppressing of traffic which might otherwise come into this area to do business.

The advantages offered by this system in the downtown business area speak

for themselves. The Signal Section already showed the advantages in signal timing. The re-distribution of traffic along Main Street will mean that both sides will be equally accessible. Drivers traveling to parking areas will be able to make turning movements which are now difficult.

Another one-way street system which should be placed in operation as an integral part of this plan is the Ashman-Rodd Street combination. Ashman Street is required to handle the large traffic volumes which desire to travel between the Main Street business area and Ashman Circle. This proposal also offers a means of diverting some of the traffic out of the Ashman Circle area. This proposed one-way operation will require construction, since Rodd Street does not extend beyond Jefferson Road. Rodd Street should also be widened to 36 feet, since this width meets standards for one-way streets with either three lanes for moving traffic or two lanes of moving traffic and one lane for parking. Removal of parking at the present time could permit its usage in the one-way system, but it would be desirable to perform the construction in the beginning to avoid detouring of one-way traffic.

Plate 40 shows a plan worked out in cooperation with the City Planner and the City Engineer. Rodd Street is continued over to Saginaw Street over Matthews Street and through vacant property. It travels northeast of Saginaw Street on this alignment where it intersects Wisconsin Street. It is returned to Ashman Street where the one-way operation ends. It is not necessary for Ashman Street to be one-way west of this intersection to the Circle. The reason is that since Ashman Street must be two-way east of Wisconsin Street, there would be little gained by making Ashman Street one-way since the two-way operation would limit the amount of traffic coming from the east. This intersection will very likely be signalized if the following plan is adopted. Under signalization, traffic coming from Wisconsin can enter or cross Ashman Street during the green period for Wisconsin traffic. Permitting Ashman Street to be two way between the Circle and Wisconsin will provide shorter travel paths to the parking areas located in the southeast quadrant of the Circle. Without signalization, Ashman Street will have to be one-way from Wisconsin Street to the Circle in order that Wisconsin Street traffic can turn right onto Ashman Street without conflict.

An extension of Wisconsin Street north of Ashman Street would require a relocation of Cambridge Street. This is very desirable, since it will eliminate a jog in the intersection which would be formed if Cambridge Street was in its present location. This relocation of Cambridge Street would take place on vacant property and would serve the purpose of allowing more parking adjacent to the commercial establishments in the quadrant of the circle in the vacated Cambridge Street location.

Relocated Cambridge Street should be two-way north of Ashman Street, but only right turns should be permitted into Ashman Street since a left turn from the north to the east on Ashman Street would interfere with the large volumes of traffic entering Ashman Street from Wisconsin Street. Southbound vehicles on Cambridge Street can go east on Ashman Street by traveling over Federal and Boston Streets. A signal at Ashman and Wisconsin could be coordinated with the signal at Ashman and Washington for the purpose of providing a two-way progression.

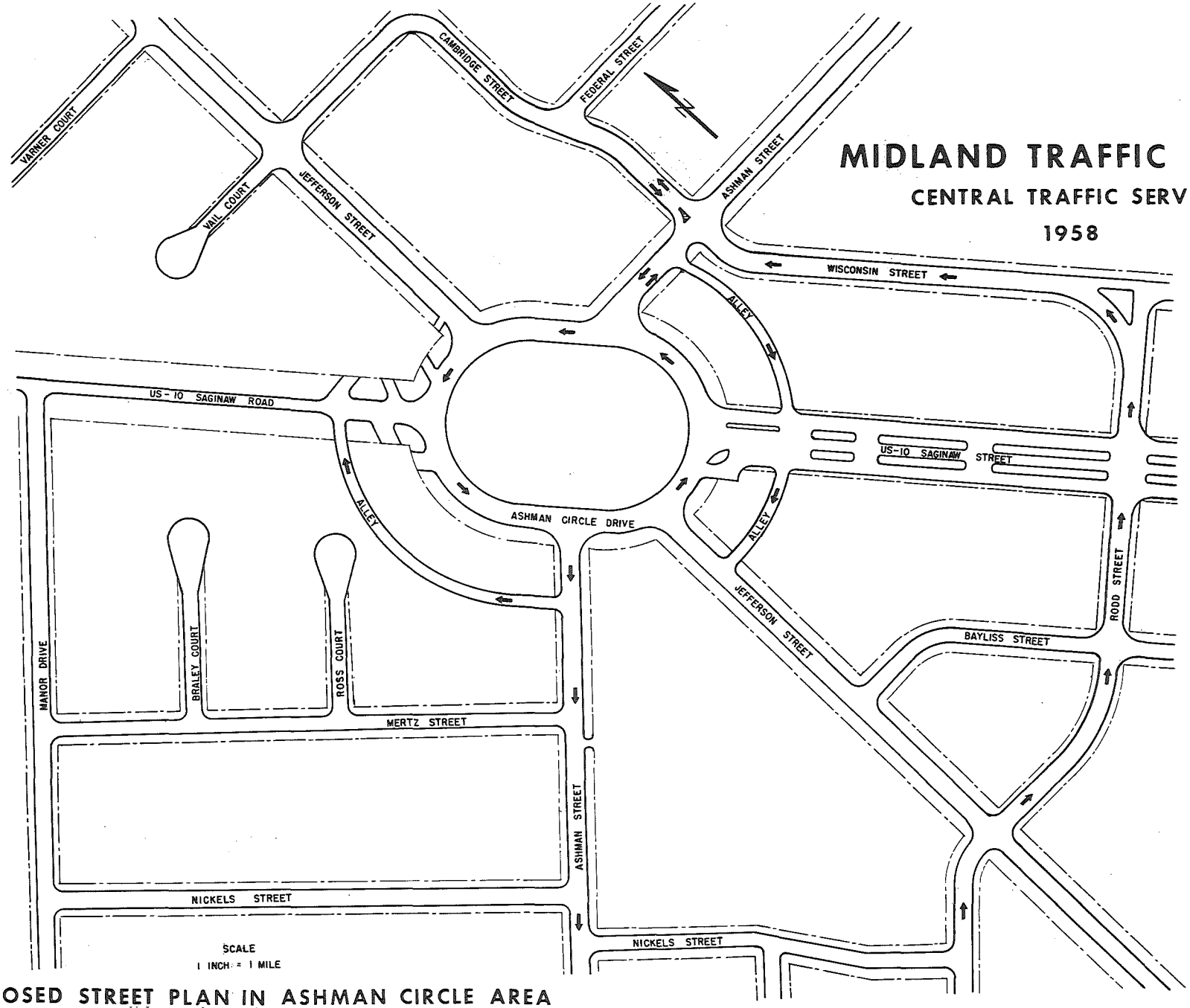
An examination of Plate 40 shows that the north quadrant of the Circle could be bypassed by extending Vail Court to Saginaw Road. Even though this

PLATE 40

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958



PROPOSED STREET PLAN IN ASHMAN CIRCLE AREA

would permit vehicles to cross Saginaw Street and go down Manor Street, thus bypassing the Circle, it is of questionable advantage. This would require a signalized crossing of Saginaw Street which would be too close to St. Andrews Street and Saginaw Road. This intersection will no doubt require signalization in the near future and a signal at Vail-Manor and Saginaw Road would be spaced too close for two-way vehicle progression. With the proposed reconstruction of Ashman Circle, the signals at Ashman Circle and Saginaw Street will be removed which means that vehicles can come down Jefferson Street from Vail Street and thence travel over to Ashman Street via the Circle Drive.

Ashman Street will be one-way on both traffic plans from Ashman Circle to the parking lots east of the river. Since McDonald Street is the only good means of returning to Main Street from the parking area on the river, it is recommended that the present one-way operation be retained. Vehicles can travel from the parking area to Main Street and then proceed north on Rodd Street. Although it is not good practice to have two, one-way streets in the same direction adjacent to each other, the Ashman-Rodd one-way system makes this necessary. McDonald Street cannot be made one-way paired with Ashman Street, since it does not go far enough to accomplish any good. McDonald Street between Main Street and Ellsworth Street would actually serve a better purpose if it were closed off and used as a parking lot. However, by establishing Rodd Street as a return for Ashman Street traffic, many of the traffic unbalances which exist along Main Street under the present operation will be eliminated.

If Ashman Circle is reconstructed so that Saginaw Road will no longer bisect it, there will be some question as to how this land will be utilized. It is not recommended for a parking area since driveways on the inside of the Circle Drive would be hazardous. Also, there is ample parking space in the areas back of the businesses which surround the Circle. An alternate use for this area is a park, or a site for a memorial. Pedestrians could certainly have difficulty crossing the heavy traffic and the successful operation of the circle will not permit the installation of a traffic signal. If any usage is planned for the Circle which will attract pedestrians, a physical separation should be provided so pedestrians will not be exposed to vehicles. Most of the undesirable characteristics of these structures have been eliminated in present designs.

There are a few other traffic changes which will have to be considered in the Ashman Circle area. The alleys lying to the rear of the businesses in the west, south and southeast quadrants of the Circle should be made one-way opposite to the direction of traffic flow on the Circle Drive. This will provide for good circulation of traffic to the parking areas. With the extension of Rodd Street through Saginaw Street, Dartmouth Street will be relieved of considerable traffic which is now using it as a bypass of the Circle between South Jefferson Road and Ashman Street. This street will lose its arterial character and should be deleted from the Arterial Street System when Rodd Street is constructed. This means that the traffic signal at Saginaw and Dartmouth Streets should be shifted to the intersection of Saginaw with Rodd Street.

The Benson Street bridge must be replaced in the very near future if a critical traffic problem is to be avoided in Midland. In planning the one-way streets, it would appear to be very logical to make Rodd Street one-way to the southwest and Townsend Street one-way to the northeast. While this would have

meant better traffic operation to the present bridge, it would completely eliminate the Ashman-Rodd one-way system. It might be argued that reversing the direction of Rodd and Ashman Street would still permit both plans to be put in operation. This is not true if we understand that the intersection of two, one-way streets can only operate satisfactorily if traffic can rotate around the square formed by the intersections of the two, one-way pairs. If Rodd and Ashman Street were reversed in their directions, this would not be possible as an examination of the intersections of the Ashman-Rodd with the Main-Larkin and Ellsworth-Buttles systems will reveal.

Since several of Midland's proposed one-way street systems must return to two-way systems at their terminals, it is essential that the "counter-clockwise" direction of one-way movements be maintained on each pair of streets. The reason is simple. Traffic in this country generally operates under the "right-hand" rule. That is, in operating on two-way roadways vehicles are confined to the right of the centerline. Therefore, when entering or leaving a one-way street, operated in a counter-clockwise direction, the vehicles follow their natural paths with no conflict. However, were the one-way streets operate in a clockwise direction, it would be necessary for the traffic streams to cross at the terminals of the one-way system. This would create a very bad traffic situation and is carefully avoided in any well planned one-way street system.

Since the bridge must be relocated due to the need for keeping traffic which has no origin or destination out of the downtown area, it is deemed advisable to establish an operation which will take care of present needs. With Main and Larkin Streets being made one-way in the directions recommended, the present operation will be greatly improved. Townsend Street can still remain one-way to the southwest. It is apparent that since Benson Street is offset from Townsend Street in the direction against the one-way flow on Main Street, some means must be taken for protecting vehicles going from Townsend Street to Benson Street even though the distance is very short. This can be accomplished by placing a short 'all-red' interval on the traffic signal at the expiration of the Townsend Street green and will permit vehicles to clear out of the intersection in safety before Main Street traffic is released. This interval need be only three seconds in length.

By operating Townsend Street one-way in this manner, the traffic signal should remain in operation on a 24-hour basis. This will create no problems on the one-way operation; in fact, it will help maintain speed control along Main Street. A flashing red arrow can face Benson Street traffic during the Main Street green period since the traffic island will shelter this right turn from Main Street traffic. The flashing red arrow means that motorists must stop before making the right turn. This will give pedestrians protection in crossing Benson Street. A second time dial should be placed in the controller at this intersection in order to handle rush hour traffic which will probably require a longer green period for Townsend-Benson than would be required in the normal part of the day.

The order in which the one-way streets are installed is quite important to the success of the entire plan. There is always a tendency to go into a one-way street system on a "little bit at a time" basis. This can sometimes be the undoing of an otherwise successful plan. Perhaps if one-way streets were being instituted on a "hit or miss" basis, this might be advisable.

Since the plan being offered has been developed on an engineering basis, simultaneous adoption of several new one-way streets is urgently recommended.

The Main-Larkin and Ashman Rodd one-way street systems should be put in simultaneously for reasons already mentioned in the report. This means that Rodd Street should be extended to Ashman Street at the earliest possible date. The completion of this construction should establish the time when these two, one-way pairs can be placed into operation. It would be highly desirable to have the Ellsworth-Buttles one-way operation placed in effect at the same time as the other two pairs, but this requires action on the part of the State Highway Department. If any delays are anticipated, the city can proceed on its two, one-way systems. The other adjustments in traffic operation discussed in this report resulting from the changeover to one-way traffic movements should be performed.

The City should be prepared to coordinate with the State Highway Department in extending the Ellsworth-Buttles Street one-way operation on its own streets to the east of Saginaw Road. Since Austin Street must be completed along with a connection to Buttles Street, this construction should be given a very high priority.

The State-George Street one-way system should be established with the opening of the proposed bridge. This traffic operation is designed specifically to handle bridge traffic. The bridge is needed now, but time is required to prepare plans, finance and construct. All steps should be taken to insure against delay in providing Midland with this urgently needed project. Citizens should do their part by giving support to the financing of this project.

The one-way streets proposed in this report are the backbone of Midland's traffic structure and regardless of their priority with one another, they should be completed in the first five-year program. The benefits which will result will far outweigh any disadvantages real or imaginary.

The State-George Street Bridge

In the section on Pedestrian and Vehicle Volumes, it was revealed that the present Benson Street bridge is inadequate, both from its traffic carrying capacity and its structural strength. If it were necessary to close this bridge, the large volumes of traffic would have to make exceedingly long detours since there are no other bridge crossings for this route in the Midland area. Since many of the motorists use this bridge to come and go from work on a daily basis, it would create untold hardship and would prove to be a big economic loss to the city. The urgency of this matter has already been brought to the attention of City Officials, and they have hired consultants to prepare plans and cost estimates for a new bridge. Preliminary work has already been completed.

It was quite obvious from the early findings of this traffic study that the new bridge would have to be located southeast of the present bridge location in order to keep the heavy traffic volumes generated by the bridge from intermingling with shopper and business traffic in the Main Street business area. The Dow Chemical Company's property which extends to the south and east from State Street dictates that the bridge be located in this vicinity. Plate

37 shows an aerial view of the proposed site of the new bridge.

Bridge construction is very expensive; therefore, it is vitally important that every traffic lane built over a bridge be able to carry the greatest amount of traffic. Unless a bridge services an expressway, the best means of doing this is by connecting the end of the bridge to a one-way street system. Since each lane of one-way traffic can carry at least one-third more traffic than a lane on a two-way street, the bridge will be able to serve a much greater traffic function without any additional financial costs.

Preliminary plans for the bridge show that it must be located between State and George Streets which means that these two streets should be converted to a one-way operation with State Street carrying northeast-bound traffic, while George Street carries southwest-bound traffic. Both George and State Street come together at the northeast side of the bridge without creating any traffic conflicts. Plate 41 shows how the various traffic movements will be handled in the vicinity of the bridge.

Due to the anticipated traffic volumes which will use this bridge from the very day it is constructed, it must be built to handle four moving lanes of traffic. It is very desirable that the bridge have a four foot curbed median for safety purposes and also to make an easy transition into the one-way operation at the end of the bridge.

The need of providing ingress and egress to the Dow Chemical Offices which are southeast of the proposed bridge location on Main Street along with the necessity of bringing Main Street traffic to the bridge means that an intersection will be needed at the northeast end of the bridge. The cost of providing a separation for this traffic movement and also the railroad would make the bridge much more expensive. The plan shown on Plate 41 will handle traffic volumes for a long time with a minimum of congestion. Since Main Street traffic is one-way to the southeast, this directional flow will be maintained to the intersection of George Street. Most of Main Street traffic at this point should make a right turn for the purpose of crossing the river. There will be a small amount of traffic which will desire to cross this intersection to the Dow Chemical offices. This intersection should not be signalized since not only is this difficult to do, but movements requiring signalization will be too small to meet traffic signal volume warrants. The traffic coming from Main Street which desires to turn left onto State Street should be encouraged to use Cronkright and travel up to Ellsworth Street. Cronkright Street could even be made one-way to the northeast if traffic volumes required such treatment. Ellsworth Street would be the logical path to follow southeast of State Street since Larkin Street is only two blocks long from State to Haley Street.

Traffic coming from Main Street that desires to travel to the northeast on State Street can get to State Street by way of Cronkright and Ellsworth Streets. There would be no difficulty making a left turn from Ellsworth Street to George Street on one-way operation. These routes are suggested in order to offset any arguments that a traffic signal is needed at the foot of the bridge. However, a traffic signal will be required at the intersection of Larkin and George Street. This will create gaps in southwest-bound traffic which will help crossing at Main Street. This traffic signal will be especially beneficial to the right turns coming from Main Street and will permit safe entry into the southwest.bound traffic stream during the signal gaps and at any other time when no traffic is present.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

TRAFFIC OPERATION AT PROPOSED STATE-GEORGE STREET BRIDGE

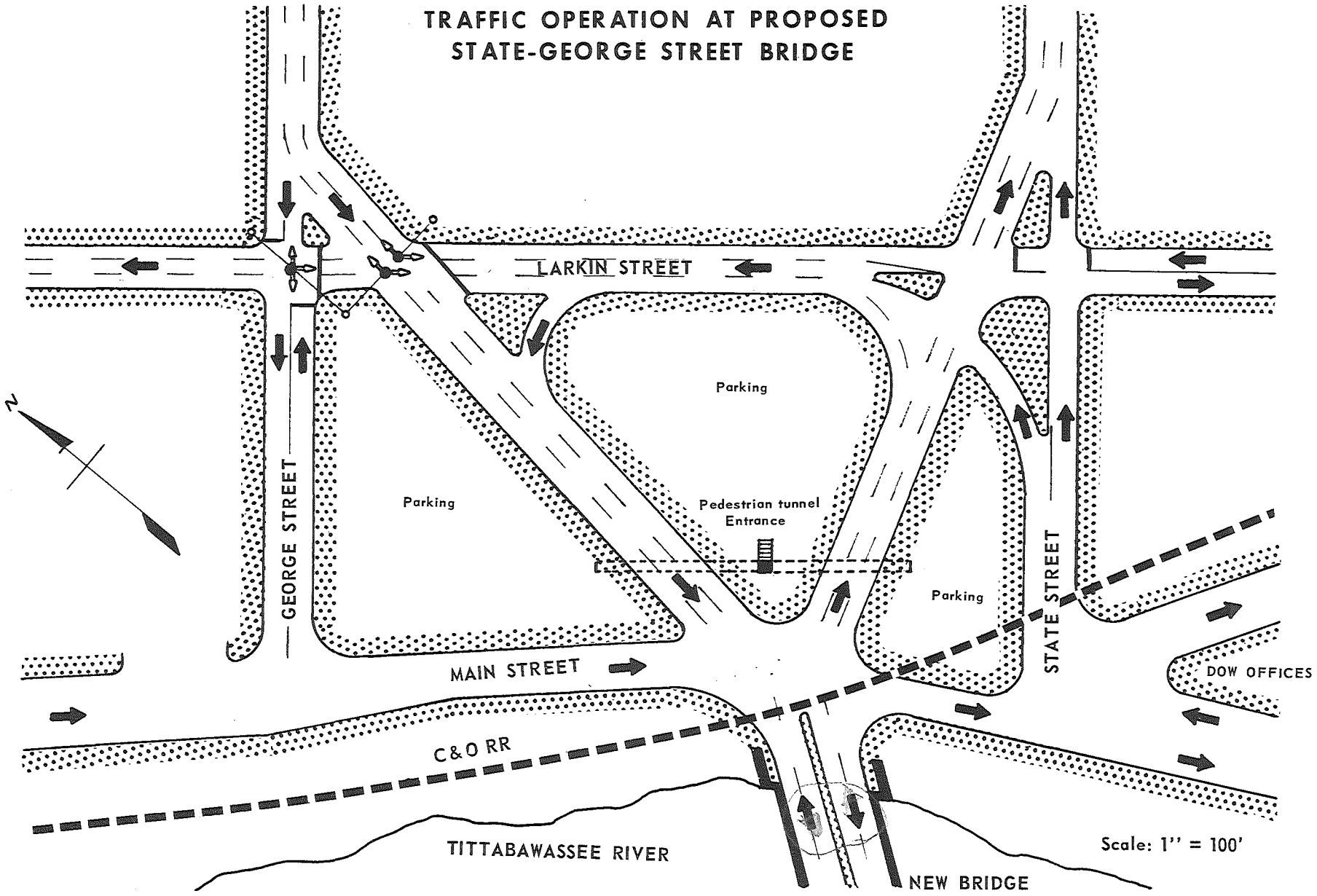


PLATE 41

Most of the entry to the Dow Chemical's offices will come from George Street. Sufficient lane capacity is constructed on George Street between Larkin and Main Street to provide storage for the left turn going to Dow and also to preserve two lanes for through traffic. It is easy to see that a traffic signal at Main and George would make this left turn very difficult to perform. A special left turn slot formed by a traffic island is shown at Larkin and George. George Street should have three lanes of traffic from Buttles Street to the bridge.

State Street is also expanded to three lanes from the bridge to the traffic signal at Buttles Street. This increase in lane capacity is needed in this area due to the signals at Ellsworth and Buttles Streets. Traffic will be considerably lighter on State Street beyond Buttles Street and will not require three lanes.

Traffic leaving the Dow Chemical offices will use State Street (old location) which will be one-way to the northeast. Traffic will split in advance of Larkin Street and going northwest can enter Larkin Street on a merging maneuver in the shelter of a traffic island. Traffic making a left turn out of the traffic stream coming from the bridge can use this same merging lane. Larkin Street will be two-way from State Street to the southeast. Departing Dow traffic can make a right turn to the southeast on Larkin Street or go straight through on State Street. No traffic signal should be necessary at the intersection of State and Larkin. The cross movements are light and there are alternate paths in case traffic volumes get too heavy on State Street.

The question may be asked why traffic leaving the Dow offices is not permitted to use the entrance (extension of Main Street) and make a left turn onto the new bridge. This is specifically designed out of the intersection of the two, one-way streets and Main Street so there will be no interference with the left turn and through movement coming from the northwest on Main Street. Since the intersection capacity will be reduced by a signal, we can eliminate the need of a signal by keeping the conflicts in traffic out of this intersection. The slight added distance required in traveling around the State-Larkin-George Street loop will more than be offset by the safer travel path and elimination of capacity restrictions.

It is proposed to construct the connection to St. Charles Street on the southwest side of the bridge as a two-lane highway for the present time in order to save money. Without traffic signal control to block traffic on the two-lane section, the capacity will be commensurate with a four-lane highway under traffic signal control.

The plan of traffic operation outlined for this area will perform satisfactorily for some time in the future. If the proposed Downtown Redevelopment Plan materializes, Main and Larkin Streets will no longer be needed. By eliminating these two intersecting streets to the State-George one-way street system, additional capacity can be gained in the future by a simplification of the intersections and an increase in the number of lanes on State and George Streets.

Two-Way Arterial Streets

In addition to the one-way pairs which are either state trunkline highways

or arterial streets, there are several two-way streets which complete the proposed major street system of Midland. The recent arterial street plan passed by the City Council represented a composite of information gathered from the traffic study, the City Planning Commission and the City Engineer's Office. In order to separate those arterial streets which are based upon traffic demands of today and in keeping with construction projects already approved, from those predicated upon development yet to materialize, we have prepared the plan shown on Plate 42. Some of these streets are capable of handling present traffic volumes even though they are sub-standard to the designs of new arterial streets.

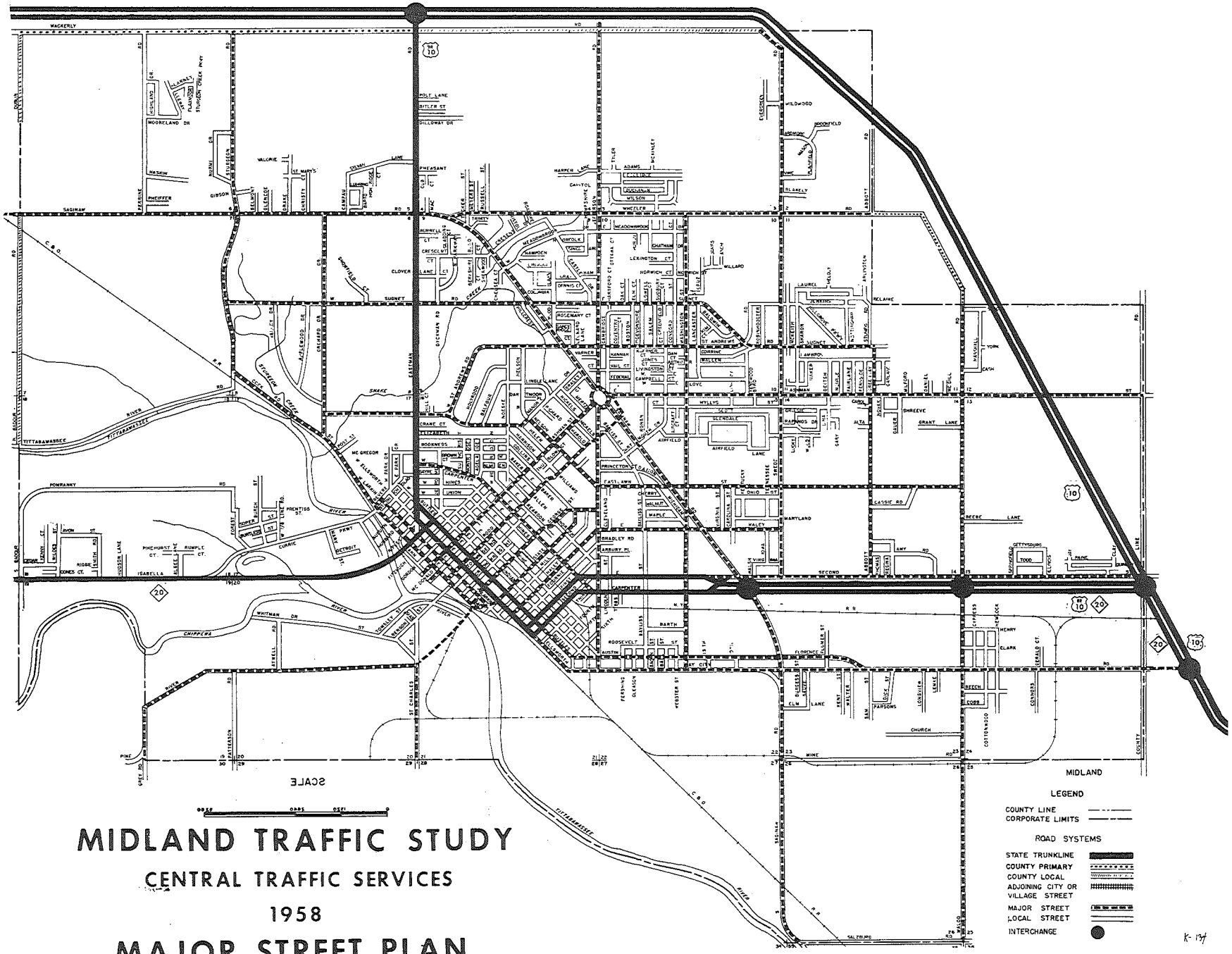
It is not pertinent to this report to go into detail over the entire list of arterial streets since their identity is apparent from the map. It may be well to mention those streets which are shown in addition to the ones approved by the Michigan State Highway Department for the period of July 1, 1958, to June 30, 1959. Traffic increases and positive development trends make addition of the following streets reasonable since they fulfill the requirements of arterial streets.

There is a need for north-south arterial streets west of Eastman Road, Eastman Road is a state trunkline highway which will serve as the US-10 business route from the new expressway. This means that this road will be required to handle very large traffic volumes and local traffic should be provided alternate routes. The Main-Larkin one-way street system ends at Revere Street, therefore, this traffic should be carried at least as far as Saginaw Road on an arterial street. Cook Street should be designated an arterial street and brought to Saginaw Street in the first five-year construction program. This street would serve a much better purpose if it were relocated to a point south of Sugnet Road and made to meet Sturgeon Road at Saginaw Road. Sturgeon Road should be continued to the north as far as Wackerly Road. This can be built in the second five-year program.

Orchard Drive will prove to be ideally located for an arterial street paralleling Eastman Road and Cook Road. This will extend from Cook Road to Saginaw Road and should be built in the second five-year program. Present Sugnet Road should be extended west of Orchard Drive to Cook Road. This probably will not be needed for some time. Sugnet Road should be continued from its easterly terminus as an arterial street from St. Andrews to Greenway Street and thence continue south to Ashman Street. The present streets should be utilized until the time that traffic volumes require rebuilding to arterial street standards. As Midland develops to the northeast, considerable traffic can be generated over Greenway-Abbott Road on its way to the Dow Administrative Center.

St. Andrews should be an arterial street from Eastman Road to Sugnet Road. This route is already showing considerable traffic volumes between Eastman Road and Jefferson Road since it serves as a north bypass route to the Ashman Traffic Circle. The portion from Eastman Road to the Country Club entrance is in need of widening to arterial standards at the present time. The portion lying to the east of this point will probably serve for ten years. Midland's development to the north will require that Wheeler Road be made an arterial street from Saginaw Road to the new US-10 expressway from whence it will turn south and connect to Waldo Road. The portion in the northeast corner near the expressway is outside of the City limits. The new section of Wheeler Road from Saginaw Road to Jefferson Road should be built in the second

PLATE 42



MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

MAJOR STREET PLAN

five-year program, while the section from Jefferson to the city limits should be built in the first five-year program.

Swede Road should be extended as an arterial street from Wheeler Road to Wackerly Road and developed to arterial standards in the second five-year program. This will produce a north-south route from Second Street to Wackerly Road which will be a service drive to the new expressway. Traffic from Swede Road can travel over this service drive to Eastman Road where an interchange for the new expressway is located. The construction of this route should be timed with the building of the new expressway and the development of the Dow Administrative Center.

Eastlawn Street should be constructed from Swede Road to Waldo Road in the first five-year program and made part of the arterial street system. This will provide a good east-west traffic route for traffic from the Dow Administrative Center since this street forms its northern limit. This will bring traffic as far west as Jefferson Road from whence it can continue on other streets and as far east as Waldo Road.

Haley Street should be added to the arterial street system between Jefferson Road and Swede Road. This will be another east-west route serving Dow traffic from the Administrative Center going as far west as Ellsworth Street. The present street is in good condition and should serve traffic for some time to come.

There is need for Washington Street to be constructed as an arterial street between Norwich and Wheeler Road. This should be done in the first five-year program, since Washington Street traffic will continue to increase in view of it being one of the principal north-south streets serving Dow Chemical Company's traffic coming from the parking areas south of Bay City Road. The Dow Administrative Center traffic will also find this route convenient. The traffic signal at Saginaw Road is encouraging traffic to use this route.

Eastlawn Street requires an extension to the west for the purpose of providing a continuous route for traffic going to the north on Eastman Road. There is no direct connection, but by adding portions of Nelson, Manor and Helen Streets as shown on the plan, a suitable route is provided. Manor Street, from Helen to Nelson Streets and Nelson Street from Manor to Ashman Streets will require reconstruction in the second, five-year program. The remainder of the route should satisfy traffic requirements for some time to come.

The priorities of reconstruction on the existing arterial streets have already been indicated on the Highway Needs Study. Traffic volume is only one of the factors which determine the priority of improvement. Some of the present streets, while not meeting modern arterial street standards, will be able to handle anticipated traffic loads for some time in the future. Parking removal programs should be instituted and planned whenever lane volumes exceed 350 vehicles per lane per hour. This will often eliminate the need of a street widening project and result in the maximum life being obtained from the existing pavement.

The number of additions in streets and mileage to the arterial street system shown on Plate 42 as compared to the arterial street plan developed by the City Planning Commission and passed by the City Council, is smaller. The

major portion of the mileage deleted from the city's plan and not shown on this plan is located in the mile wide band lying north of the city between Wackerly Road and Saginaw-Wheeler Road. The other principal exceptions are Tittabawassee Road between Badour Road and Cook Road along with Dartmouth Drive between Jefferson Road and Ashman Street. The latter should be abandoned as an arterial street when Rodd Street is extended to Ashman Street.

The streets not included in this plan were omitted since they were based upon predicted growth factors derived from planning estimates and not from traffic volumes and their present trends. This does not mean that the city's proposed plan is fanciful or overly ambitious; it only means that more definite development should transpire before the streets in question are added to the working arterial street system. An arterial street plan should be reviewed every three years in order to adjust for changing conditions.

Certain streets or sections thereon have been deleted from the present arterial street system. Indian Street will no longer need be in this network if the Ellsworth-Buttles and Main-Larkin one-way street plans are made a practical reality. The single block of Jerome Street between Buttles and Indian can also be deleted for the same reason.

McDonald from the riverside parking lot to Main Street can be retained in the arterial street network, but the two blocks from Main to Ellsworth Street should be deleted. The Ashman-Rodd one-way system will take care of all the traffic needs along this axis.

Carpenter Road should be taken from the system in the area between Second and Jefferson Road. The new M-20 one-way streets will intersect Jefferson Road. The new M-20 one-way streets will intersect Jefferson Road immediately north of the Jefferson and Carpenter Street intersection. This means that arterial traffic should be discouraged from using the intersection of Jefferson and Carpenter Streets, since no signalization would ever be possible in view of its close proximity to First and Second Streets. Traffic should use the one-way streets.

Dow Administrative Center

Any time that a new generator of traffic is introduced to an area, it takes careful designing and engineering to anticipate and prepare for its effects. The parking areas and private areas of this center are being built to accomodate five thousand vehicles a day. The effect of this traffic will be very noticeable on Midland's traffic structure, therefore, city officials must be prepared to cope with its impact. The center is being constructed in the area between Eastlawn, Abbott, Second and Swede Roads. These streets, plus Haley Street, are those which will be required to bring traffic directly into the center. A photograph on Plate 37 shows an aerial view of the newly constructed center.

Origin and Destination data which was available for Dow employees at existing plant locations was non-existent for the Dow Administrative Center, due to its undeveloped condition and considering the type of employees who will be concentrated here. Land-use data was valuable in determining the probable paths and need for expansion for the traffic anticipated at the center. The travel paths in each of the cardinal directions are described below.

Traffic from the north will have the choice of several arterial streets. Swede and Abbott Streets will be the direct routes, while Washington, Jefferson and Saginaw Road will bring traffic in conjunction with east-west route feeders. Traffic from the east of the center will be able to utilize the new M-20 expressway due to the construction of an interchange at Waldo Road. Traffic can get to the center from Waldo Road either over Eastlawn or the Second Street service drive.

Traffic to the south can use either Saginaw Road or Waldo Road. Traffic using Saginaw Road to the center can travel over Haley or Second Streets. The latter street should get the most usage due to its more strategic location.

Traffic from the west will present the most difficult traffic problem due to the concentrated areas through which it must pass. The best route will probably prove to be Second Street. Second Street at the center is a service drive for the M-20 expressway, but west of Saginaw Road it goes into the First-Second Street one-way system. This traffic can go to the Ellsworth-Buttles one-way street system without any great trouble. When the new bridge is built at the foot of State and George Streets, traffic can go from the First-Second one-way pair to the State-George one-way pair by using Carpenter Road.

Haley Street runs from the midpoint of the Dow Center to the west and can quite logically be expected to handle a considerable volume of traffic at least as far as Jefferson Road. Haley Street to the southwest of this location is not a very desirable travel path, since its intersection with Ellsworth and Buttles Streets is in an area of high parking lot development and being a two-way street, it cannot handle traffic as safely or efficiently as the proposed State-George one-way street system. With the construction of the new bridge, State and George Streets will be in its direct path which will also minimize the usage of Haley Street. Carpenter Road can be used to bring traffic from the State-George one-way pair over to Haley Street from whence it can proceed east to the center. It might prove very desirable to plan a connection between the State-George one-way system and Haley Street so that the benefit of one-way operation can be gained at least to some point east of Jefferson Road.

Eastlawn Street will be the third east-west carrier of traffic from the center. Most of the traffic using Eastlawn will probably go northwest on Saginaw Road although there should be a substantial percentage going south to George Street on Jefferson Road. The other routes should be made the most facile in order not to encourage any more traffic than necessary to pass by the schools situated along this route.

The arterial grid street system planned for the Dow Administrative Center should prove to be capable of handling traffic for some time to come. These streets are non-interlocking nor do they funnel traffic through any one particular location. The plan should prove quite efficient if placed into operation.

CENTRAL BUSINESS DISTRICT RE-DEVELOPMENT

Some time ago, with the combined efforts of the City Planning Commission, the Planning Department, private citizens and downtown business people, an ambitious plan was developed to keep the downtown business district as an important increment of the community. While it is true that the final accomplishment of this plan in its entirety may still be a few years away, it is nevertheless necessary that we consider it carefully in the preparation of this report and in the recommendations made.

Due to the appearance of this plan upon the scene, it has been necessary that our study embraces not only recommendations based on the use of the streets as they now exist, but also as they will be used in converting to the proposed re-development.

The proposed plan of arterial streets shown on Plate 42, in the section on Major Streets, show that there will be little difficulty in accomplishing the conversion. Plate 43 shows the plan of the proposed re-development of the central business district, and it can be seen that there will be no substantial change in the direction of flow of traffic on the streets. The Major Street plan uses Buttles and Ellsworth Streets as a one-way pair with traffic flowing in a southeasterly direction on Ellsworth Street and north-westerly on Buttles Street. Main and Larkin Streets are treated similarly with Main Street being used for traffic in a southeasterly direction and Larkin Street, for that travelling in a northwesterly direction. Ashman and Rodd and George and State Streets are also used as one-way pairs with Ashman and George Streets being confined to southeastbound traffic only, and Rodd and State Streets for northeast bound vehicles.

The area involved in the Downtown Re-Development Plan has been carefully selected to insure a proper balance between the areas devoted to business, parking and streets. The positioning and capacity of these three items has been selected to insure a well coordinated operation.

In the plan for re-development it becomes necessary to close some of the streets of the central district and thus necessitates using other streets for handling the flow of traffic into and around this new development. Since Ellsworth Street loses its identity entirely between Cronkright and Jerome Streets, it becomes necessary to move our northern perimeter one-way pair one block further north. The accomplishment of this move will not be difficult, because Buttles Street will have already been brought up to the proper arterial standards for carrying trunkline traffic loads in the initial plan by using it as a pair with Ellsworth Street. Traffic, operating under the re-development plan, must flow in an opposite direction on Buttles Street and will move in a southeasterly direction. Indian Street now becomes the street for the return flow in the one-way pair for this perimeter route. It can be brought up to the traffic and construction standards of a state trunkline highway before it is converted to this use. Traffic on this street will flow in a northwesterly direction only. With this two-way facility on the north boundary, the movement into and out of the parking areas and circulatory streets will be easily negotiated.

Main and Larkin Streets will still remain in operation as a one-way pair from Gordon Street west to Revere Street. Main Street will end at Gordon

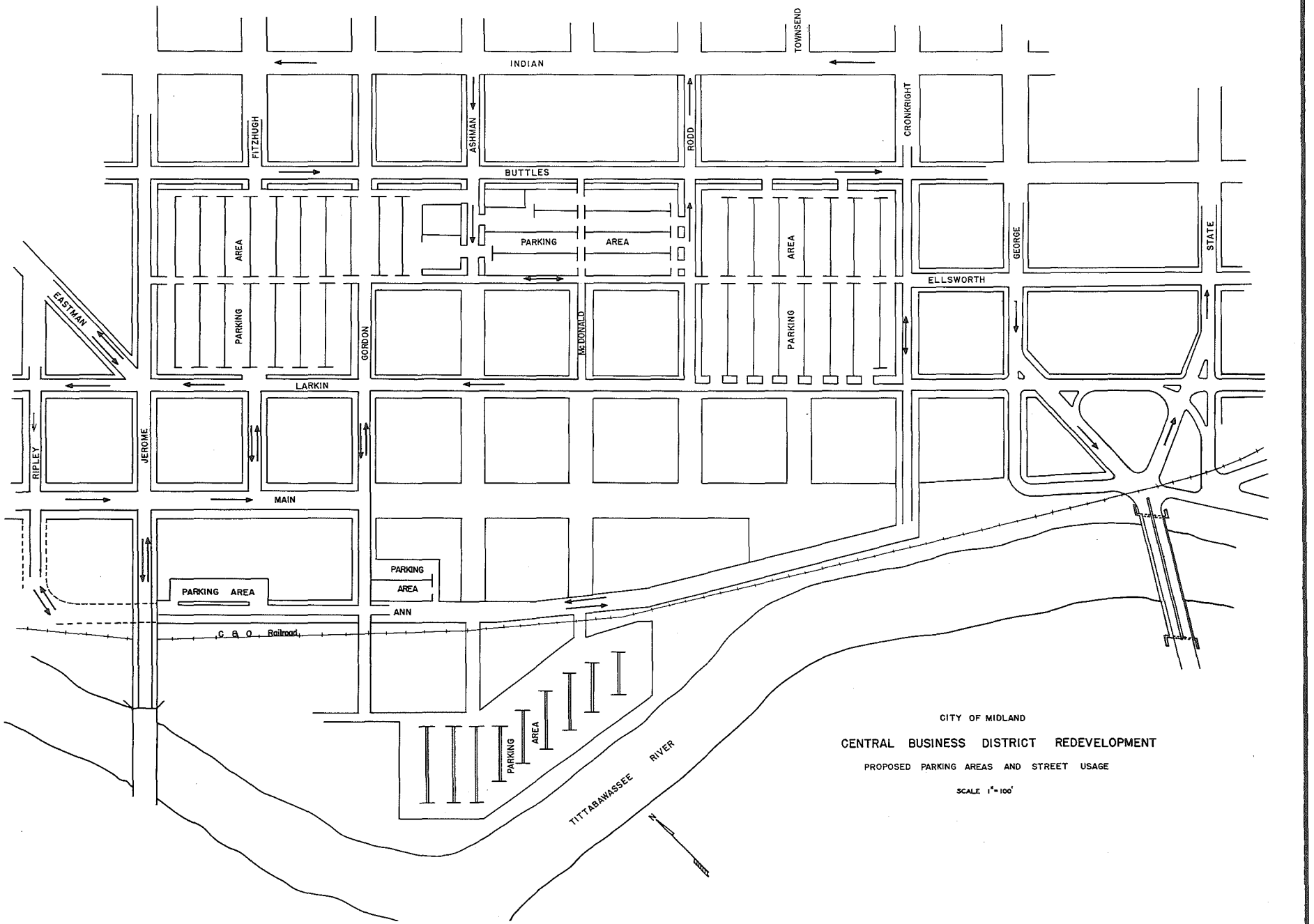

INDIAN
TOWNSEND
FITZHUGH
ASHMAN
ROOD
CRONKRIGHT
BUTTLES
PARKING AREA
AREA
PARKING
EASTMAN
GORDON
McDONALD
GEORGE
STATE
ELLSWORTH
LARKIN
RIPLEY
JEROME
MAIN
PARKING AREA
ANN
C & O Railroad
TITTABAWASSEE RIVER
N
CITY OF MIDLAND
CENTRAL BUSINESS DISTRICT REDEVELOPMENT
PROPOSED PARKING AREAS AND STREET USAGE
SCALE 1"=100'

PLATE 43

Street as far as vehicular movement is concerned and will be a shopping mall, from that point to Cronkright Street. Larkin Street will still be in use by vehicular traffic as far as Cronkright Street, but it will lose its arterial characteristics at Gordon Street. From Gordon Street southeast, its use will be mostly by commercial vehicles loading or unloading at the stores within the mall itself and as an exit route from the large parking areas shown on the map.

Ellsworth Street will also become a minor passageway with commercial vehicles using it for loading and unloading and by other vehicles to enter and leave the parking lots.

An exceptionally important addition to the street system in this plan of re-development is the extension of Ripley Street to Ann Street. It is necessary to construct this street so that it may become a direct connection to Ann Street, which forms the southern perimeter of the business area and gives direct access to the municipal parking lots in that area. In addition to this, it becomes important for traffic entering via Eastman Road and from the area served by Cook Road which wishes to do business on the easterly edge of the business section. It will also be used by vehicles leaving the river-side parking lots which desire to gain access to the new bridge between George and State Streets.

It will be necessary to acquire right-of-way through private property for this connection of Ripley Street to Ann Street, and it would be well to start on this acquisition as soon as possible. This new street connection does not need to wait for the materialization of the downtown re-development plan, since it will serve a traffic need today. At the present time, Ann Street deadends at the parking lot back of the County Court House, but it will be an east matter to extend it farther to the west to meet with the Ripley Street extension. The clearance between the proposed grade of Ann Street and the bottom of the deck and girders of the Jerome Street bridge is sufficient to handle any legal loadings with room to spare, so this will not present a problem. The general character of the terrain involved in the construction of the connection lends itself nicely to this development. The grades involved between Main and Ann Streets will be very gentle and little difficulty will be encountered by vehicles of any size using the street. The entire length of this Ann-Ripley Street corridor will be used in two-way operation and will aid materially in keeping congestion at critical points at a minimum by giving freedom of circulation. Ripley Street from Main Street to Eastman Road should be one-way for southwest bound vehicles.

One of the streets which must be closed on this plan is Ashman Street southeast of Buttles Street. This may appear to be a very drastic step and arouse considerable alarm. Although Ashman Street has continuity for traffic as far as Ellsworth Street, from Buttles Street southwest it is no longer an arterial street, but merely a driveway between parking lots. The closing of Ashman Street is very vital to the success of the re-development plan.

At the present time, Ashman Street deadends at the parking lots adjacent to the river. The new plan merely moves the end of the street to the east side of the business district, in order to eliminate a potentially dangerous pedestrian crossing. It is quite obvious that present Ashman Street is serving only three purposes in this area. One, some traffic is using this route as a feeder route to Main Street from whence it will either go southeast to

Benson Street Bridge or to Dow. To the northwest it will go either to M-20 or out Cook Road. Two, traffic is using Ashman to go to the river front parking areas. Three, Ashman Street is being used as a parking lot by the presence of curb stalls.

There can be no objection to closing Ashman Street to through traffic if a better alternate route is provided. The Buttles-Indian and State-George one-way pairs, plus the proposed changes in the street operation pattern along Jerome Street, offer far better traffic routes than present Ashman Street. The new bridge will eliminate any need for vehicles to travel through the downtown area due to its location.

Development of extensive parking areas on the east side of the business area will greatly reduce the need of travelling through the business district for parking purposes. Curb stalls on Ashman Street will be generously replaced in the proposed parking areas. Even if the motorist desires to go to the river front parking areas where he may be closer to his intended destination, he still will have a well-designed travel path. He can go to the parking area along the river from Ashman Street by using Ellsworth Street to the northwest and then travel southwest on Gordon Street. With arterial traffic eliminated from his route, he should have little difficulty.

The inventory of parking in this area reveals that merchants have very few parking places in very close proximity to their businesses. The new plan will more than offset the relocation of these parking stalls to much larger parking areas involving slightly longer walking distances. The average pedestrian path will be shortened by the addition of a much larger number of parking spaces in fairly close proximity to the businesses. The increased number of desirable parking places, plus the elimination of street congestion, will mean additional revenue to the area.

The primary purpose behind this entire plan of re-development is survival. If this central core area is to survive and prosper as a business area, it must be able to compete on an equal basis with the outlying shopping areas which are rapidly developing. The preservation of this section as a business and commercial area is of vital importance to the city government as well because of its terrific impact on the revenue available from taxes. In order to furnish this competition, it is necessary to make it as attractive as possible to the prospective shopper and consumer. One of the most important aspects in the matter of attraction is to make sure that there will be adequate desirable parking space close to the shopping area. The proposed plan of re-development in Midland has taken this important factor into consideration and has provided the parking areas shown on the map in Plate 43. It is important in planning parking facilities to locate these facilities in such a way that the shopping pedestrian is not required to cross vehicle travel paths where their safety is endangered and that they do not add to the problem of traffic control. The plan presented here recognizes this fact and has provided parking areas on the perimeter easily accessible on the approach from all directions. It is estimated that when all the areas have been developed for parking it will be possible to accommodate in excess of 2,500 vehicles simultaneously. With the parking areas being located as shown, no place of business within the limits of this re-development plan will be more than two blocks away from available parking space, and the majority of these businesses will be even closer.

In another section of this report it was recommended that additional

space be acquired for off-street parking. The land encompassed by this plan of re-development which is set up for parking purposes should be acquired and developed as soon as it becomes available. This will help condition the shoppers to the end that they will soon look upon these lots as destination points and be already educated when the new plan becomes effective.

With the large number of parking spaces being made available, the high capacity potential of the one-way system of perimeter routes recommended, and the full cooperation of the business people of the community obtained, there is no reason why this plan cannot successfully accomplish the desired objective.

Stop Signs

A thorough study of stop signs at locations where their use is required brought out the fact that there is a definite need to install additional signs of this type and to bring the rest up to the proper acceptable standards now in effect. In the preceding section on Major Streets, roadways were designated arterial and local. Streets should be protected at crossings by compelling entering traffic to stop by means of a sign, unless there is a traffic signal present for assignment of the right of way. Failure to place stop signs where their use is required will create an accident potential due to the fact that motorists have good reason to believe that all arterial streets are protected and will assume that this is the case in Midland and that they have the right of way. The fact that a stop sign cannot be seen by a motorist traveling on the street at right angles to it contributes to this unsafe condition.

The present stop signs in the City of Midland are in fair condition appearance-wise, but they are not placed according to standards. They have no standard location as to placement or mounting height and some are either hidden from view or too high to be visible from a vehicle. Uniform location of these signs makes it easy for the motorist to know where he will encounter these signs. Unless he can see the sign, it is impossible for him to obey the message he is supposed to receive from them. This fact is borne out in the study of the accident records which showed that a high percentage of the accidents were caused by disregard of a traffic control device at the high accident locations. It is quite possible that the driver did not know what was expected of him, since he had no sign to tell him what to do or else it was hidden from view.

State law now requires that all new or refinished stop signs have a red background in conformance with national standards. The old type yellow stop sign has become weaker as the use of the new red one has become widespread. Its effectiveness has correspondingly diminished to the point where it is almost of no value whatsoever, since the color is not recognized as meaning 'stop'. It is recommended that any existing yellow stop signs be replaced through a program of stop sign renovation as soon as practicable.

Although the stop sign with the opaque background was approved only because it is cheaper; and, while the law does not state that it is required to use stop signs with a reflectorized background, it would be well for the City to consider only this type of sign and to use it exclusively. The red background which is in use nationally has become the 'stop' color; and, if this sign cannot convey this meaning both night and day, it loses much of its value. Midland certainly can afford the additional cost if consideration is given to the extra benefits in safety which are derived from this type of sign.

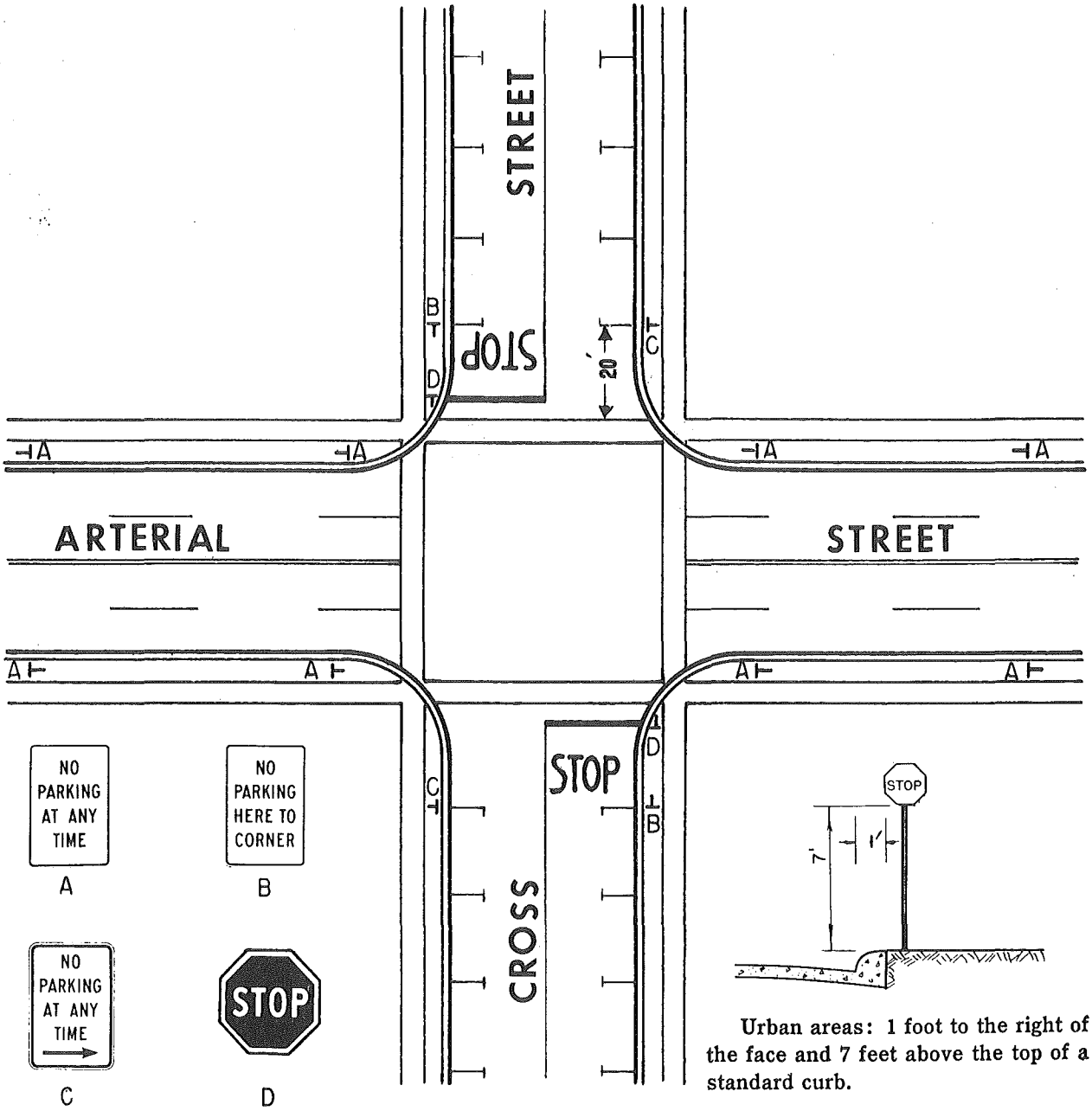
Stop signs should be no smaller than 24 inches and may be 36 inches or larger at intersections with a multi-lane highway or where higher speed traffic is present. They should be erected in urban areas one foot to the right and seven feet above the top of the curb as shown on Plate 44. In areas where parking is not a factor which will obstruct their visibility, they may be installed at a five foot bottom height. Periodic checks of all stop sign loca-

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

TYPICAL INTERSECTION CONTROL



Urban areas: 1 foot to the right of the face and 7 feet above the top of a standard curb.

Scale:

1" = 40

PLATE 44

tions should be made to insure their continued good visibility. It is neither economical nor practical to immediately replace all stop signs which are deficient for minor reasons, but it is recommended that a program for their replacement be instituted to rectify this condition. The stop signs on the major arterial streets should get attention first with the others coming in the order of their importance.

Stop signs must be placed only after intelligent study or the entire purpose of their use will be defeated. While there are no definite warrants for establishing the necessity for a stop sign, some of them may be poor sight distance, right angle accidents and traffic volumes.

Arterial one-way streets need to be protected by stop sign control from side streets. There will be some circumstances where one-way streets will have to stop for a stop sign, and the usual treatment of placing one stop sign at the right hand curb will not suffice. All one-way streets should have a stop sign placed on both the right and left hand side of the roadway. On streets where there are three or more lanes of moving traffic, it is wise to consider the installation of an overhead stop sign, preferably of the illuminated type.

At channelized intersections, where various lanes are separated by a traffic island, each of the lanes which are required to stop should have individual stop signs, since it is all too common for channelized intersections to have separate controls for different lanes. The driver of each lane must therefore be assured as to the proper action he is to take.

Yield Right of Way Signs

The use of this sign has now become quite prevalent in Michigan and is proving very effective in assigning the right of way to motorists. The intent of this sign is to assign right of way to motorists at intersections where traffic volumes are not heavy enough, under most circumstances, to require a full stop by a vehicle approaching the intersection from the lighter volume street. This sign also serves the purpose of preserving the use of the stop sign for approaches to through streets designated as arterial where higher speeds and heavier volumes require a full stop. The presence of this sign should eliminate any need for using a stop sign improperly in residential neighborhoods. When a yield right of way sign is used, the motorist realizes that although he is approaching a street which does not carry a large volume of traffic, he must yield right of way to such traffic. Since he is not compelled to make a stop when traffic does not warrant such action, he is willing to comply more readily. This eliminates an unnecessary delay from his trip without detracting anything from safety. It is a matter of record that this sign has been proved safe when used in the prescribed manner. This is particularly true where the two streets intersect at an angle less than 90 degrees. The motorist approaching this intersection usually gets a better view back of the intersection. If he sees it is clear, he keeps moving through. Under stop sign control he would be required to stop and then have a very difficult time appraising traffic conditions due to his poor angle of sight.

Intersection Sight Distances

Maintenance of proper sight distances at intersections which do not pos-

sess traffic signal control is very important if accidents are to be avoided. Intersections which have stop sign control must have sufficient sight distance, since the vehicles from the side streets are required to make a complete stop before they may cross the major street. The length of this sight distance is dependent on the design speed of the major street and the length of time it takes a vehicle to cross a roadway from a standing start. Assuming a typical example where the design speed of the major street is 30 miles per hour and the road is 2 to 6 lanes wide, the sight distances will range from 180 to 220 feet to the left and 200 to 280 feet to the right.

Parking, when permitted at the curb, can be a sight restriction if improperly controlled. If vehicles are allowed to park, they should be held back a sufficient distance from the intersection so that stopped vehicles on the side street will not be forced to encroach the intersection beyond the stop bar in order to gain the proper sight distance. The limits of restricted parking can be shown by painting the curb yellow and by the erection of signs bearing the legend "No Parking Here to Corner". Plate 44 shows a typical intersection control where cross street traffic is required to stop for the arterial street. This plate illustrates very clearly the State Law which requires that parking be restricted a distance of 20 feet back of a pedestrian crosswalk. At the intersections which do not have pedestrian crosswalks, this distance does not guarantee the satisfaction of the minimum sight distance requirement. For the purpose of maintaining the proper intersection sight distance, vehicles on the major street should not be parked closer than 100 feet to the left and 70 feet to the right of the cross street centerline.

At intersections where there is "Yield Right of Way" control or no control, the sight distance must be sufficient so the motorist can see the other vehicle, make a decision and either decelerate at a comfortable rate or be able to travel through the intersection with a reasonable margin of safety.

Traffic signal control by the nature of its operation, does not require long sight distances. Left turns, of course, require sufficient sight distance of oncoming traffic, but in urban areas where lower speeds are prevalent, this is usually no problem.

There were many intersections in Midland which are in violation of the State Law in regard to parking near an intersection. It is recommended that this deficiency be eliminated without delay. Not only should the minimums as required by law be satisfied, but safe sight distances should be established by removing the parking interference near intersections. Where a critical shortage of parking space exists, off-street parking should be tailored to accept this additional load.

Traffic Signs and Markings

In order to aid the drivers who travel the streets of Midland, it is necessary to install appropriate signs and to mark the streets for designated usage. The Michigan Manual of Uniform Traffic Control Devices which is to be mandatory after January 1, 1960, establishes the standards as to size, color, shape and mounting position of such devices. The traffic study revealed several exceptions to the manual in Midland which will have to be corrected. Deficiencies in stop signs have already been discussed.

The three general categories of highway signs are regulatory, warning and guide. The regulatory signs convey driving rules to the driver. Stop signs, parking signs, speed signs, turn restrictions, etc., fall into this category. The warning signs are usually diamond in shape and warn the motorist of some impending highway hazard. The guide signs are used to aid the motorist in travelling from one point to another. There are other signs which fall in special categories which are also listed in the Michigan Manual.

School signing should meet the highest standards in view of the extreme importance of alerting motorists to the presence of children. Although Midland has done a fine job in providing school crossing signs, there were some examples of signs which were in need of refinishing; since the signs are losing their effectiveness through weathering. It is not important to call attention to any particular sign, but a periodic check should be made of all school signing to make sure that they meet the proper standards and are in good state of maintenance. During the latter part of August before school starts, all school signs should be thoroughly checked for satisfactory service.

One-way operation is still sufficiently new and different from two-way operation so that a high sdandard of signing must be maintained in order to guarantee successful operation. This is particularly true when the one-way street is being established, since motorists must be indoctrinated with their new travel habits. Plate 45 shows the intersection of a typical one-way and two-way street. One-way signs which indicate the direction of traffic flow on the street are mounted on the near right and far left side of the street. Signs are mounted back to back at each of these locations so that they can be observed by traffic in both directions. In urban areas, they should be mounted one foot to the right and 7 feet above the top of a standard curb. There may be some locations where a third sign may be desirable on the far right hand corner. This sign should always be in addition to, but not in lieu of the two signs required in the standards.

New signs of great effectiveness are now coming on the market. Illuminated signs have been found most effective at signalized intersections to show turn restrictions. This permits the sign to be as discernible to the motorist as the lighted signal lens. Another sign of proven value is the illuminated stop sign which is mounted over the center of an intersection. This is a highly effective means of calling to the motorist's attention the presence of stop control. Good reduction in accidents have been recorded by the use of this sign at high accident locations.

Center lines should be painted on streets in the downtown area, except at locations where conditions require special treatment. Center lines are very important, both from the standpoint of safety and the efficient movement of traffic. The center line helps to prevent the encroachment of the left side of the street by right hand traffic. Center lines are recommended on city streets when:

1. Traffic volume is sufficient.

2. The roadway between curbs is greater than 20 feet and less than 40 feet and there is no parking present.

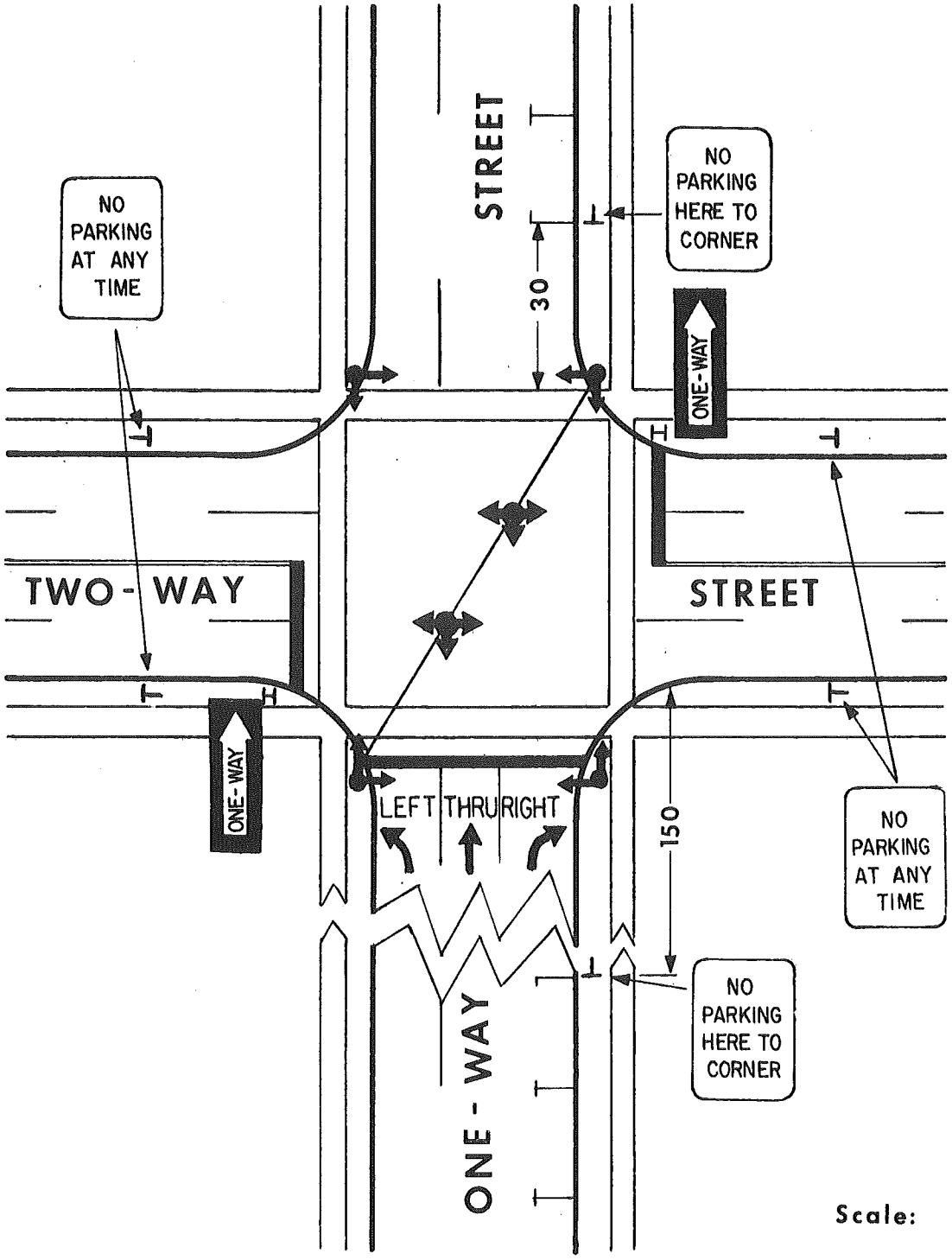
3. The roadway between parallel parked cars is greater than 24 feet and less than 40 feet wide.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

INTERSECTION OF ONE-WAY AND TWO-WAY STREET UNDER TRAFFIC SIGNAL CONTROL



Scale:

1" = 40'

PLATE 45

4. The roadway between angle parked cars is greater than 24 and and less than 60 feet wide.

5. The roadway between parallel parked vehicles on one side and the curb on the opposite side with parking prohibited is greater than 24 and less than 40 feet wide.

Four lane, two-way roadways shall have a center line which shall be composed of two parallel yellow lines 5½ inches apart. The lines shall be placed equal distances from the extremities of that part of the roadway available for free moving traffic. They are recommended when:

1. The roadway between curbs is greater than 40 feet wide with parking prohibited.

2. The roadway between parallel parked cars is greater than 40 feet.

3. The roadway between angle parked cars is greater than 60 feet.

4. The roadway between parallel parked cars on one side and the curb on the opposite with with parking prohibited is greater than 40 feet wide.

The use of lane lines permits an efficient use of the pavement, with a consequent increase in capacity. The lane lines are particularly valuable at signalized intersections where an additional lane is acquired at the intersection by the removal of parking. Plate 45 shows a good example of how this is accomplished.

Solid yellow lines are used to mark "no passing" zones. A speed of 25 miles per hour requires a sight distance of 500 feet while a speed of 35 miles per hour requires a sight distance of 700 feet. The terrain in the Midland area is sufficiently flat so that no zones of this type are required at the present time.

Colors used in pavement painting should be those specified in the Michigan Manual. In this respect, white is used for the following purposes.

1. Center line on city streets.

2. Lane lines

3. Turn markings

4. Stop lines

5. Crosswalk lines

6. Parking stall limits

7. School markings

8. Word markings

The yellow color is used for the following purposes:

1. Double center line on four or more lane undivided pavement
2. "No Passing" barrier line
3. Curb marking to indicate parking prohibition
4. Curb marking to indicate an obstruction in the roadway

Pavement marking is very useful for marking parking stalls either along the curb or in off-street parking lots. Curb stalls for parallel parking should be 22 feet long and 8 feet wide. Vehicles are becoming longer; and, unless there is sufficient distance in each parking stall, the parking maneuver becomes very difficult and causes excessive blocking of the traffic lane while the driver attempts to move into a short space. Unless off-street parking lots are marked, careless motorists will make inefficient use of the available parking space.

Intersection Recommendations

Main Street, Townsend Street and Benson Street

This intersection has already been discussed in the report, but Plate 46 shows a drawing of the intersection. The signal phasing mentioned in the signal section can be utilized to provide a safe means of bringing traffic from Townsend Street to Benson Street without interfering with the one-way movement on Main Street. The technique of signing must be such that by permitting this particular movement, we do not destroy the impression to the motorist that Main Street is one-way to the southeast on both sides of the intersection.

Two signs will be of particular importance in accomplishing the desired results. A sign shall be erected on the right hand curb to Townsend Street approach traffic as shown on the drawing which will have the legend "RIGHT TURN PERMITTED TO BENSON STREET ONLY". This sign can be black legend on reflectorized background. The second sign will be suspended on the signal span and will be of the internally illuminated type due to the importance of its legend. It shall read "LEFT TURN ONLY". This will prevent traffic from travelling northwest on Main Street beyond the Benson Street intersection. Arrows painted on the pavement can also assist vehicles in travelling from Townsend to Benson Street.

The illuminated sign can have a face in the direction of oncoming Main Street traffic which will be of the "Blank-out" type. The message reading "LET TRAFFIC CLEAR" will come on a short period before the green signal is displayed to Main Street. By displaying this message at the appropriate time, it will be more effective and its purpose at other times during the signal cycle will not be confusing. This sign is an insurance that Main Street traffic will not move at the beginning of the green period and trap an unusually slow vehicle moving from Townsend to Benson Street. The sign can remain lighted for a short interval after the beginning of the Main Street green.

The signing for the one-way operating and parking restrictions are not shown on the drawing since standards for this type of signing are established.

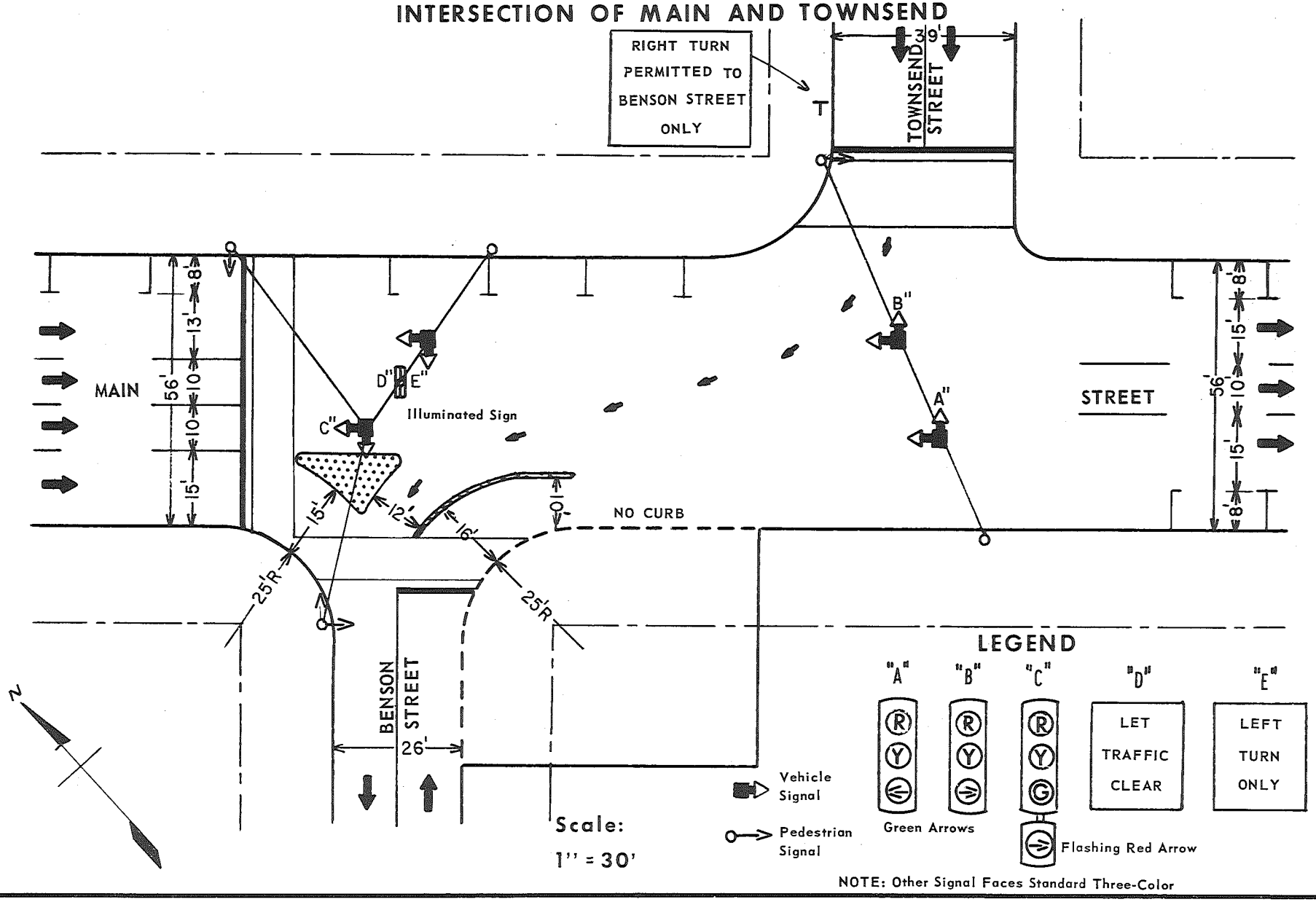
PLATE 46

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

INTERSECTION OF MAIN AND TOWNSEND



Parking restrictions should be applied and enforced from Rodd Street to Townsend Street along the southwest side of Main Street. All parking should be restricted for a distance of twenty feet back of all pedestrian crosswalks. Crosswalk markings are shown at only those locations where safe crossing is possible. Main Street should be crossed only northwest of Benson Street since there will be no interference from turning traffic. Benson and Townsend Street can be crossed where shown.

Due to the one-way operation, no vehicle signal faces will be needed on the downstream side of one-way traffic. This means that there will be three pedestrian signals which will be needed for directions in which vehicle signals are not visible. In addition to these signals, a fourth pedestrian signal head should be added on the northeast side of Main Street to permit pedestrians to cross Main Street. By protecting this crosswalk with pedestrian signals, it is possible to hold the pedestrians near the end of the green interval and permit turning movements from Main Street to Benson Street. Admittedly, there are not many pedestrians using this crosswalk, but the pedestrian signal would guarantee the vehicle a clear period to make the right turn. Since this right turning movement is very heavy, a flashing right turn, red arrow signal should face Main Street traffic during the red signal period. Right turns can be made at this time after vehicles make a safety stop. Pedestrian traffic is sufficiently light to permit this type of operation.

The signal heads facing Townsend Street traffic have a left turn arrow in the left hand signal and a right turn arrow in the right hand signal. This not only provides the proper signal indications to the driver, but will aid in segregating the two turning movements into their proper driving lanes. Pavement marking can aid this.

The existing traffic island at this intersection should be changed in order to obtain maximum number of traffic lanes and proper turning radii. The radii should be increased to 25 feet on the northwest and southeast corner of Benson Street and the northeast corner of Townsend Street. This will greatly facilitate traffic movement. By moving the traffic island to the position shown on Plate 46, three lanes of traffic are available for through movements on Main Street and one for right turns.

Eastman Road, Buttles Street and Hubbard Street

By the proper traffic control and channelization, it is possible to make this intersection operate very efficiently and safely without any traffic signal. Under the one-way plan of operation, Buttles Street will become an important carrier of traffic, since it will be the one-way pair to Ellsworth Street. Since this is a five-legged intersection and also the point where the one-way operation begins for Eastman Road, it is imperative that the plan shown on Plate 47 be placed in effect.

The plan calls for restrictions in traffic movements involving West Buttles Street and Hubbard Street traffic. The plan permits a right turn off of Eastman Road so that traffic can enter either West Buttles or Hubbard Street. Traffic from these same two streets can likewise enter Eastman Road only on a right turn. The other movements from these two streets to Eastman or East Buttles are physically eliminated by the construction of the traffic island.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

INTERSECTION OF EASTMAN AND BUTTLES

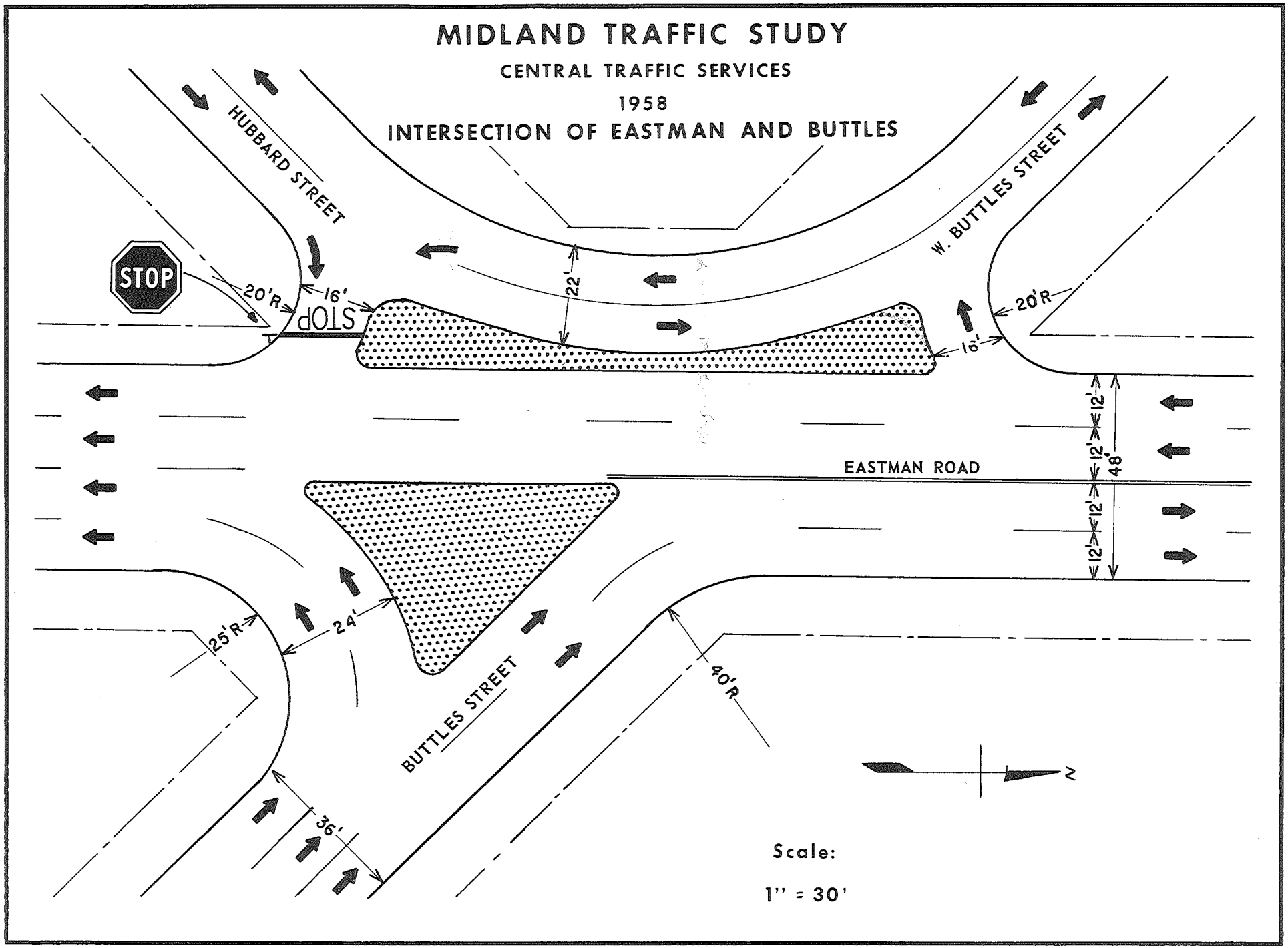


PLATE 47

One-way traffic from East Buttles can make a right turn onto Eastman Road and proceed north. Traffic from Buttles Street desiring to go south on Eastman Road can do so in the shelter of the traffic island. This eliminates the need of a stop sign or traffic signal. This traffic island permits an easy transition from the one-way to a two-way operation on Eastman Road. If the minor traffic movements into and from West Buttles and Hubbard Streets were not prohibited, this whole plan would be destroyed and confusion and inefficient operation would result.

INTERSECTION OF MAIN STREET AND REVERE STREET

This intersection marks the point where Main Street traffic changes from two-way to one-way operation. Larkin Street traffic must be returned to Main Street because of this transition. If traffic conflicts are to be eliminated, Larkin Street traffic should be returned to Main Street by making Revere Street one-way to the southwest in the block between Larkin Street and Main Street. A less severe treatment which would permit Revere Street to remain two-way would involve the extension of Larkin Street beyond Revere Street by the construction of a diagonal return to Main Street. This would continue the one-way operation of Larkin Street down to Main Street. Revere Street could still serve traffic going northeast by this plan of operation, in the block between Larkin Street and Main Street.

INTERSECTION OF ELLSWORTH STREET AND ASHMAN STREET

This intersection will be improved by the one-way operation contemplated for both Ellsworth and Ashman Streets. A traffic problem is created at the present time by Ashman Street being one-way only southwest of the intersection. This requires all northeast-bound traffic to come from Ellsworth Street with the resultant turning movements. The left turns from Ellsworth Street to Ashman Street usually restrict a through lane of traffic.

Under the one-way plan, there will be no conflicts caused by turning movements of vehicles except with pedestrians. The installation of pedestrian signals would be desirable for this reason. The block on Ashman Street between Ellsworth Street and Larkin Street will receive a considerable amount of traffic due to traffic arriving from both Ashman and Ellsworth Streets. The removal of parking in this block would permit four lanes of vehicle traffic as shown on Plate 48. This restriction would not be necessary southwest of Larkin Street, since there should be a considerable amount of traffic leaving Ashman Street and turning right into Larkin Street.

A flashing red, right turn arrow should be installed to permit southeast-bound Ellsworth Street traffic to make a right turn to Ashman Street during the red signal period.

The drawing shows an illuminated sign mounted on the signal span wire between the two traffic signal heads. This sign is equally effective day and night and can be used to designate the proper direction of the one-way street. Its use is recommended at all signalized intersections of one-way streets. The lighted sign mounted in the same area as the traffic signal permits good visibility to the motorist. Normal roadside one-way signing should also be utilized.

MIDLAND TRAFFIC STUDY

CENTRAL TRAFFIC SERVICES

1958

INTERSECTION OF ELLSWORTH AND ASHMAN

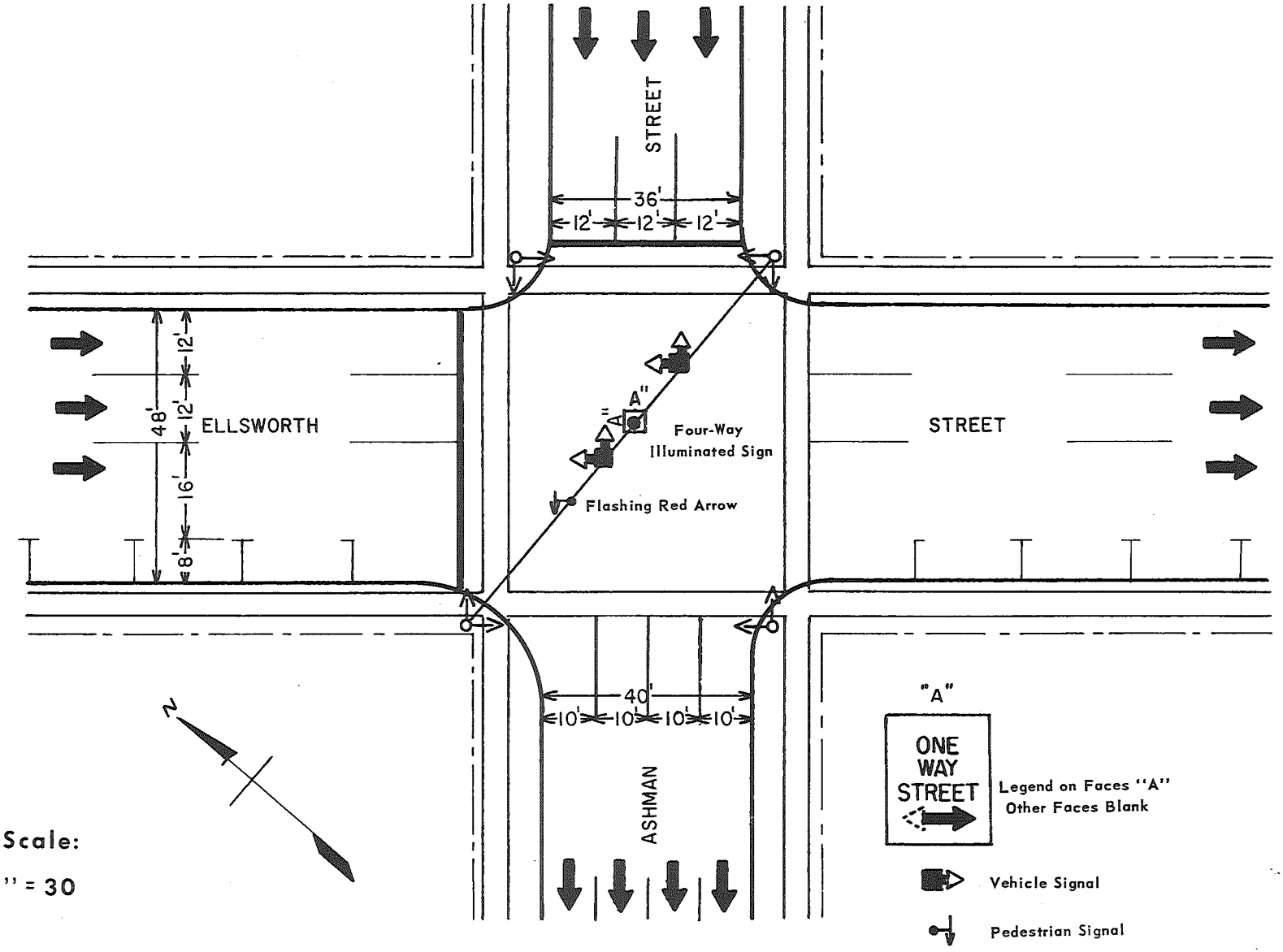


PLATE 48

INTERSECTION OF ELLSWORTH STREET AND RODD STREET

This intersection will be very similar to the intersection of Ellsworth and Ashman Streets. A signal will be needed for right-of-way assignment. Pedestrian signals can also be used to advantage at this location.

INTERSECTION OF ASHMAN STREET AND CARPENTER STREET

The present intersection has two traffic control features which are neither efficient nor do they contribute to safety to any great extent. One of these is the four-way stop control. This method of meeting a traffic problem has outlived its usefulness if it ever had one at all. It should be abandoned as soon as time will permit. Capacity of the intersection involved is cut to less than half due to the fact that everyone is required to stop at all times. When this is added to the normal delay and reduction of the efficiency of the intersection caused by turning movements, it leaves a great deal to be desired from the standpoint of good traffic operation. The delays and misinterpretation of the control causes motorists to become irritated and prone to do things not conducive to safe practices. Confusion on the part of the motorist over who is supposed to have the right of way adds to the delays as well as causes accidents between two vehicles starting at the same time. Many complaints have been received about this intersection, and it should be made a two-way stop as soon as possible. When Ashman Street is made one-way in the future, it will have the proper type of stop control already in place. When an intersection carries traffic in heavy enough volumes to require alternate assignment of right of way, a study should be made to determine whether or not a stop and go signal should be used.

The second control device detracting from traffic efficiency is the assignment of one lane of traffic for left turns from Ashman Street to Carpenter Street. The traffic counts indicate that the amount of traffic making this turn does not warrant an exclusive lane for left turns. Under the present two-way operation, it would be much better to designate the center lane for "Left and Thru" movements and designate the curb lane for 'Thru and Right' movements. This type of operation could be accomplished by pavement marking only and would not require overhead signing. When the change to one-way operation is made, the lane designation will change and the problem will be eliminated.

INTERSECTION OF CARPENTER STREET AND HALEY STREET

This intersection is also under a four-way stop control. Again the stop control would be better if one street were assigned the right of way over the other. Carpenter Street should be the preferential route, since it is destined to play a more important part in Midland's traffic future than Haley Street. When the State-George Street one-way system is placed in effect, Haley Street will lose its present major street characteristics. This will be especially true if a means is found to extend the State-George one-way system east of Jefferson as proposed in the chapter on Major Streets. The change in stop control can be made after due publicity is given to the proposal.

INTERSECTION OF SUGNET ROAD AND ORCHARD DRIVE

This intersection is cited as an example where a bad accident potential is being created by brush and weeds being permitted to grow at such heights that vision is impaired. This situation is duplicated at other locations, and city officials should be very observant of conditions creating barriers to vision at such locations.

INTERSECTION OF ASHMAN STREET AND HINES STREET

This intersection has a traffic condition existent which has already been mentioned in the report as being illegal and a breeder of accidents. Vehicles are being parked right up to the intersection crosswalks. This makes it virtually impossible for motorists on Hines Street to see vehicles approaching on Ashman Street. Parking on both sides of Hines is a serious problem due to the lack of adequate width of the street. Parking should be eliminated from one side. As it is now, a very serious accident could be caused by a car turning into Hines Street off Ashman Street to find no clear travel path ahead due to the remaining width of the street being blocked by a vehicle waiting to enter Ashman Street. This same situation should be guarded against at other locations in Midland which were observed to have this same fault.

INTERSECTION OF HALEY STREET AND JEFFERSON STREET

The radius in the northwest quadrant of the intersection is much too small to permit vehicles to turn from Jefferson Street into Haley Street. There is a curb which forms a restriction in the width of Haley Street by projecting into the street right at the intersection. Since the curb recesses a few feet away from the intersection, it is pointless to permit this restriction right in the area of greatest need for additional street width.

INTERSECTION OF WASHINGTON STREET AND ST. ANDREWS STREET

This intersection has four-way stop control. By eliminating it along with the other two intersections already mentioned, Midland would be free of this type of control which leads to motorist confusion with very little resultant benefits. Washington Street should be made the preferential route, since it should experience the greatest traffic volume increase.

INTERSECTION OF ELLSWORTH STREET AND REVERE STREET

Ellsworth Street dead-ends at Revere Street at this intersection. The sign at the end of the street is a diamond shape warning sign with a red arrow pointed in both directions of Revere Street. This arrow his a vertical stem. The yellow color of the warning series of signs is used, but the color of the arrow should be black. Not only is the legibility of a red arrow on a yellow background poor, but it is contradictory to the Michigan Manual. The arrows should have no vertical stem. A horizontal bar should join the two arrow heads.

The plan of conforming to the Manual has more benefits than merely being

legal. It permits strangers in a city to encounter standard signs for various circumstances with which they are thoroughly familiar. Local people who acclimate themselves to non-standard signs in their own community may be at a loss to properly decipher a standard sign in another area.

INTERSECTION OF LARKIN STREET AND REVERE STREET

The same two-headed arrow sign is present at this intersection and should be changed to a standard sign as outlined above.

INTERSECTION OF WASHINGTON STREET AND EASTLAWN STREET

This intersection has one lane designated on Washington Street for left turns exclusively. The same condition is true here as at Ashman and Carpenter Streets. It is well to have additional lane capacity at the intersection, but an exclusive lane for one turning movement should be utilized only when the turning movement warrants an exclusive lane on the basis of traffic distribution. More efficiency will be experienced at this intersection by designating the inside lane to both through and left turns.

There are other intersections which have some of the faults already mentioned. These should be corrected in line with the procedure outlined in this report and as published in the Uniform Manual of Traffic Control Devices. By eliminating the undesirable conditions, even though they may be considered trivial, a better safety record and a more efficient street system will be the reward of the people of Midland.

This location has a bad traffic problem along with the intersection of Saginaw Road and Eastlawn Street. Traffic is heavy on Eastlawn and the High School creates a bad traffic problem. The solution to the problem must be sought by trying to develop a one-way pair for either Eastlawn Street or Haley Street in order to disperse concentrations of traffic and facilitate signal timing problems created by the close proximity or major intersections. The suggested one-way system should be an extension of the State-George one-way system.

GENERAL RECOMMENDATIONS

Each section of this report deals with a specific function of traffic, and recommendations for changes and improvements are made in the respective sections. There are some traffic recommendations which are general and do not fit any one category. These recommendations are reserved for this final section since they play an important part on how the material in the report can be brought to a practical reality in the City of Midland. The common fault of many reports is not in the material contained therein, but they usually fail to emphasize the importance of following the suggestions and the changes which can result in altering vital portions. We are not attempting to create the impression that any alterations will be disastrous, but major alterations to the plans as discussed in the report should be considered only after careful appraisal and with due consultation. A good traffic plan can only be evolved after careful analysis of numerous interrelated variables. Failure to consider this when making changes can only result in jeopardizing the complete plan.

In working on the traffic study in Midland, we had the opportunity of meeting with several groups. Each one showed interest in their particular activity, but intimate knowledge of the activities of other groups and organizations was lacking. Two ventures are presently underway in Midland which will effect traffic and have a vital bearing on the welfare of the community. These are the Dow Administrative Center and the Downtown Development Plan. Both of these endeavors will require assistance in the solution of their traffic operation problems. The report contains very specific recommendations on these two projects.

During the course of the study, the need of a new bridge became very apparent, and city officials took very prompt measures to prepare initial plans for the bridge. This was not difficult for energetic city officials to accomplish, but putting in effect a traffic plan as extensive as the one outlined in this report might prove to be a different matter. City officials may be willing, but lack of understanding and cooperation from various groups and business interests may deter them in their efforts.

Some mechanism must be found to undertake the program of traffic revitalization needed in Midland. Since a great deal of cooperation will be needed, a committee should be appointed which will have as its purpose the planning and carrying out the liaison work needed to place the traffic plan in effect. Existing committees would not be suitable for this function since it is quite important that committee members represent agencies and organizations vitally effected by the traffic plan. The two city officials who would be most interested in this subject would be the City Planning Engineer and the City Engineer. There should be a representative from the City Council. Businessmen and merchants should have a representation along with workers' groups. Dow Chemical and Dow Corning should have membership. The former group should have a member from management and also from the division which has the responsibility for traffic operations.

It is not only important that various groups have membership on this committee, but also that the representatives selected have by reason of training, experience and duties knowledge of traffic matters. The Mayor and City Council should select the members of the committee, but it would be well to have a list of qualified men from the above mentioned organizations represent-

ed on the committee. These persons should be capable of gaining the support of their own organization for the development of the traffic plan.

The citizens of Midland are entitled to know the proposed plan of traffic operation through the media of the local newspaper and radio. It is suggested that a series of articles be published which would explain the reasons for the plan's development as outlined in the report. It can be appreciated that there are certain features of the plan which will be severely questioned by certain groups. While we would not recommend deletions of all controversial issues from the traffic plan, the people who dissent are entitled to know the reasoning behind the proposals. In many cases, an explanation of the reasons for a certain recommendation will satisfy the complaintants.

The City of Midland is reaching the size where a full-time traffic engineer is desirable. Whether a traffic engineer is employed or not, there should be a clear understanding where the function of traffic engineering is placed. The City Planning Engineer has many functions closely allied to traffic engineering, and it would be logical to give him this responsibility. The more involved situations which would require professional engineering skills could be obtained through consulting sources. Whenever the city feels it is more feasible to employ a full-time traffic engineer, then the responsibility for traffic operation should be placed with him.

A Traffic Commission should be appointed by the Mayor and City Council for the purpose of passing on all matters pertaining to traffic operation and regulation. This Commission may be composed of the same members as the committee suggested for carrying out the recommendations of this report. The person entrusted with the traffic engineering functions should serve as Secretary of the Commission and bring matters pertaining to traffic and transportation before it. He should supply the factual data on traffic matters to the Commission and make recommendations in the best interests of safety and efficiency of travel. The Chief of Police should serve on the commission in an ex officio capacity. His services are quite important, since he can lend advisory service on suitability of ordinances for proper enforcement. The City Attorney should likewise be represented for the purpose of keeping all proposals within legal limits. Although the City Council should pass on recommendations of the Traffic Commission, the Council should take no direct action on traffic matters which have not been cleared through the Traffic Commission.

A program of traffic education will have sound and far reaching effects. This education can come through the press, radio, school and public meetings. The more enlightened the public, the more sincere will be its support.

The Midland Traffic Study has been an experience in the strength which can be gained by cooperation. It is our fond hope that the initial enthusiasm will maintain itself with the result that Midland will experience a well balanced and sound traffic operating street system. This will require close support and cooperation and the relegation of selfish interests to a secondary position.