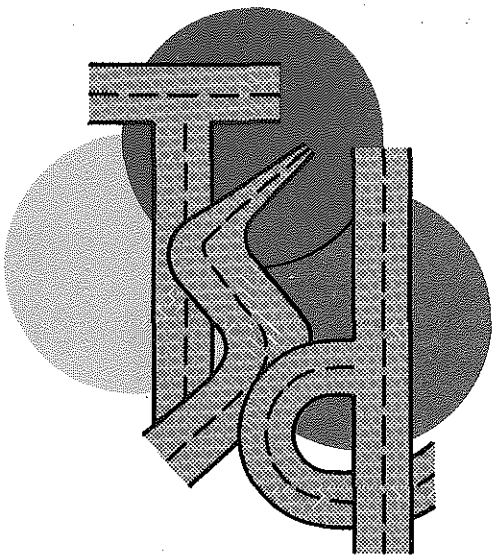
Report TSD-232-73

A TRAFFIC ACCIDENT ANALYSIS OF HIGH ACCIDENT LOCATIONS IN THE CITY OF PORTAGE



TRAFFIC and SAFETY DIVISION

DEPARTMENT OF STATE HIGHWAYS
STATE OF MICHIGAN

Michigan Department

of

State Highways and Transportation

Report TSD-232-73

A TRAFFIC ACCIDENT ANALYSIS OF HIGH ACCIDENT LOCATIONS IN THE CITY OF PORTAGE

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TRAFFIC ENGINEERING SERVICES

PREPARED BY

Traffic Engineering Services
Traffic and Safety Division
Michigan Department of State Highways and Transportation

in cooperation with

The Michigan Office of Highway Safety Planning
and
The U. S. Department of Transportation
Federal Highway Administration

ACKNOWLEDGMENTS

MICHIGAN DEPARTMENT OF STATE POLICE

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NHTSA Project #MCD-73-001B

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INTRODUCTION

The Highway Safety Act of 1966 was enacted by the Congress of the United States in order to promote highway safety. Highway safety standards were then developed to assure the orderly implementation of the Act.

Purpose

Highway Safety Standard 4.4.13, Traffic Engineering Services, is one of those standards. The purpose of Standard 4.4.13 is

> "to assure the full and proper application of modern traffic engineering principles and uniform standards for traffic control to reduce the likelihood and severity of traffic accidents.".

This standard includes the identifying of specific locations or sections of streets and highways which have a high accident experience or potential as a basis for establishing priorities for improvement, selective enforcement or other practices that will eliminate or reduce the hazards. It provides an orderly inventory of all traffic control devices, which include those signs, signals, markings and devices placed on, over or adjacent to a street or highway to regulate, warn and guide vehicular and pedestrian traffic.

The State of Michigan carries out a program of this type on the state trunkline system; however, many of the state's city and county agencies lack the financial and technical prerequisites necessary to pursue similar programs with similarly defined objectives. To insure that this additional highway safety standard is met and to improve the overall evaluation of the accident picture in Michigan, the Michigan Department of State Highways and Transportation requested and received through the Office of Highway Safety Planning in the Department of State Police, a federally funded project entitled "Traffic Engineering Services for Cities and Counties".

In cooperation with participating cities and counties, the proposed service, under the direction of Department personnel, will make a traffic engineering evaluation of the factors causing traffic accidents and will recommend corrections to those conditions which may be contributing to accidents; and additionally will recommend the upgrading of traffic control devices where necessary.

Scope

The intent of this program is to improve traffic safety on all Michigan streets and roads by expanding the traffic engineering evaluation of factors causing accidents, and by providing uniform

standards for traffic control to reduce the likelihood and severity of traffic accidents.

Study Procedures

The study procedures for the subject project involve several distinct phases. They may be described as follows: basic data collection, identifying and locating high accident locations, field investigations, an accident analysis of the high accident locations, technical evaluation of previously compiled facts and consequent remedial recommendations.

Since a portion of the data collection phase involves accident records and reports, and since the Michigan Department of State Police is responsible for keeping all accident records in Michigan, the task of identifying and locating the high accident locations (and providing an inventory of these locations) was designated as State Police responsibility. The high accident locations for the City of Portage were determined by the 1968 Kalamazoo County accident reports. Twelve of the 37 high accident locations originally selected for the Kalamazoo County report are now under the jurisdiction of the City of Portage. These 12 locations will compose the high accident locations for the City of Portage. Once the problem locations were identified additional accident information for the years 1966, 1967, 1969 and 1970 was compiled in order to expand the accident base at each location. After compiling this information the Department of State Police transmitted it to the Department of State Highways and Transportation.

The Department of State Highways and Transportation is then responsible for further data collection utilizing the following basic steps: 1) conducting field investigations; 2) preparing collision diagrams and, if necessary, physical condition diagrams for each selected location; and 3) obtaining traffic counts and preparing an Average Daily Traffic Map (p. 11).

The accident analysis phase involves the analysis of the summarized facts and field data from the viewpoint of a highway traffic engineer with special attention focused on the effect which the highway environment may have had on the accident. Thus, at each high accident location, individual accident reports were reviewed in detail and the accident factors were tabulated and grouped in various tables. The collision diagrams which were prepared for each location are used to identify accident patterns and to locate the accident in relation to the intersection. A technical evaluation and engineering analysis of the compiled data is used to recommend corrections to those conditions which may be contributing to accidents.

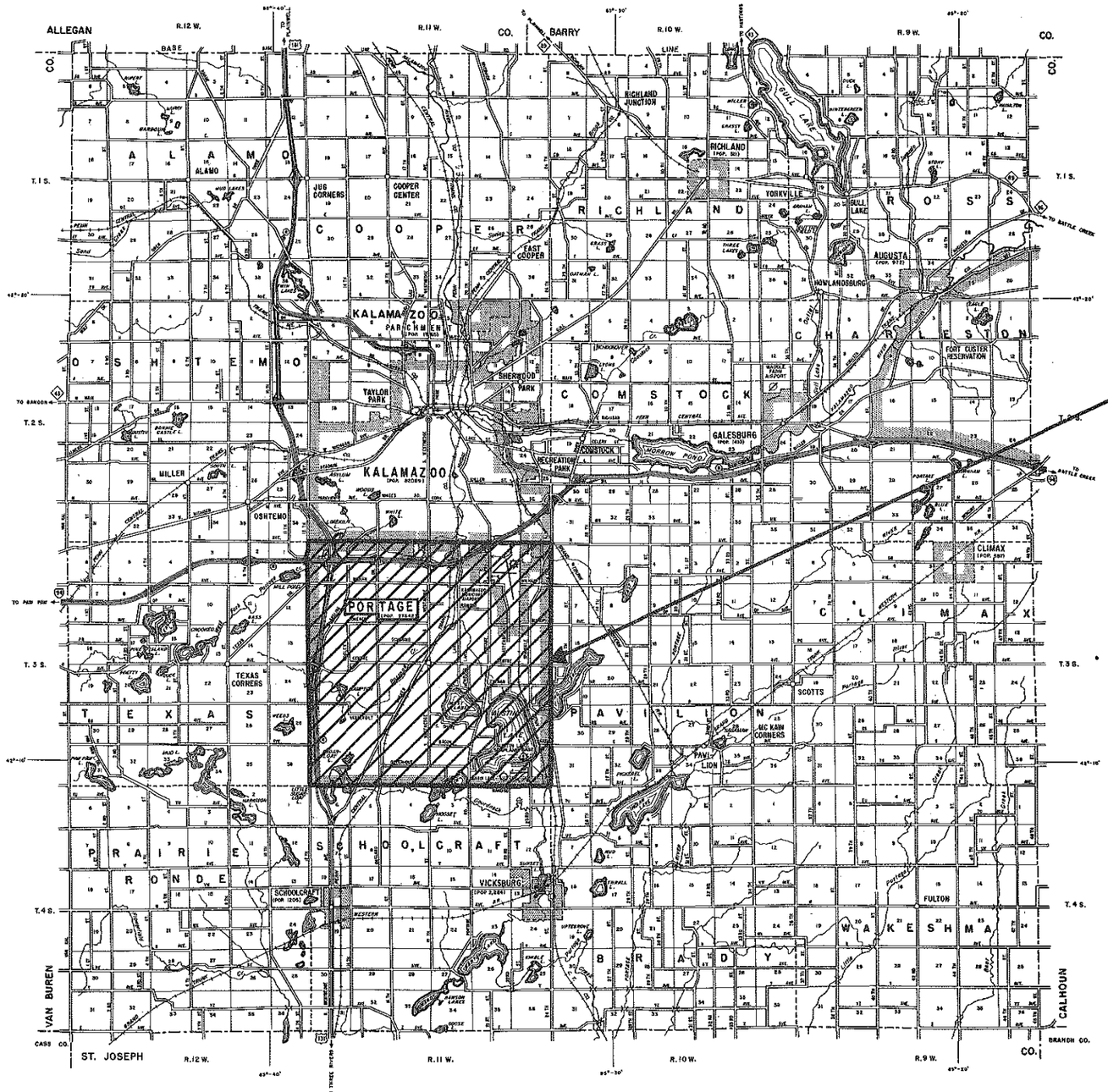
Study Area

The City of Portage is located in Kalamazoo County which is located in southwestern Michigan (Figure 1). This location puts the City of Portage on two primary trade linkages, the east-west Detroit to Chicago corridor and the north-south Grand Rapids to Northern Indiana corridor. These trade linkages have contributed to the City's present development and will continue to do so in the future.

The City of Portage is served by excellent transportation facilities including a fine network of regional and local highways. US-131 provides north-south access and I-94, M-43 and M-96 provide east-west access.

The Twentieth Annual Progress Report compiled by the Local Government Division of the Michigan Department of State Highways and Transportation indicates that the City of Portage has 186.72 miles of streets. This figure includes 10.83 miles of state trunkline, 23.47 miles of County Primary, 34.97 miles of major city streets and 117.45 miles of local city streets (Figure 2).

FIGURE 1



STUDY AREA

KEY TO COUNTIES

KALAMAZOO COUNTY

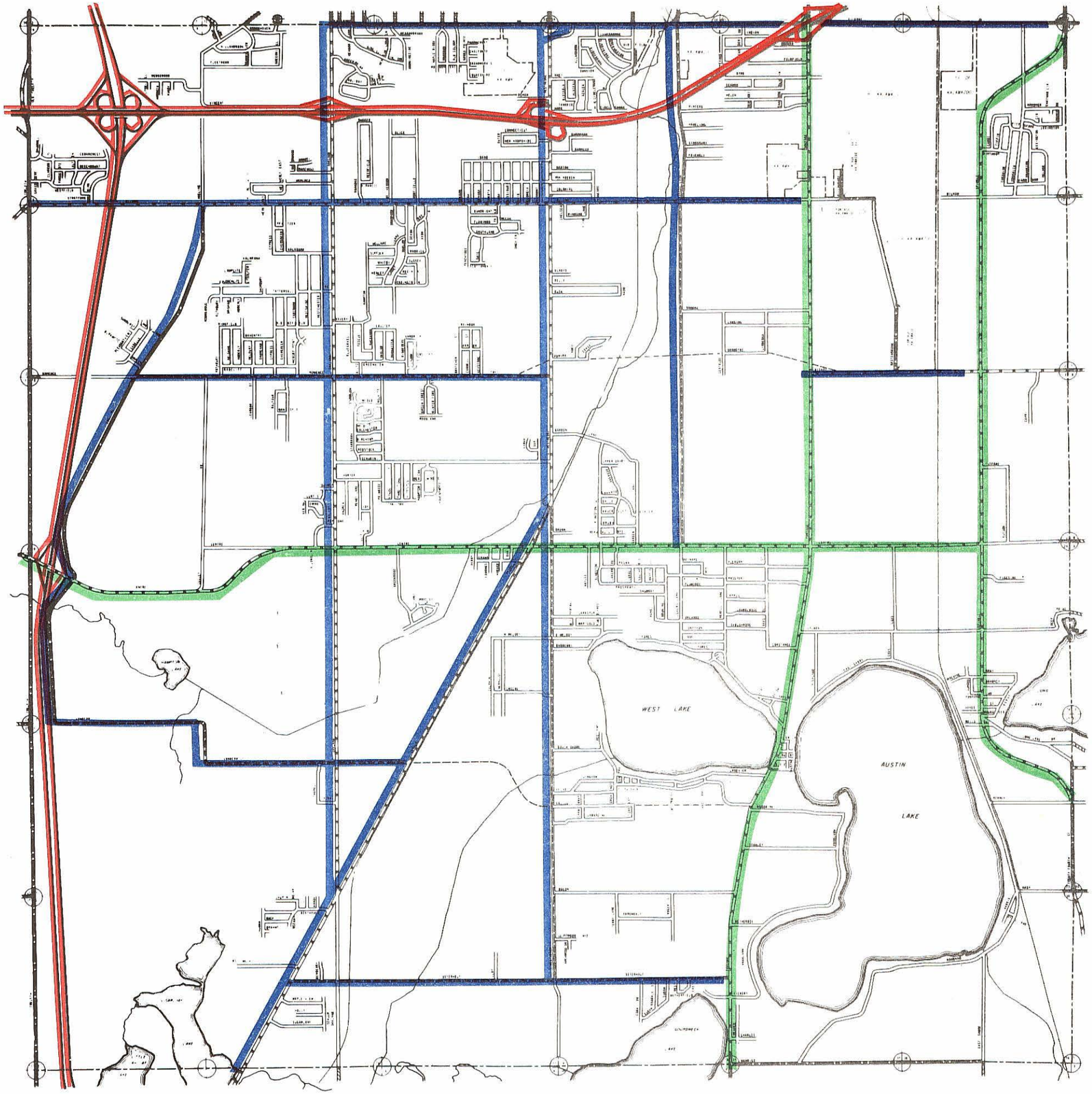
MICHIGAN
STATE HIGHWAY COMMISSION
DEPARTMENT OF STATE HIGHWAYS

DATA OBTAINED FROM
HIGHWAY PLANNING SURVEY
CONDUCTED IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE 0 1 2 3 MILES
1" = 2.75 MILES
POLYCONIC PROJECTION

TOWNSHIPS AND CORPORATE LIMITS REVISED JANUARY 1969

CITY OF PORTAGE



STATE TRUNKLINE
CITY MAJOR STREET
COUNTY PRIMARY
CITY LOCAL STREET

FIGURE 2

TRAFFIC ENGINEERING ANALYSIS

The traffic engineering analysis phase involves evaluating the summarized facts and field data and prescribing the proper remedial treatment. One of the basic tools used in this type of analysis is a graphic representation of accidents, either in a collision diagram or strip map, which is used to determine accident patterns. An accident pattern is the prevalence of one or more types of accident occurrence. The accident pattern gives an indication of the type of corrective action needed at the specific location.

Accident causes, however, are numerous and often difficult to determine. An accident pattern does not always exist. In some cases, the collisions may involve a combination of driving hazards such as slippery pavement, snow or fog, drinking drivers, defective equipment, excessive speed and inadequate traffic control. In many cases these hazards may be eliminated or at best alleviated. In some cases, the accident causes may lie in factors outside the jurisdiction of the traffic engineer such as enforcement. In this instance he can offer specific information to the police or other responsible agencies and request their cooperation.

Collection and Analysis of Data

After the 12 high accident locations were transmitted by the Michigan Department of State Police to the Michigan Department of State Highways and Transportation, additional statistical information was collected on the reported traffic accidents in Kalamazoo County and the City of Portage. Table 1, which contains the traffic accident data, shows that reported traffic accidents in Kalamazoo County (county roads only) increased every year between 1966 and 1970 while reported traffic accidents in the City of Portage increased every year except for 1968 and 1970. The City of Portage had a total of 4,030 reported traffic accidents on city streets during the five-year study period for an average of 806 accidents per year. The 12 high accident locations accounted for 635 accidents or 15.8 percent. The total reported accidents in the City of Portage increased 15 percent between 1966 and 1970. This figure does not indicate an accident criticality when one considers the fact that vehicle registrations in Kalamazoo County increased 25.2 percent over the same period.

City-Wide Recommendations

Wet Pavement Accidents

After the pertinent data was assembled an accident analysis of the 12 high accident locations was conducted. This analysis indicated that wet pavement accidents occurred frequently at many of the locations. At any location where

TABLE 1

REPORTED TRAFFIC ACCIDENTS IN KALAMAZOO COUNTY

Year	Total	County Road	State Route	City of Portage	Property Damage	Injury	Fatal	Persons Injured	Persons Killed
1966	6,968	572	2,199	730	5,094	1,839	35	2,820	47
1967	7,789	617	1,308	864	5,901	1,853	35	2,750	39
1968	7,501	810	1,365	751	5,519	1,936	46	3,079	57
1969	7,348	969	1,538	846	5,502	1,805	41	2,683	45
1970	8,089	1,096	1,576	839	6,137	1,921	31	2,888	39

COMPARISON OF ACCIDENT FREQUENCY

Year	Portage City Streets	Kalamazoo County Roads	Total Accidents State of Mich.
1966	730	572	302,880
1967	864	617	299,004
1968	751	810	305,495
1969	846	969	331,223
1970	839	1,096	313,715

PERCENTAGE CHANGE FOR THE ABOVE TOTALS

1966-67	18.4	7.9	-1.3
1967-68	-13.1	31.3	2.2
1968-69	12.6	19.6	8.4
1969-70	- 0.8	13.1	-5.3

wet pavement accidents are greater than 27 percent of the total accidents and greater than 40 percent of the total accidents minus the snow and ice accidents, skidometer tests are usually warranted. This criteria is used by the Michigan Department of State Highways and Transportation in their safety program. All skidometer test values are expressed as 40 mph coefficients of wet sliding friction (wsf). A wsf value of 0.40 is generally considered the dividing point between "satisfactory" and "unsatisfactory" pavement surfaces and it has been arbitrarily defined as the "Departmental Safety Standard". Surfaces with coefficient values of 0.35 to 0.40 are in a transitional or questionable range. Surfaces below 0.35 could be dangerous under wet conditions depending on prevailing speeds, road alignment, and geometrics. Surfaces with wsf's below 0.20 are considered as slippery as packed snow. Pavements that fall within the unsatisfactory range should be resurfaced in the very near future. If a skidometer test is warranted at a particular location, it will be mentioned under the recommendation portion of the discussion.

Signalized Locations

Further analysis indicated that two of the high accident locations satisfy the requirements in the 1973 edition of the Michigan Manual of Uniform Traffic Control Devices (hereafter referred to as the Manual) for pretimed signals. Pretimed signals may be installed and operated when one or more of the following warrants are satisfied:

Warrant #1 - Minimum vehicular volume.
Warrant #2 - Interruption of continuous traffic.
Warrant #3 - Minimum pedestrian volume.
Warrant #4 - School crossings.
Warrant #5 - Progressive movement.
Warrant #6 - Accident experience.
Warrant #7 - Systems.
Warrant #8 - Combination of Warrants.

The Average Daily Traffic volumes (hereafter referred to as ADT's) were obtained for each of the 12 high accident locations. Furthermore, 24 hour volume counts and eight hour turning movements were obtained from the Transportation Planning Division for select locations. This data was used in conjunction with the signal warrants to make specific signal recommendations. At any location where stop and go signals are either existing or recommended a minimum of two vehicular signal faces should be provided per approach for the following reasons:

1. Two (or more) properly located overhead faces will in almost all cases provide drivers with a signal indication even though trucks or buses may momentarily obscure one signal face.

2. Multiple faces provide a safety factor where the signals must compete with a brilliant background such as advertising signs or the sun.

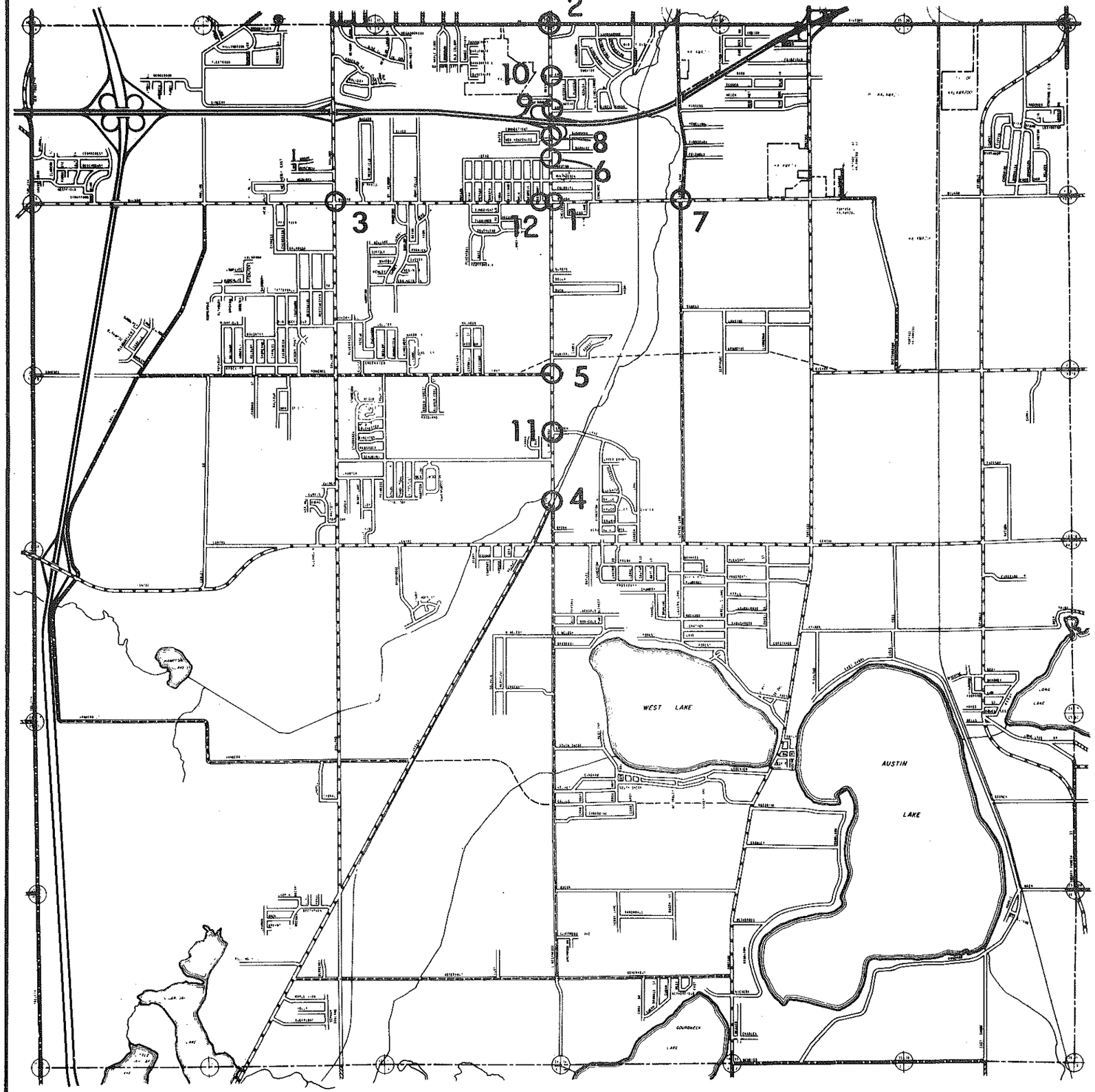
3. The occasional inevitable lamp failure in one face will not leave an approach without any signal indication.

Furthermore, all signal installations in the city should have a minimum amber time of four seconds and a maximum time of 4.5 seconds. An adequate amber time contributes to the prevention of right angle accidents at signalized locations.

High Accident Locations

After the analysis of the 12 high accident locations was complete, it was apparent that no engineering recommendations would be feasible for four of the locations. There were no accident patterns at these four locations and no present or potential serious driving hazards that could be eliminated or controlled by traffic engineering. Consequently, this report will discuss in detail only the remaining eight locations. The collision diagrams and pictures for each of these will be found on the pages following each recommendation. A cost estimate for each recommendation is included in the Summary of this report. These estimates are based on Michigan Department of State Highways and Transportation costs for materials and labor.

CITY OF PORTAGE

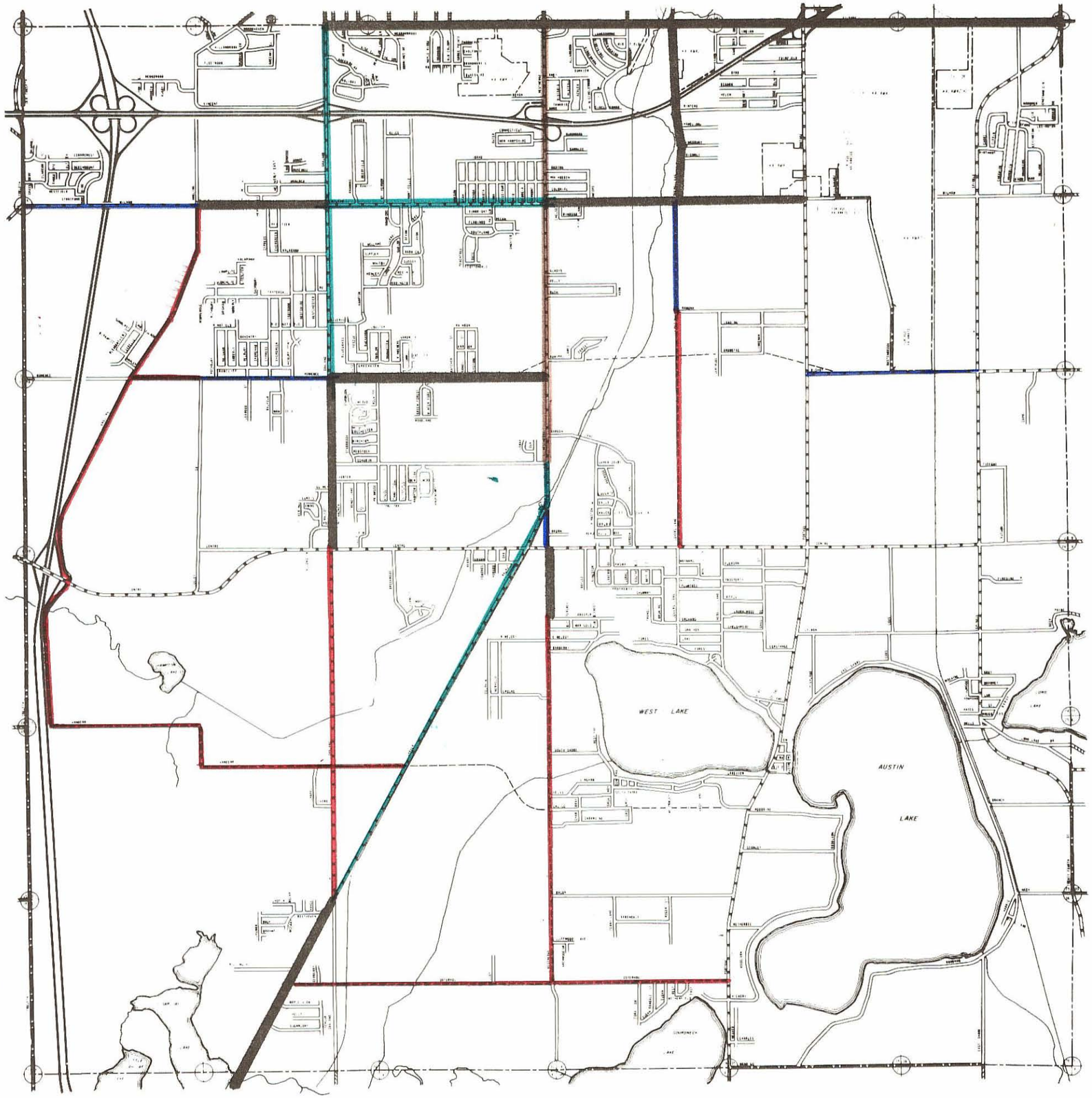


SPOT MAP
FOR
HIGH ACCIDENT
LOCATIONS

FIGURE 3

CITY OF PORTAGE

AVERAGE DAILY TRAFFIC MAP OF CITY MAJOR STREETS



LEGEND

- 0-1,999
- 2,000-3,999
- 4,000-7,999
- 8,000-12,999
- 13,000-OVER

FIGURE 4

LOCATION 1 WESTNEDGE AVENUE (F.A.S. 1803) AT MILHAM ROAD (F.A.S. 397)

Westnedge Avenue and Milham Road form a highly traveled signalized intersection located in an urban area. Westnedge Avenue has a five lane, 62 ft wide bituminous pavement with the center lane for left turns only. Milham Road has a four lane, 50 ft wide bituminous pavement west of the intersection and a 48 ft wide bituminous pavement east of the intersection. Milham Road becomes a two lane roadway both east and west of the intersection. The Southland Shopping Center, which is a major generator, is located in the southwest quadrant of the intersection.

The traffic controls consist of five overhead signals with oversized red indications. Each leg of this intersection has a separate left turn phase. There are also pedestrian walk/wait indicators on all four corners.

There were 175 accidents at this location during the five-year study period. Seventy-one of these accidents or almost 41 percent occurred on either wet, snowy or icy pavement. The total accidents per year decreased from 38 in 1966 to 32 in 1970. All of the accident types decreased between 1966 and 1970 except for rear end accidents which increased in both 1969 and 1970. Rear end collisions accounted for almost 42 percent of the total accidents at this location. Approximately 59 percent of these rear end accidents occurred on southbound Westnedge Avenue. Furhtermore, about 26 percent of both the total rear end accidents and the rear end accidents on Westnedge Avenue occurred on wet pavement.

Three other accident types contributed heavily to the total accidents that occurred at this location. Right-angle, head-on left-turn and driveway accidents accounted for almost 43 percent of the total. All three of these accident types decreased in the last two years of the study period. Right-angle accidents decreased the most as the total went from 23 the first three years to four the last two years. Head-on left-turn accidents reached a high of seven in 1967 with six of these accidents occurring from northbound Westnedge Avenue. In both 1969 and 1970 there was only one head-on left-turn accident for each leg of the intersection. The introduction of left turn phases for all four legs of the intersection is responsible for the reduction in head-on left-turn accidents. Driveway accidents decreased from a total of 19 during the first three years of the study period to six for the last two years. The average of three driveway accidents per year over the last two years is good considering the types of generators that exist in three of the four quadrants (two service stations and a tavern).

Eight other accident types accounted for the remaining 15 percent of the total accidents at this location. Sideswipe accidents and

improper turns accounted for about 11 percent of the total. Most of these accidents were reportedly caused by carelessness on the part of the operators. The remaining accidents consisted of three involving improper backing, two involving improper lane usage, two involving pedestrians, one ran-off roadway, one head-on and one involving a parked vehicle.

Recommendations

Twenty-nine percent of the total accidents at this location and 26 percent of the rear end accidents occurred on wet pavement. These percentages indicate that a possible slippery condition may develop at this intersection during inclement weather. Thus, it is recommended that skidometer tests be conducted. If a slippery condition is found to exist, resurfacing should be scheduled as soon as it is feasible.

Fifty-nine percent of the rear end accidents at this location occurred on southbound Westnedge Avenue. It appears that the turning radius for the northwest quadrant is too sharp. It is recommended that the turning radius be increased to enable southbound Westnedge Avenue traffic to turn right without bringing their vehicles to a stop. A larger radius in this quadrant should measurably reduce the rear end problem on southbound Westnedge Avenue.

The total number of accidents per year at this location has been decreasing since 1966. Only rear end accidents have increased over the five year study period. The addition of extra signal heads and the adoption of left-turn phases for all four legs at this intersection undoubtedly had a great effect on the reduction of right-angle and head-on left-turn accidents. There were only four right-angle accidents at this intersection and only one head-on left-turn accident for each leg of the intersection during the last two years of the study period. It is recommended that future accident reports be checked to determine if the improvements incorporated at this intersection remain effective.

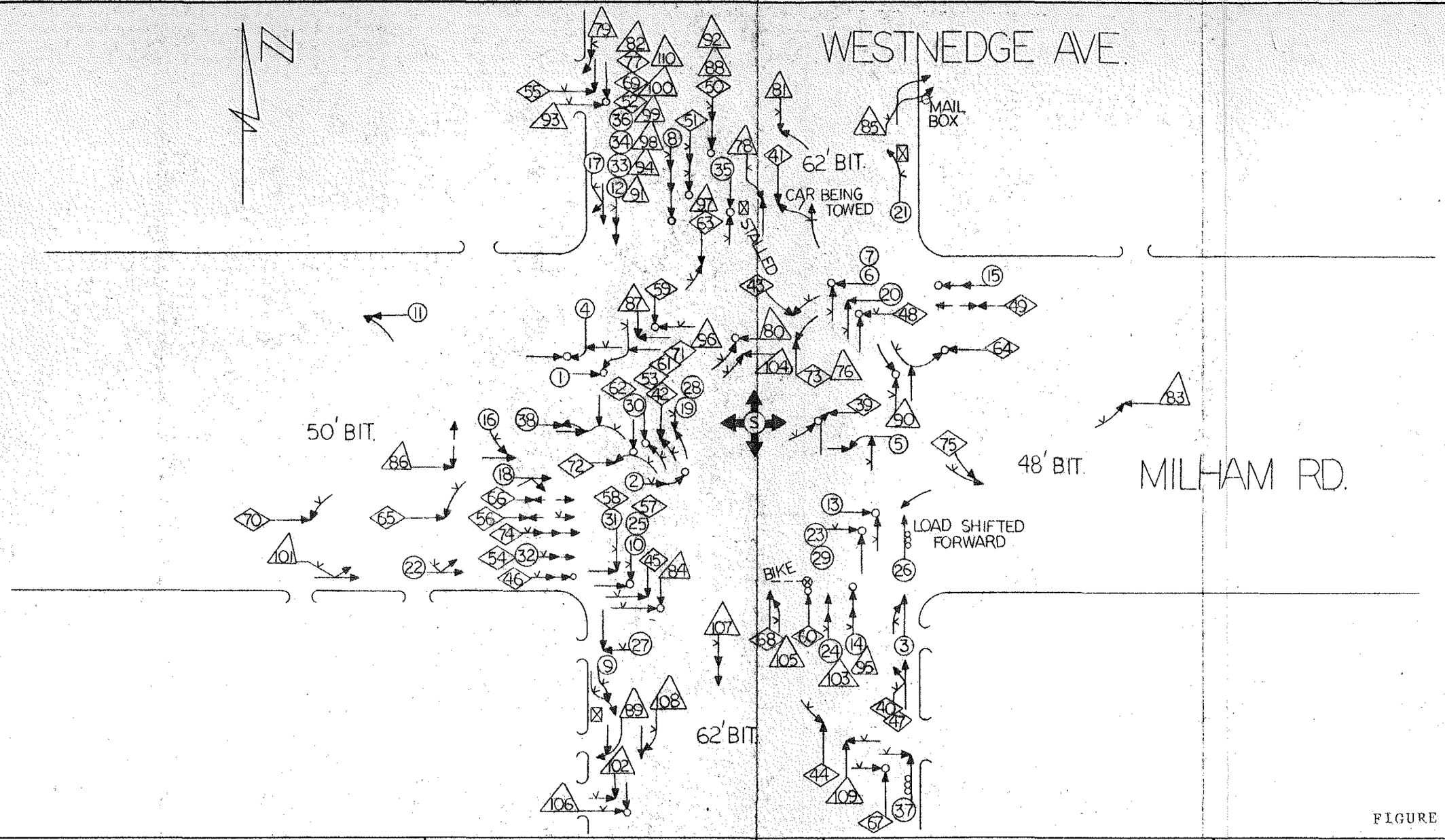


FIGURE 5

REMARKS

○ 1966
◇ 1967
◿ 1968

LEGEND

Stop & Go Signal — Stop Sign S
Flashing Beacon — Yield Sign Y
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian
Tree
Out of Control
Driver Intent
Deer
Violator

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1968
Accidents – Total 1 - 110
P.D. 75
Injury 35 (61)
Fatal 0 ( )
ADT
Rate /100 mvm
Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at MILHAM RD.
CITY OF PORTAGE
KALAMAZOO CO.
C.S. Miles
Drawn DVW Date 4-30-71
Plan No. LOCATION I

Form 1547 (Rev. 5/69) Sheet 1 of 2

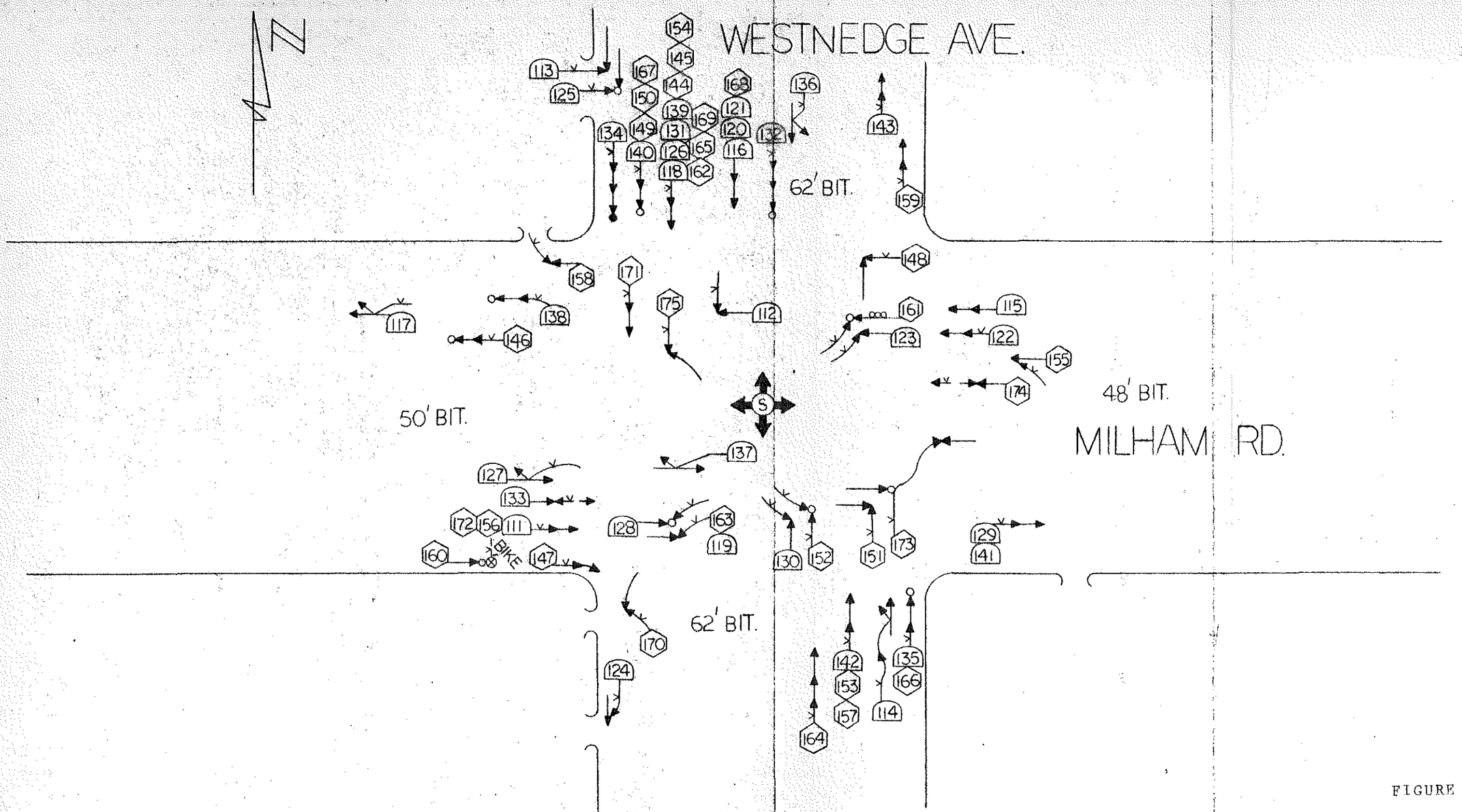


FIGURE 6

REMARKS

1969
1970

LEGEND

Stop & Go Signal — Stop Sign S
Flashing Beacon — Yield Sign Y
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian
Tree
Out of Control
Driver Intent
Deer
Violator

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1969 THRU 1970
Accidents – Total 111-175
P.D. 49
ADT
Injury 15 (26)
Rate /100 mvm
Fatal 1 (1)
Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at MILHAM RD.
CITY OF PORTAGE
KALAMAZOO CO.

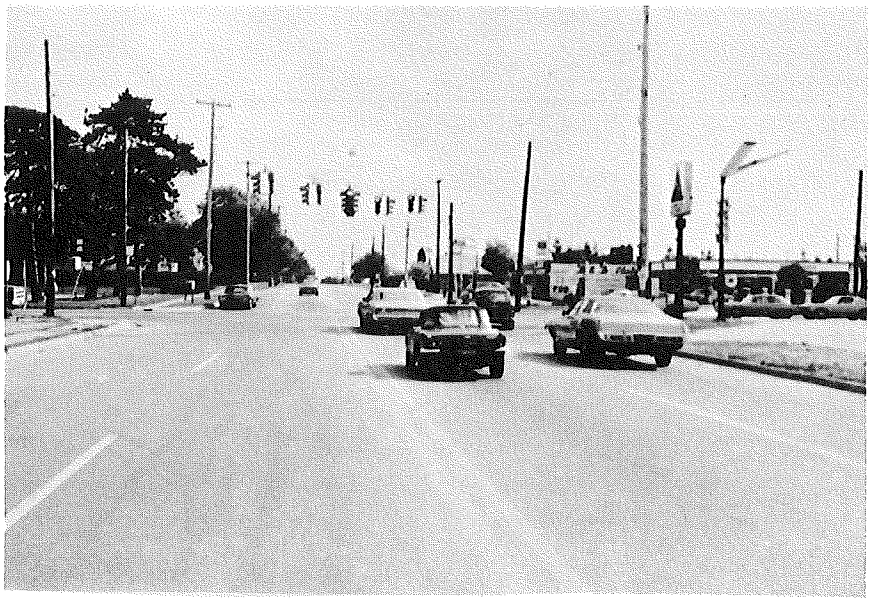
C.S. Miles
Drawn DVW Date 4-30-71
Plan No. LOCATION 1

Form 1547 (Rev. 5/69) Sheet 1 of 1

NORTHBOUND WESTNEDGE AVENUE

SOUTHBOUND WESTNEDGE AVENUE

FIGURE 7



EASTBOUND MILHAM ROAD

WESTBOUND MILHAM ROAD

FIGURE 8

LOCATION 2 WESTNEDGE AVENUE (F.A.S. 1803) AT KILGORE ROAD (F.A.S. 380)

Total	Property Damage	Injury	Fatal
100	76	24	0

LOCATION 3 MILHAM ROAD (F.A.S. 397) AT OAKLAND DRIVE (F.A.S. 396)

Milham Road and Oakland Drive form a right-angle intersection that is under signal control. Milham Road has a four lane, 40 ft wide bituminous pavement, while Oakland Drive has a four lane, 42 ft wide bituminous pavement. Both roadways originally had two lanes and were widened to four through the construction of flares. Milham Road and Oakland Drive both have center and edge line markings, while only the north leg of Oakland Drive has lane line markings.

The traffic controls at this location consist of two signal heads suspended over the center of the intersection. Also, passing is prohibited in the immediate intersection area by double yellow center line markings except for the south leg of Oakland Drive which has a single yellow center line.

There were 53 accidents at this location during the five-year study period. Nine of these accidents occurred on wet pavement and 12 accidents occurred on either snowy or icy pavement. Rear end, right-angle and head-on left-turn collisions accounted for 81 percent of the accidents at this location. Eight of the 18 rear end accidents occurred on the north leg of Oakland Drive. Seven of these accidents occurred on icy pavement with the remaining accident occurring on wet pavement. Eleven of the 14 head-on left-turn accidents occurred on Oakland Drive with three of them happening during the signal's flasher operation. Six of the 11 right-angle accidents also occurred during the signal's flasher operation. Four of the remaining right-angle accidents involved operators who disregarded the traffic signal. The remaining accidents at this location consisted of three ran-off roadways, three improper turns, two sideswipes and two that involved improper backing.

Recommendations

There were 18 rear end accidents and 14 head-on left-turn accidents during the five-year study period. These accidents could be reduced if both Milham Road and Oakland Drive were converted to three lanes with the center lane for left turns only and the outside lane for right turns and through movements. Aligning the left

turn lanes will improve the sight distance for left turning vehicles which should reduce the head-on left-turn accidents. Rear end accidents will be reduced because through traffic will no longer have to stop for vehicles turning left..

Oakland Drive should be divided into a 12 ft left turn lane, a 15 ft approach lane and a 15 ft lane leaving the intersection. Milham Road should be divided into a 12 ft left turn lane, a 14 ft approach lane and a 14 ft lane leaving the intersection. In actual practice the 14 and 15 ft lanes may prove to be too wide. In this case the edge line for each roadway could be brought in no more than two feet from the edge of the existing pavement.

The center lane for both roadways should be marked with left turn arrows accompanied by the word "Only". The outside approach lanes for each leg should also have painted arrows to indicate lane assignments. Also Lane-Use Control signs should be erected at the intersection and in advance of the intersection for all four legs.

Rear end accidents may also be prevented if the signals could be detected a greater distance from the intersection. For this reason it is recommended that oversized (12 in.) lenses be used at this intersection for special emphasis. The oversized lenses will also contribute to reducing the accidents that occurred when the signal was flashing. Altogether there were nine accidents at this location while the flasher was in operation, six of which were right-angle accidents. If the number of accidents continues to increase during the flasher operation, consideration should be given to extending the stop and go operation.

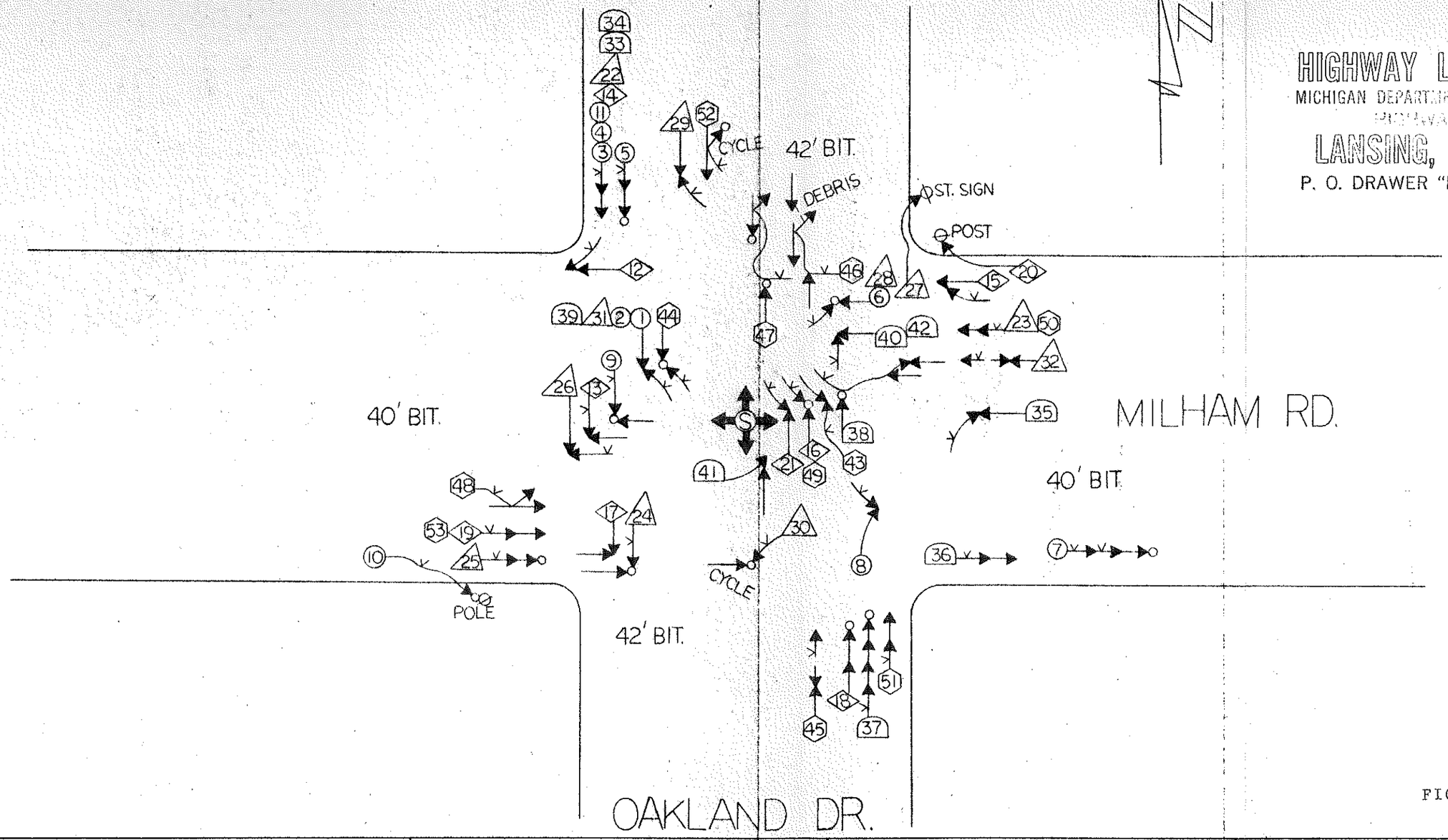


FIGURE 9

REMARKS

- ○ 1966
- ◇ 1967
- ◁ 1968
- ⌓ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal (S, R, Y, F, Y) — Stop Sign S
Flashing Beacon — Yield Sign Y

Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian (X)
Tree
Out of Control
Driver Intent
Deer (V)
Violator

ACCIDENT STUDY
COLLISION DIAGRAM

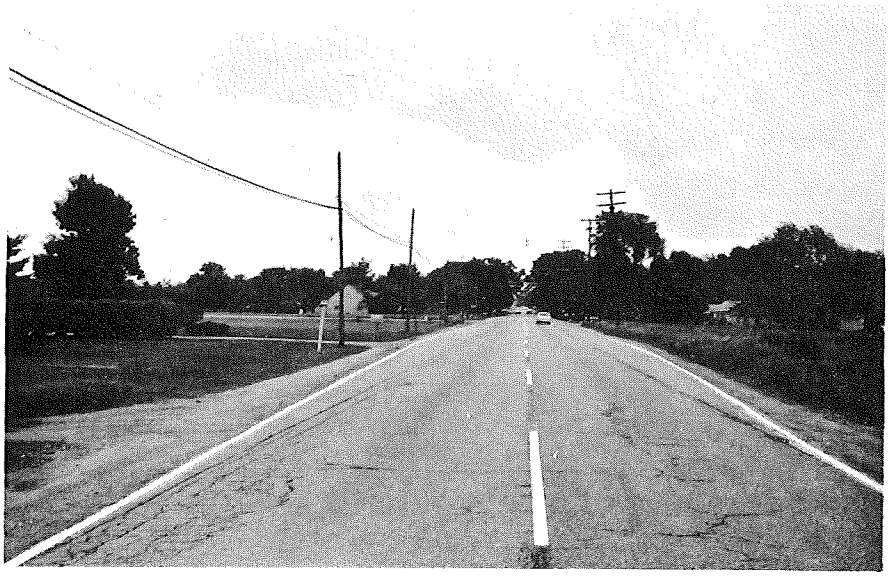
Period: 1966 THRU 1970
Accidents – Total 53
P.D. 36 — ADT
Injury 17 (27) — Rate /100 mvm
Fatal 0 ( ) — Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
MILHAM RD. at OAKLAND DR.
CITY OF PORTAGE
KALAMAZOO CO.

C.S. ____ Miles ____
Drawn DVW Date 4-23-71
Plan No. LOCATION 3

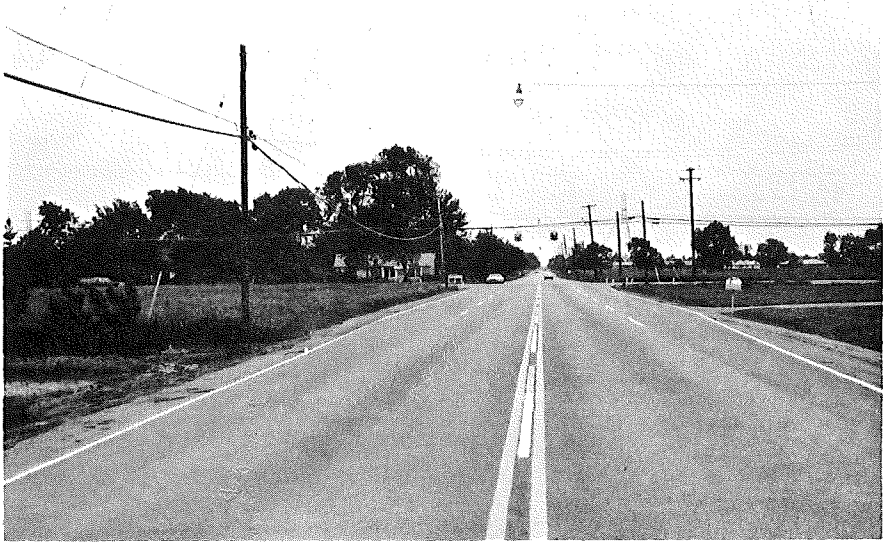
Form 1547 (Rev. 5/69) Sheet ____ of ____



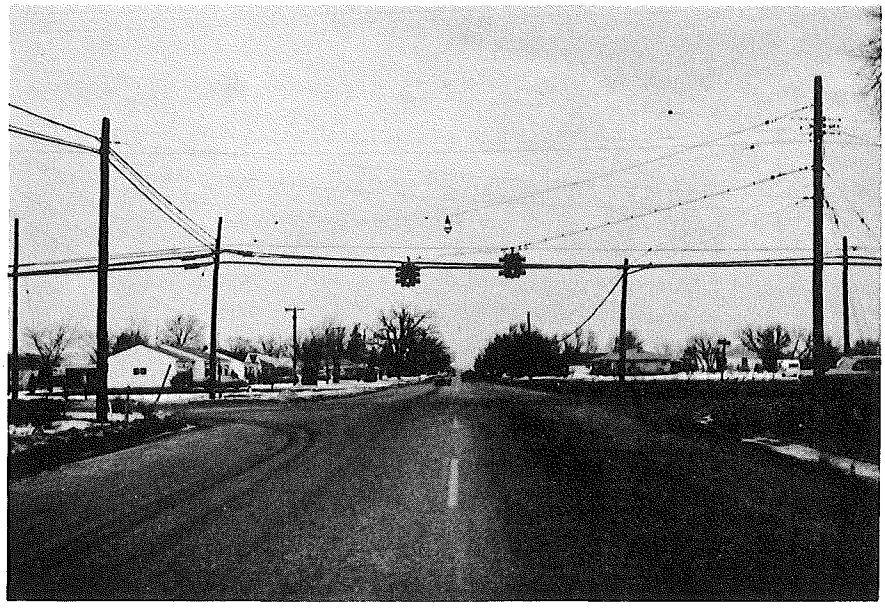
EASTBOUND MILHAM ROAD

WESTBOUND MILHAM ROAD

FIGURE 10



SOUTHBOUND OAKLAND DRIVE



NORTHBOUND OAKLAND DRIVE

FIGURE 11

LOCATION 4 WESTNEDGE AVENUE (SOUTH LEG - F.A.S. 1603 AND NORTH LEG - F.A.S. 1803) AT SHAVER ROAD (F.A.S. 1803)

Westnedge Avenue and Shaver Road form a "Y" intersection that is under signal control. Westnedge Avenue is a north-south route and Shaver Road is a northeast-southwest route. The north leg of Westnedge Avenue has a four lane, 50 ft wide bituminous pavement while the south leg has a three lane, 36 ft wide bituminous pavement with two northbound lanes and one southbound lane. Shaver Road has a four lane, 50 ft wide bituminous pavement. Both roadways have center and lane line markings.

The traffic controls at this intersection consist of nine signal heads suspended over the intersection (see Signal Layout, p. 27). The signing for this location was adequate and can be found on the collision diagram. The remaining traffic controls consist of pedestal and overhead flashing signals for the railroad tracks that cross the south leg of Westnedge Avenue and double yellow center line markings to prohibit passing on all three legs.

There was a total of 50 accidents at this location during the five-year study period. Sixteen of these accidents occurred during inclement weather with 12 of them occurring on wet pavement. Rear end collisions accounted for 60 percent of the accidents at this location. Only six of the 30 rear end accidents happened on wet pavement. Twenty-three of the twenty-five rear end accidents that occurred on northbound Westnedge Avenue happened before 1970. Twelve of these operators reported that they were checking traffic on northeastbound Shaver Road and consequently ran into the rear of a vehicle stopped at the intersection. Before 1970 northbound Westnedge Avenue was required to stop for Shaver Road traffic. In January 1970, the signals were installed creating a stop and go condition at this intersection. The installation of the signals has for the past year reduced the rear end problem that existed on northbound Westnedge Avenue. It is recommended that future accident reports be checked to determine the effectiveness of the signal installation.

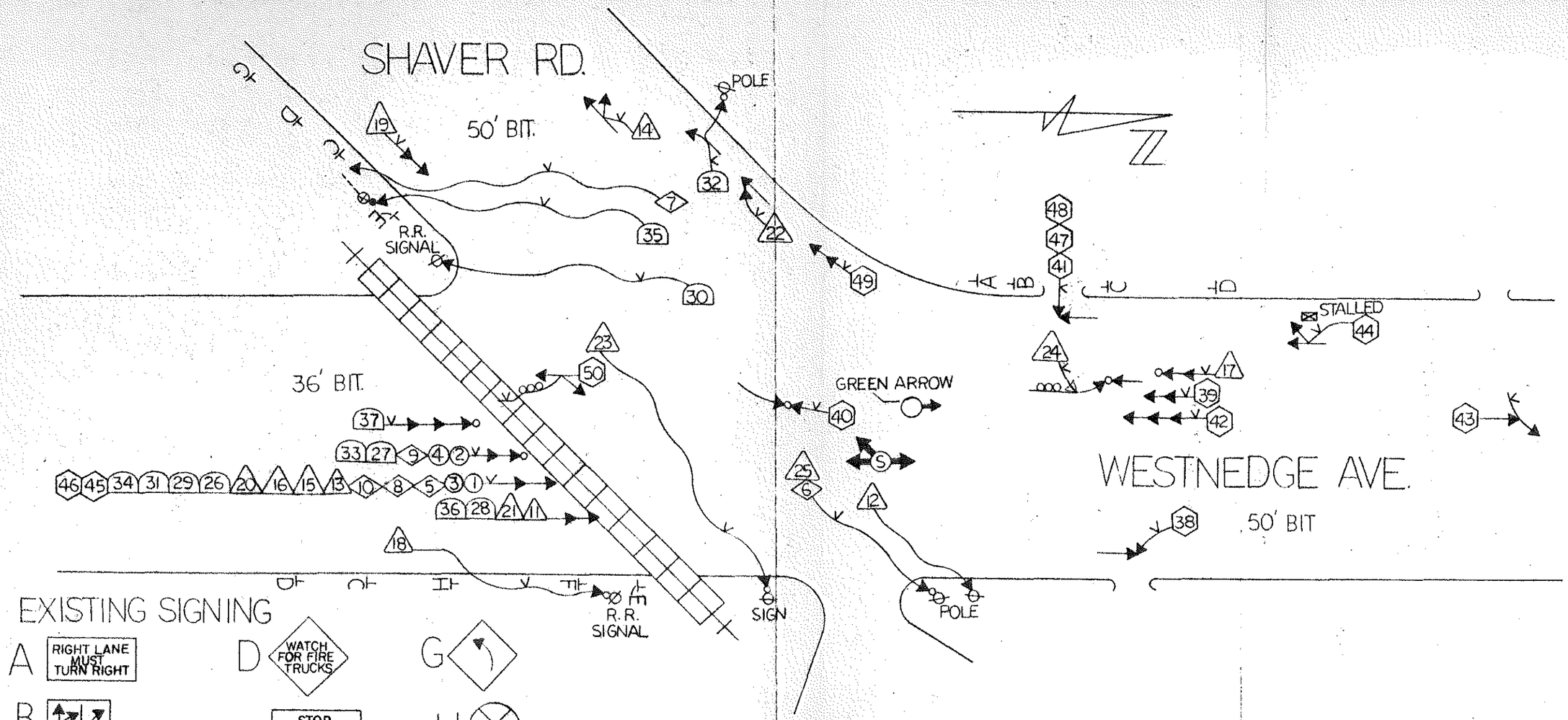


FIGURE 12

REMARKS

○ 1966
◇ 1967
△ 1968
⌓ 1969
⬡ 1970

LEGEND

Stop & Go Signal — Stop Sign S
Flashing Beacon — Yield Sign Y
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian
Tree
Out of Control
Driver Intent
Deer
Violator

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970
Accidents – Total 50
P.D. 36
Injury 13 (18)
Fatal 1 (1)
ADT
Rate /100 mvm
Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at SHAVER RD.
CITY OF PORTAGE
KALAMAZOO CO.
C.S. Miles
Drawn DVW Date 4-23-71
Plan No. LOCATION 4

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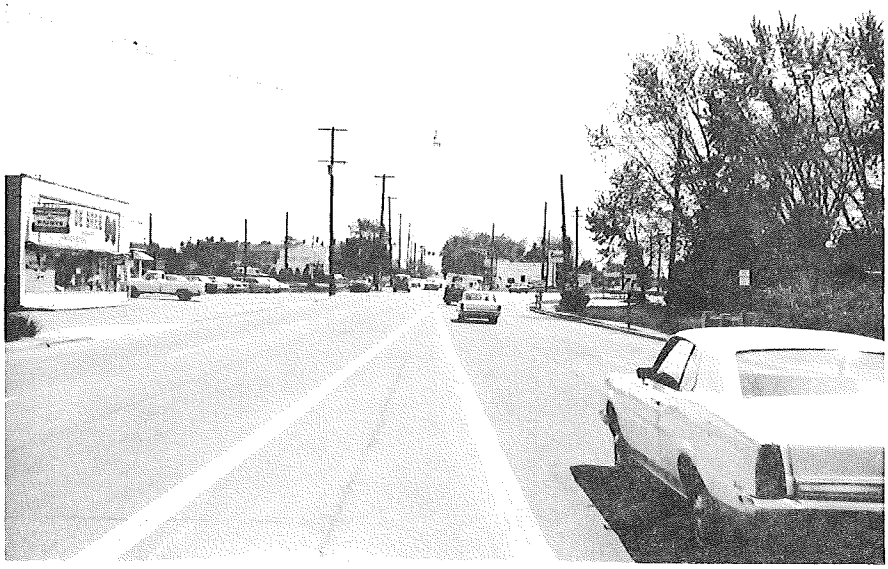


SOUTHBOUND WESTNEDGE AVENUE

SOUTHBOUND WESTNEDGE AVENUE

FIGURE 13

NORTHBOUND WESTNEDGE AVENUE

NORTHEASTBOUND SHAVER ROAD

FIGURE 14

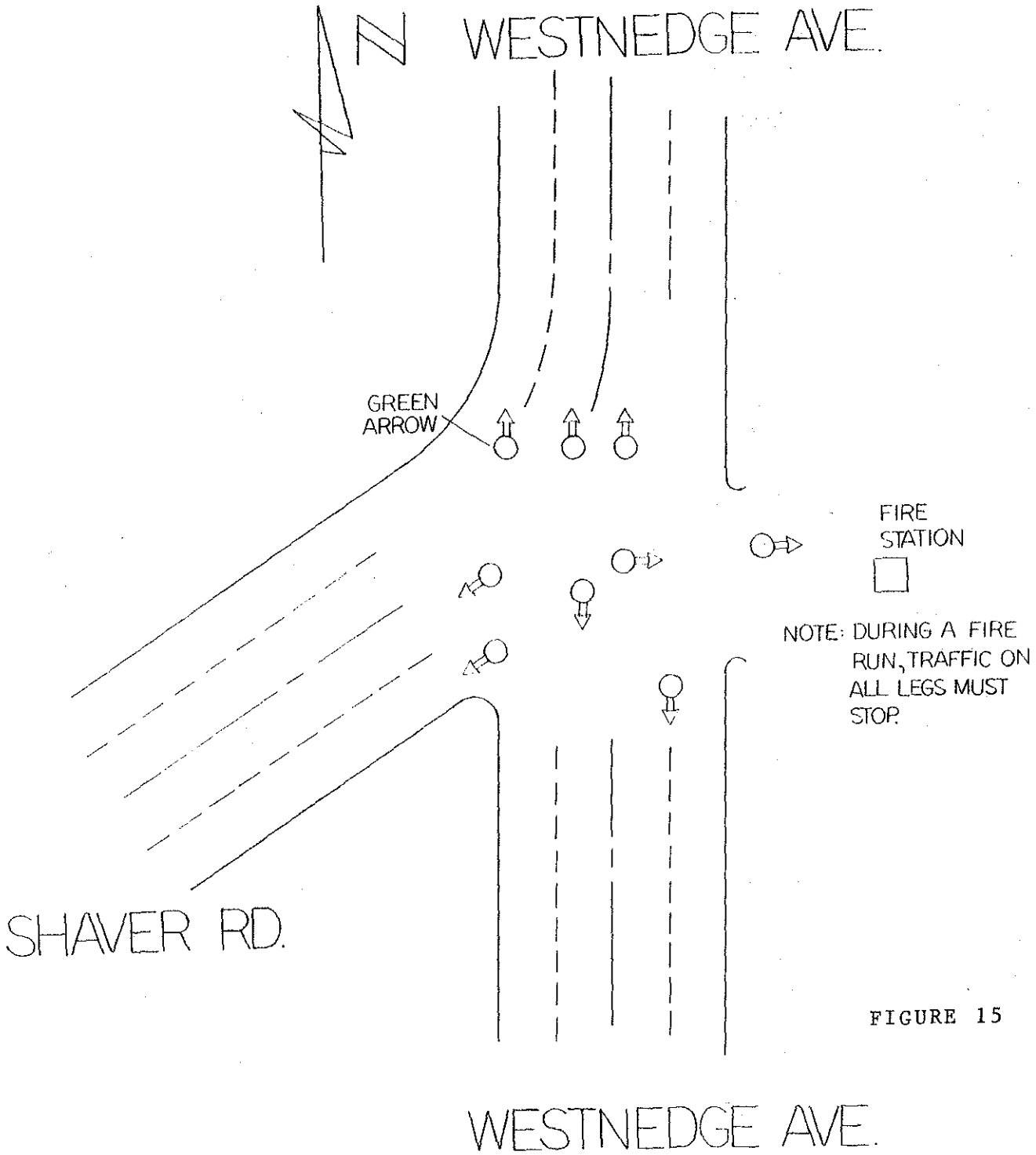

N
WESTNEDGE AVE.
GREEN ARROW
FIRE STATION
NOTE: DURING A FIRE RUN, TRAFFIC ON ALL LEGS MUST STOP.
SHAVER RD.
WESTNEDGE AVE.

FIGURE 15

LOCATION 5 WESTNEDGE AVENUE (F.A.S. 1803) AT ROMENCE ROAD

Total	Property Damage	Injury	Fatal
46	28	18	0

LOCATION 6 WESTNEDGE AVENUE (F.A.S. 1803) AT IDAHO STREET

Westnedge Avenue and Idaho Street form a "T" intersection in an urban area. During all but three months of the five-year study period Westnedge Avenue had the right-of-way with Idaho Street having to stop. In November of 1970 two overhead stop and go signals were installed along with pedestrian walk-wait indicators.

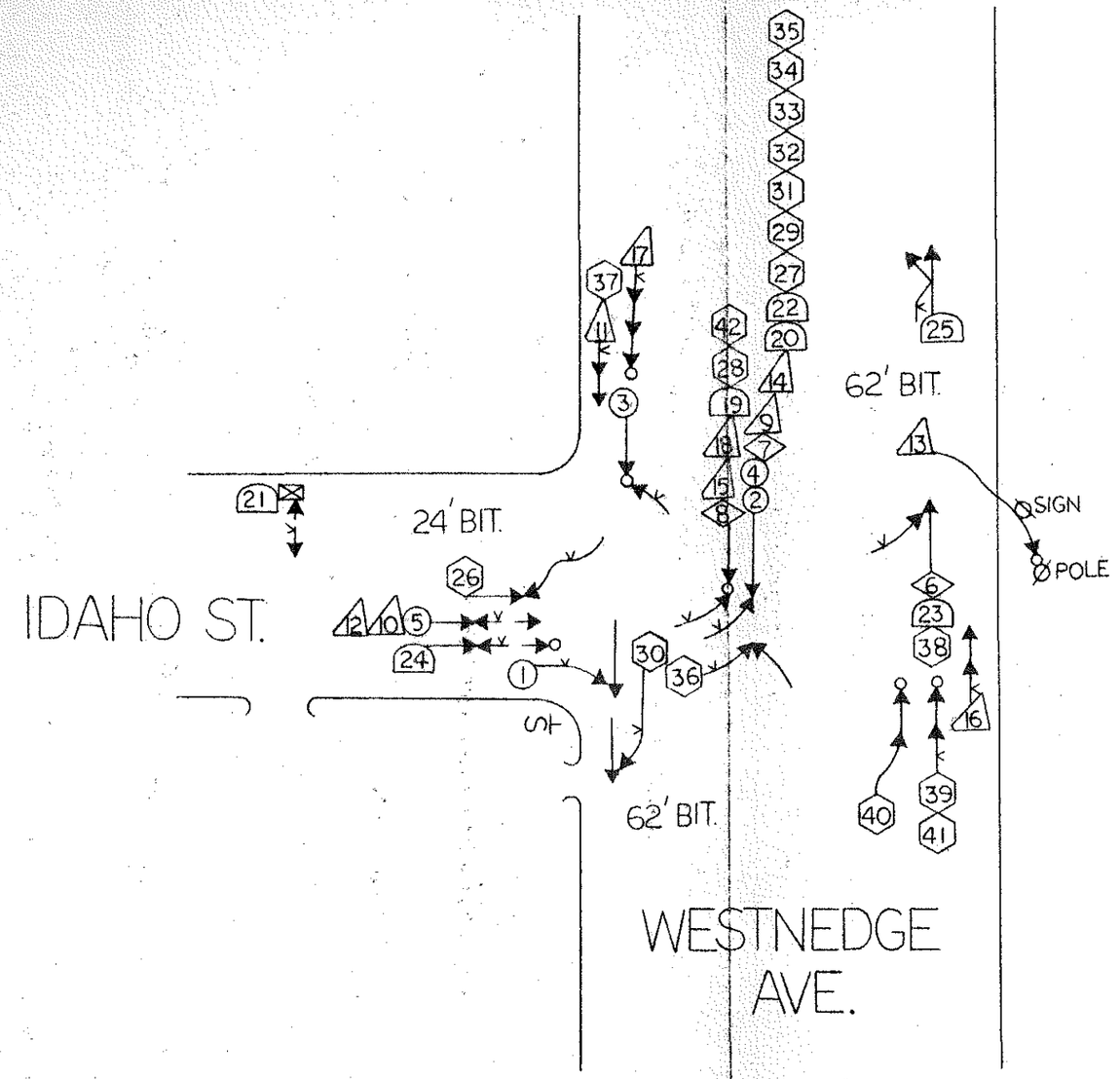
Westnedge Avenue has a five lane, 62 ft wide bituminous pavement with the center lane for left turns only. Idaho Street which has a two lane, 24 ft wide bituminous pavement, provides access to Portage Northern High School, which accounts for its high volume during the morning and late afternoon hours.

There were 42 accidents at this location during the five-year study period. Almost 43 percent of these accidents occurred on wet, snowy or icy pavement. Right-angle collisions accounted for about 60 percent of the accidents. Nineteen of the 25 right-angle accidents involved southbound Westnedge Avenue traffic. Eleven of these accidents occurred in the afternoon with ten of them happening between 3:00 and 4:00 p.m. Furthermore, there were three right-angle accidents which occurred between 7:50 and 8:50 a.m. The remaining accidents at this location consisted of seven rear ends, four involving improper backing and one each of the following accidents: head-on, head-on left turn, sideswipe, improper turn, ran-off roadway and parking.

Recommendations

A traffic signal was installed at this location in November 1970. There were eleven right-angle accidents at this location in 1970, nine of which occurred before the signal installation. The two right-angle accidents that occurred after the signal installation involved operators who reportedly were unaware of the new signal. There was a total of 25 right-angle accidents at this location during the five-year study period. Fifteen of these accidents occurred at a time that coincided with the beginning or ending of classes at Portage Northern High School. In view of the accident data at this location, we concur with the recent installation of the stop and go signal. We also agree with the short green phase allotted for Idaho Street traffic because of the heavy traffic experienced on Westnedge Avenue.

During the investigation of the accident experience at this location, it was discovered that a high percentage of accidents occurred on wet pavement. Thirty-eight percent of the total accidents and 40 percent of the total accidents minus those that happened on snow and ice occurred on wet pavement. Because of these figures, it is recommended that skidometer tests be conducted.



NOTE: A SIGNAL WAS INSTALLED IN NOVEMBER, 1970

FIGURE 16

REMARKS

- ○ 1966
- ◇ 1967
- ◁ 1968
- ▱ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal (S, R, F, Y) — Stop Sign S — Yield Sign Y
Flashing Beacon

Fatal
Injury
Skidding
Jackknife
Overturned
Backing

Pedestrian (X)
Tree
Out of Control
Driver Intent
Deer
Violator (V)

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970
Accidents – Total 42
P.D. 29 — ADT
Injury 13 (21) — Rate /100 mvm
Fatal 0 ( ) — Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at IDAHO ST.
CITY OF PORTAGE
KALAMAZOO CO.

C.S. ____ Miles ____
Drawn DVW Date 4-20-71
Plan No. LOCATION 6

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EASTBOUND IDAHO STREET

NORTHBOUND WESTNEDGE AVENUE

FIGURE 17

LOCATION 7 MILHAM ROAD (F.A.S. 397) AT LOVERS LANE (F.A.S. 1589)

Milham Road and Lovers Lane form a right-angle intersection in the City of Portage. Milham Road has a two lane, 22 ft wide bituminous pavement. Lovers Lane which is offset in relation to Milham Road, has a 37 ft wide bituminous pavement on the north leg and a two lane, 20 ft wide bituminous pavement on the south leg. Both roadways have gravel shoulders, centerline markings and edge line markings.

The traffic controls at this intersection consist of 36 in. "Stop" signs for north and southbound Lovers Lane traffic. Also, there is a 36 in. "Stop Ahead" sign for southbound Lovers Lane traffic.

There were 38 accidents at this location during the five-year study period. Right-angle and rear end collisions accounted for approximately 71 percent of the accidents at this location. Operator carelessness was reportedly the cause of the 19 right-angle accidents. Only four of the right-angle accidents occurred on wet, snowy or icy pavement. There were eight rear end accidents with six occurring on wet, snowy or icy pavement. The remaining accidents at this location consisted of three improper turns, three head-on left turns, two sideswipes, two occurring from private driveways and one ran-off roadway.

Recommendations

During the analysis at this location a Traffic Signal Warrant Graph was prepared. The results which can be found on p. 35 indicate that this intersection meets the minimum vehicular volume requirements of Warrant #1 for pretimed signals. Thus, it is recommended that two overhead signals be erected. The Lovers Lane offset should be eliminated to prevent the development of a conflict between opposing right and left turns off Lovers Lane. Furthermore, two approach lanes should be provided for each leg of the intersection to increase capacity by reducing through traffic delay caused by left turning vehicles.

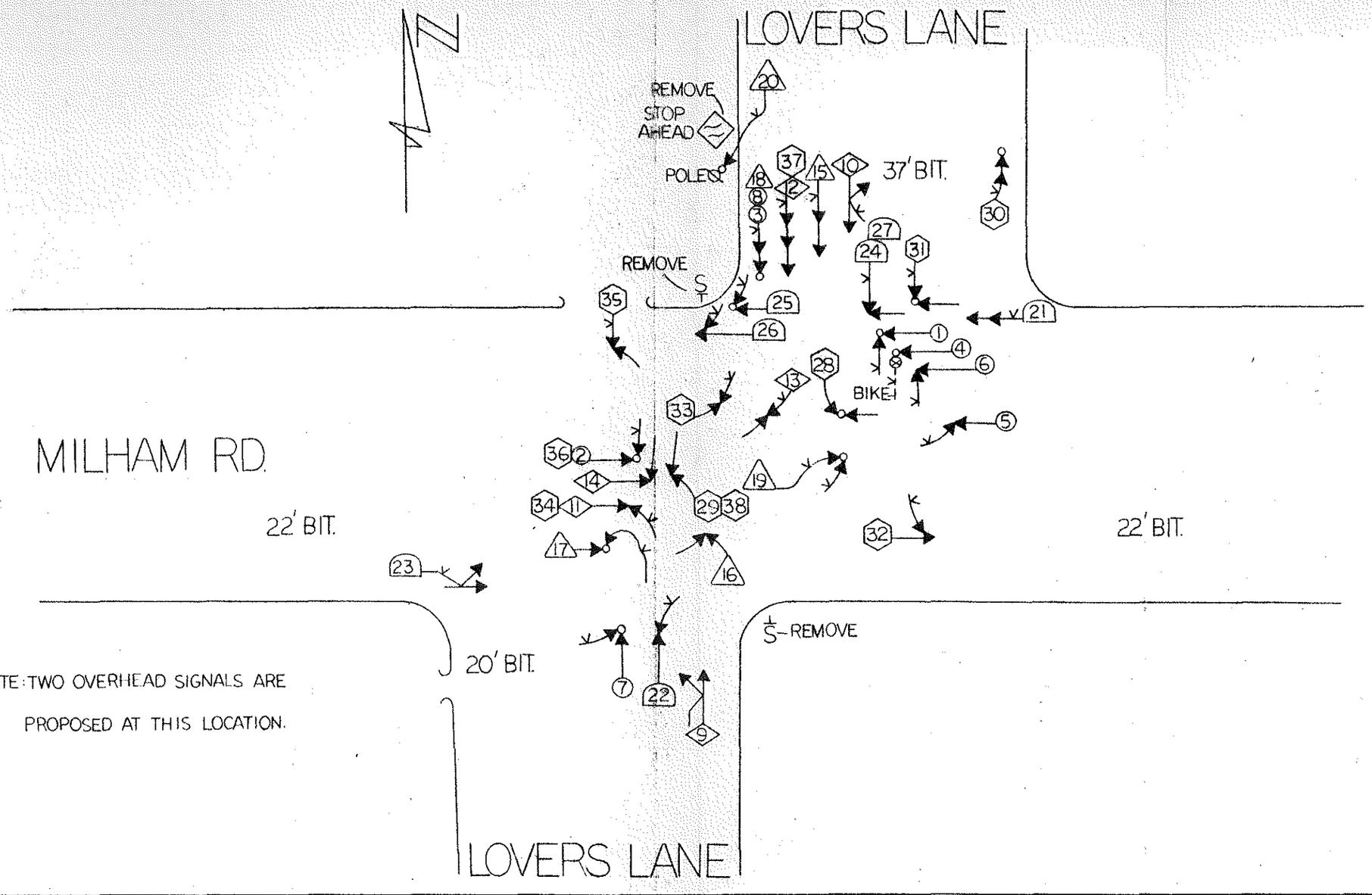


FIGURE 18

REMARKS

- ○ 1966
- ◇ 1967
- △ 1968
- ⌓ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal (S, R, Y, F, Y) — Stop Sign S
Flashing Beacon — Yield Sign Y

Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian (X)
Tree
Out of Control
Driver Intent
Deer
Violator (V)

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970
Accidents – Total 38
P.D. 23
Injury 15 (26)
Fatal 0 ( )
ADT
Rate /100 mvm
Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
MILHAM RD. at LOVERS LANE
CITY OF PORTAGE
KALAMAZOO CO.
C.S. Miles
Drawn DVW Date
Plan No. LOCATION 7

NORTHBOUND

LOVERS LANE

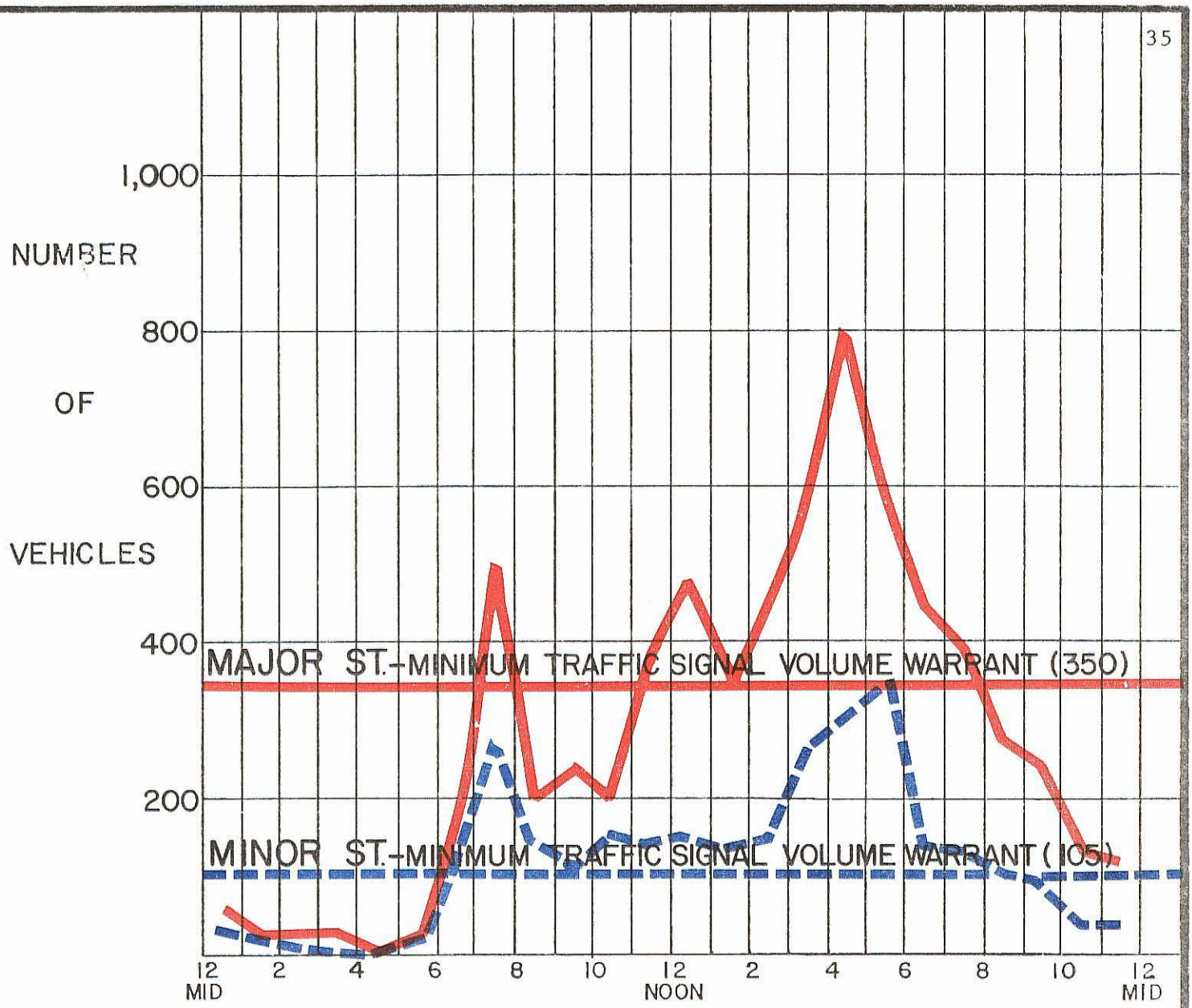
EASTBOUND

MILHAM ROAD

SOUTHBOUND

LOVERS LANE

FIGURE 19



SURVEY TAKEN 3-27-73

TIME OF DAY

LEGEND

MILHAM RD.

LOVERS LANE

ANALYSIS

APPLICABLE WARRANT: RURAL VEHICULAR

HOURLY VOLUMES:

MAJOR STREET MEETS WARRANT 10 HOURS OF REQUIRED 8 HOURS

MINOR STREET MEETS WARRANT 13 HOURS OF REQUIRED 8 HOURS

ACCIDENT EXPERIENCE

___ ACCIDENTS REPORTED IN _____, ACCIDENT RATE ___/M.V.

FIGURE 20

MICHIGAN STATE HIGHWAY DEPARTMENT — TRAFFIC DIVISION	AUTH. NO.	DRAWN DVW	VEHICLE WARRANT GRAPH
	CONT. SEC.	DATE 11-27-73	MILHAM RD. at LOVERS LANE
	REF.	SCALE	CITY OF PORTAGE
	SHEET OF	PLAN	KALAMAZOO CO.

FORM 1595 (REV. 6-65)

LOCATION 8 WESTNEDGE AVENUE (F.A.S. 1803) AT CONNECTICUT STREET OR NEW HAMPSHIRE STREET

Total	Property Damage	Injury	Fatal
35	25	9	1

LOCATION 9 WESTNEDGE AVENUE (F.A.S. 1803) AT AMOS STREET

Westnedge Avenue and Amos Street form a "T" intersection in the City of Portage. Westnedge Avenue has a five lane bituminous pavement with the center lane for left turns only. The center lane is replaced by a median south of Amos Street. Westnedge Avenue is an 81 ft wide roadway north of Amos Street and a 79 ft wide roadway south of Amos Street. The width of Westnedge Avenue includes north and southbound merge lanes for the exit ramps of the I-94 Expressway. Amos Street, which is a dead end, has a two lane, 20 ft wide bituminous pavement that is uneven and covered with loose gravel.

Westnedge Avenue has the right-of-way with Amos Street traffic controlled by a 24 in. "Stop" sign. The other traffic controls at this intersection consist of a 36 in. "Keep Right" sign located 22 ft from the toe of the median on Westnedge Avenue and an illuminated "Keep Right" sign suspended over the median.

There were 33 accidents at this location during the five-year study period. Almost 58 percent of these accidents occurred on wet, snowy or icy pavement. Ran-off roadway, right-angle and rear end accidents accounted for almost 70 percent of the total. There were ten ran-off roadway accidents, seven of which involved striking the median. Four of the 10 accidents reportedly involved excessive speed. Adverse weather and alcohol played only a small role in the ran-off roadway accidents. There were seven right-angle accidents, all involving a left turn from Amos Street to southbound Westnedge Avenue. Five of these seven accidents occurred on wet, snowy or icy pavement. There were six rear end accidents, five of which occurred on wet pavement. The remaining accidents at this location consisted of three improper turns, three sideswipes, two involving vehicles in driveways, one head-on and one involving a fixed object.

Recommendations

Thirty-six percent of the accidents occurred on wet pavement and 46 percent of the accidents occurred on either wet, snowy or icy pavement. These high percentages indicate that the pavement may become slippery during inclement weather. For this reason it is recommended that skidometer tests be conducted.

The seven right-angle accidents all involved motorists turning left from Amos Street to southbound Westnedge Avenue. Four of these accidents reportedly involved carelessness on the part of the operators. Amos Street is a dead-end and thus generates very little traffic. Therefore, it is recommended that left turns from Amos Street be prohibited. Two R3-2a, "No Left Turn", signs should be used, one on each corner of the intersection. Prohibiting left turns will eliminate the conflict that existed between left turning traffic and both the four thru lanes on northbound Westnedge Avenue and the northbound exit ramp for the I-94 Expressway. There is a signalized location one block north that could be used to gain access to southbound Westnedge Avenue.

EXISTING SIGNS

A — KEEP RIGHT

B — KEEP RIGHT (OVERHEAD)

PROPOSED SIGN

C — NO LEFT TURN

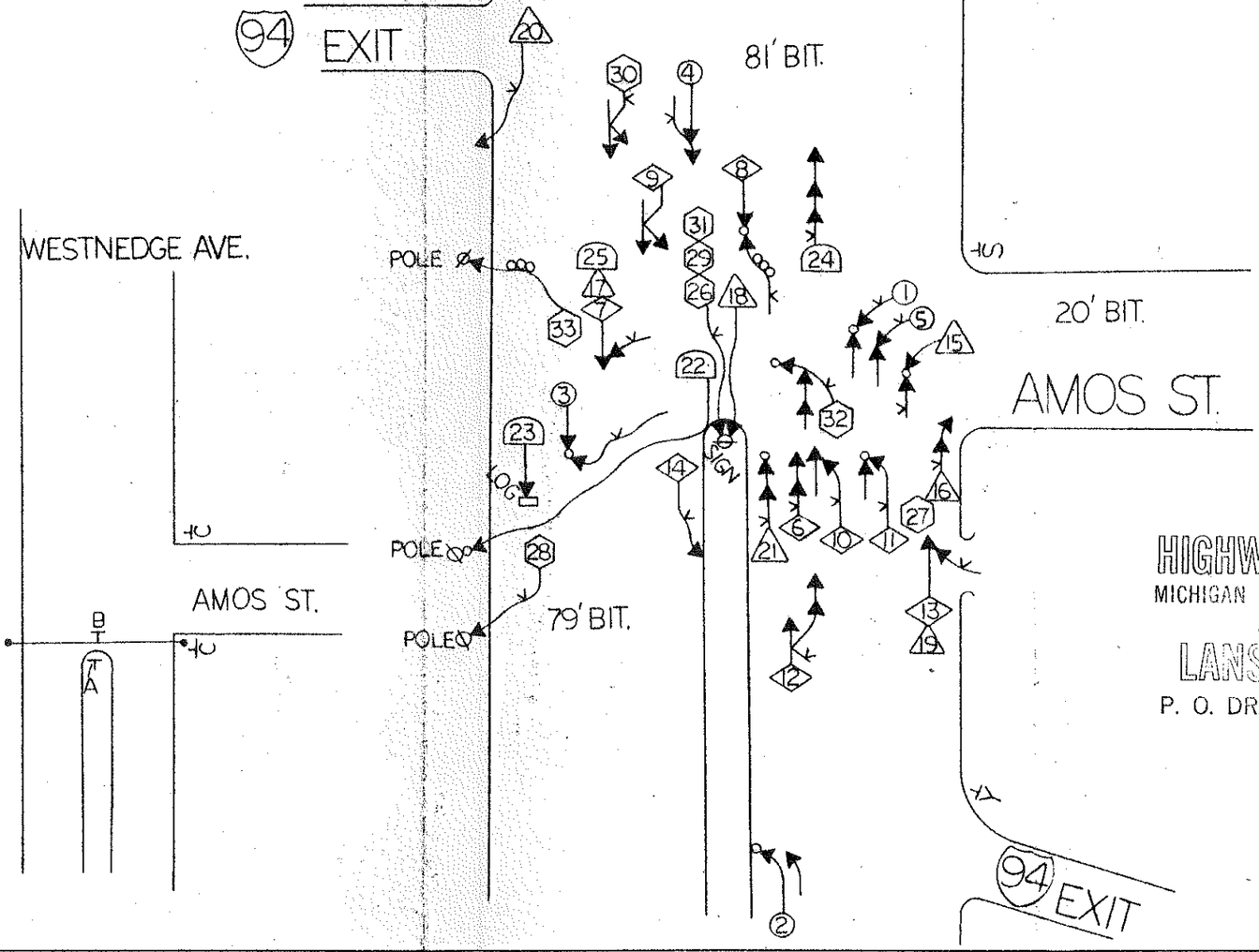


FIGURE 21

REMARKS

- ○ 1966
- ◇ 1967
- △ 1968
- ⌓ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal (S, R, Y, F, Y) — Stop Sign S — Yield Sign Y

Flashing Beacon

Fatal — Injury — Skidding — Jackknife — Overturned — Backing

Pedestrian (X) — Tree — Out of Control — Driver Intent — Deer — Violator (V)

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970

Accidents – Total 33

P.D. 24 — ADT

Injury 9 (12) — Rate /100 mvm

Fatal 0 ( ) — Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at AMOS ST.
CITY OF PORTAGE
KALAMAZOO CO.

C.S. — Miles

Drawn DVW — Date 4-16-71

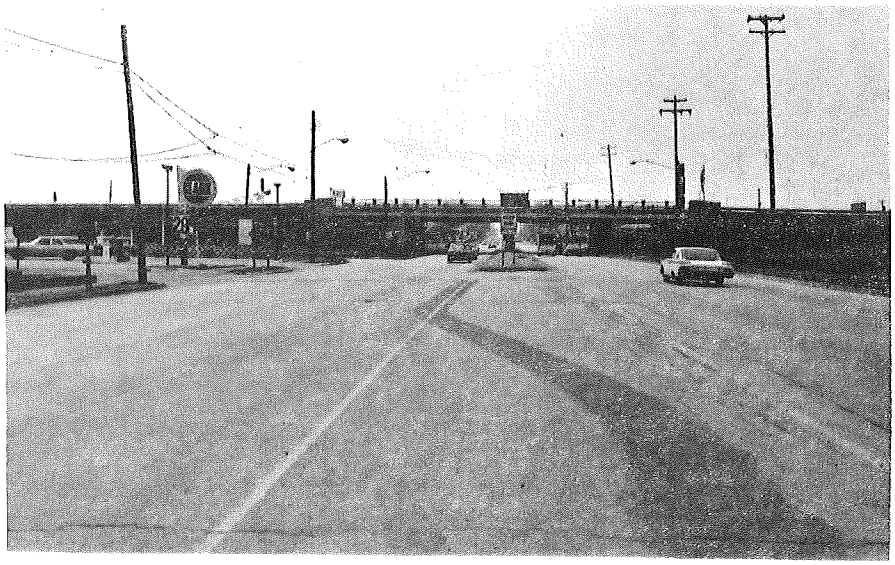
Plan No. LOCATION 9

WESTBOUND

AMOS STREET

SOUTHBOUND

WESTNEDGE AVENUE



NORTHBOUND

WESTNEDGE AVENUE

FIGURE 22

LOCATION 10 WESTNEDGE AVENUE (F.A.S. 1803) AT ANDY STREET

Total	Property Damage	Injury	Fatal
26	17	9	0

LOCATION 11 WESTNEDGE AVENUE (F.A.S. 1803) AT GARDEN LANE

Westnedge Avenue and Garden Lane form an unsignalized "T" intersection. Westnedge Avenue has the right-of-way while Garden Lane traffic is controlled by a 24 in. "Stop" sign.

Westnedge Avenue has a four lane, 50 ft wide bituminous pavement with double yellow center line and white lane line markings. Garden Lane is a two lane, 24 ft wide bituminous roadway with no pavement markings.

Rear end collisions accounted for 45 percent of the 20 accidents at this location during the five-year study period. Seven of the nine rear end accidents involved a motorist turning left from southbound Westnedge Avenue to eastbound Garden Lane. The remaining accidents at this location consisted of three sideswipes, three ran-off roadways, two head-on collisions, one right-angle, one head-on left-turn and one involving a driveway.

Recommendations

The sight distance from Garden Lane to the south leg of Westnedge Avenue is adequate. However, the sight distance from Garden Lane to the north leg of Westnedge Avenue is inadequate due to a pine tree located on the northeast corner. To see properly, a motorist has to drive his vehicle onto Westnedge Avenue. Even though there was only one accident during the study period that could be attributed to the sight obstruction, there is still a potential hazard. For this reason, it is recommended that the pine tree be removed to improve the sight distance.

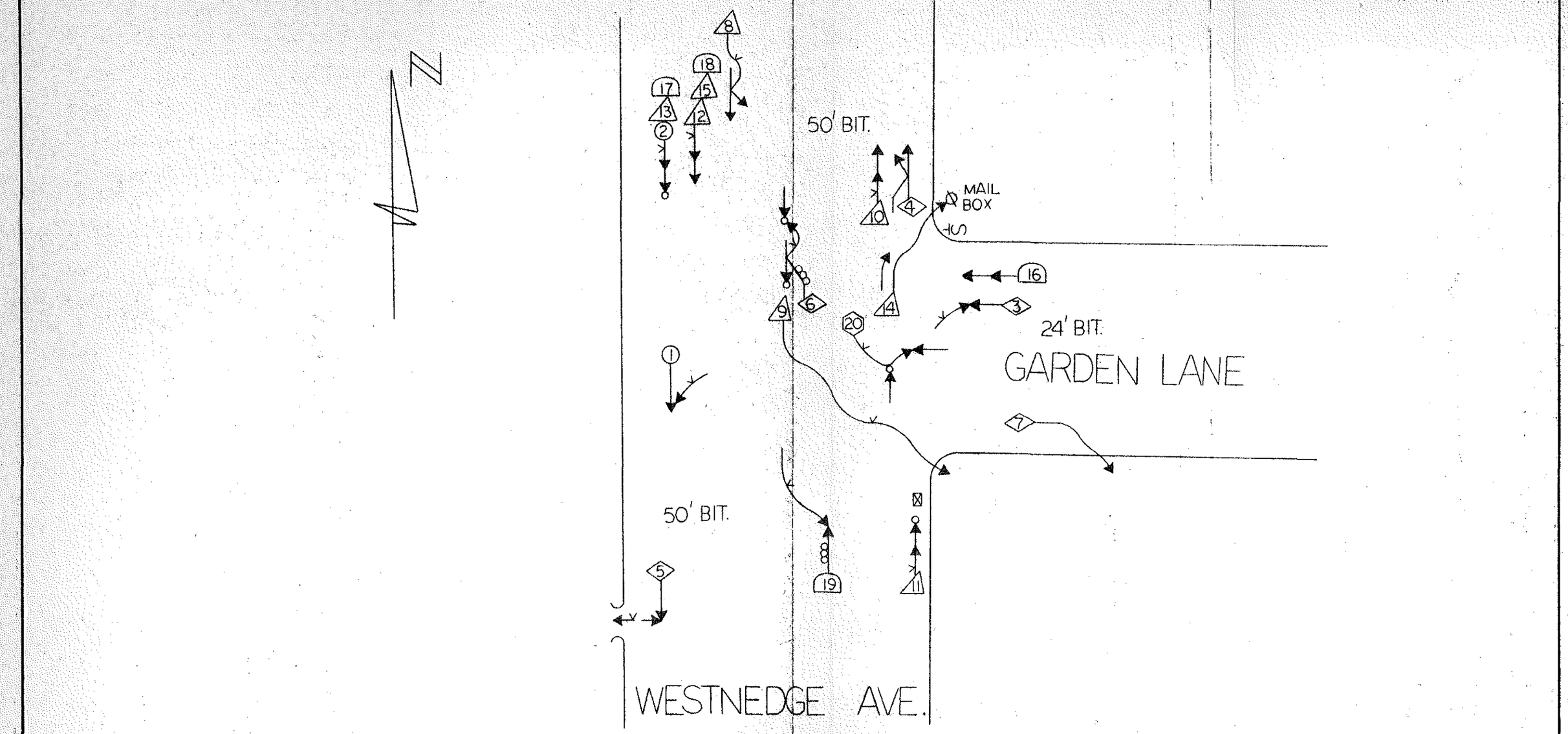


FIGURE 23

REMARKS

- ○ 1966
- ◇ 1967
- ◁ 1968
- ⌓ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal — Stop Sign S
Flashing Beacon — Yield Sign Y
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian
Tree
Out of Control
Driver Intent
Deer
Violator

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970
Accidents – Total 20
P.D. 14
Injury 6 (12)
Fatal 0 ( )
ADT
Rate /100 mvm
Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
WESTNEDGE AVE. at GARDEN LANE
CITY OF PORTAGE
KALAMAZOO CO.
C.S. Miles
Drawn DVW Date 4-12-71
Plan No. LOCATION 11

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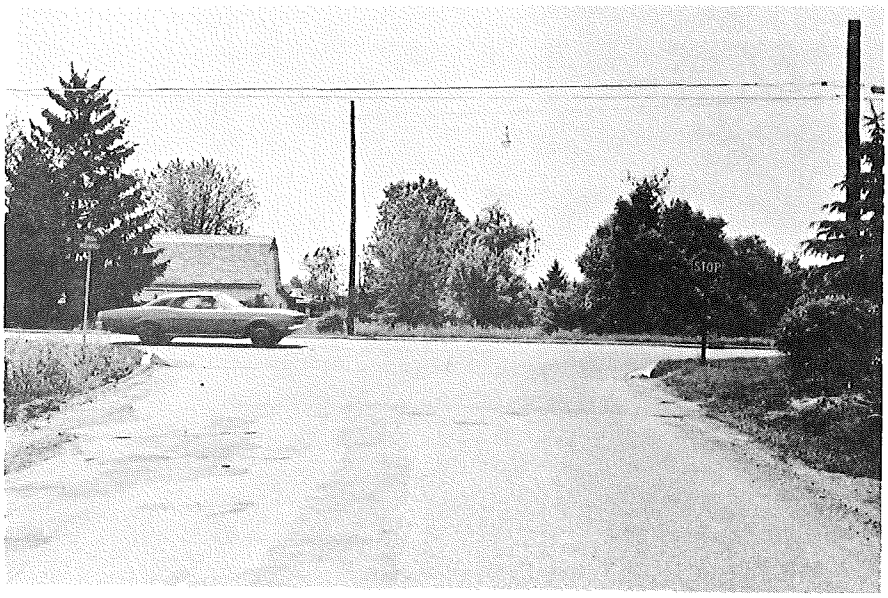
SOUTHBOUND

WESTNEDGE AVENUE

WESTBOUND

GARDEN LANE



NORTHBOUND

WESTNEDGE AVENUE

FIGURE 24

LOCATION 12 MILHAM ROAD (F.A.S. 397) AT VERMONT STREET

Milham Road and Vermont Street form a "T" intersection in an urban area. Milham Road has the right-of-way with Vermont Street traffic controlled by a 24 in. "Stop" sign. The Southland Shopping Center, which is located south of Vermont Street, has two driveways exiting on Milham Road. Passing is prohibited along Milham Road by double yellow center line markings.

Milham Road has a four lane, 50 ft wide bituminous pavement from Vermont Street east to the intersection of Milham Road and Westnedge Avenue. From Vermont Street west to the end of the second driveway for the Southland Shopping Center Milham Road has a three lane, 36 ft wide bituminous pavement. Further west Milham Road becomes a two lane bituminous pavement. Vermont Street is a two lane, 28 ft wide gravel roadway. The sight distances from Vermont Street are adequate.

There were 17 accidents at this location during the five-year study period, 13 of which occurred during the business hours of the Southland Shopping Center. Rear end and right-angle collisions accounted for almost 65 percent of the total accidents. Four of the six rear end accidents involved vehicles turning left from westbound Milham Road to the shopping center driveway located west of Vermont Street. One of the two remaining rear end accidents and all five of the right-angle accidents occurred at the first shopping center driveway which is located east of Vermont Street. All five right-angle accidents were reportedly caused by carelessness on the part of the vehicle operators. The remaining accidents at this location consisted of two head-on left-turns, one sideswipe, one improper backing, one improper turn and one ran-off roadway.

Recommendations

The accident problem at this location involves the driveways on Milham Road that provide access to the Southland Shopping Center. Fourteen of the 17 accidents at this location involved one of these driveways. These accident totals can be reduced if a system of directional driveways is incorporated. Therefore, it is recommended that the urban directional driveway design found in the Standard Guides of the Michigan Department of State Highways and Transportation be applied to the driveways for the Southland Shopping Center (See Figure 27). This design eliminates the conflicts that caused the right-angle and rear end accidents at the two driveways.

Furthermore, it is recommended that the two thru lanes for westbound Milham Road traffic be continued from Vermont Street approximately 250 ft further west (See Figure 27). This construction will create four lanes of traffic from Westnedge Avenue to a point

beyond the most westerly shopping center driveway. The extra laneage will ease the conflict between thru traffic and shopping center traffic turning left onto westbound Milham Road.

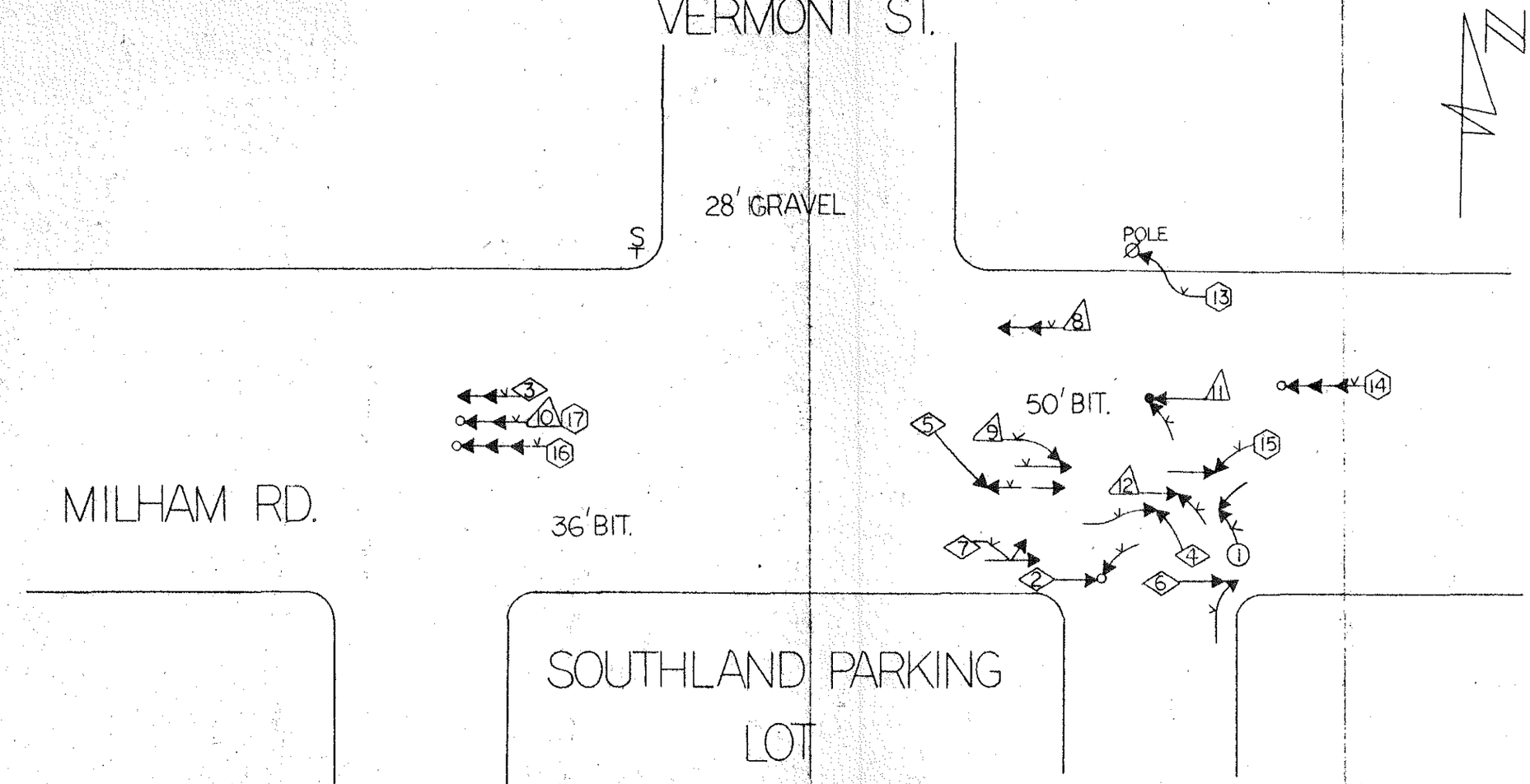


FIGURE 25

REMARKS

- ○ 1966
- ◇ 1967
- △ 1968
- ⌓ 1969
- ⬡ 1970

LEGEND

Stop & Go Signal (S, R, F, Y) — Stop Sign S — Yield Sign Y

Flashing Beacon

Fatal

Injury

Skidding

Jackknife

Overturned

Backing

Pedestrian (X)

Tree

Out of Control

Driver Intent

Deer

Violator (V)

ACCIDENT STUDY
COLLISION DIAGRAM

Period: 1966 THRU 1970

Accidents – Total 17

P.D. 11 — ADT

Injury 5 (12) — Rate /100 mvm

Fatal 1 (1) — Rate / mv

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location
MILHAM RD. at VERMONT ST. (DRIVES TO SOUTHLAND PARKING LOT)

CITY OF PORTAGE

KALAMAZOO CO.

C.S. _____ Miles _____

Drawn DVW Date 4-12-71

Plan No. LOCATION 12

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EASTBOUND

MILHAM AVENUE

SOUTHBOUND

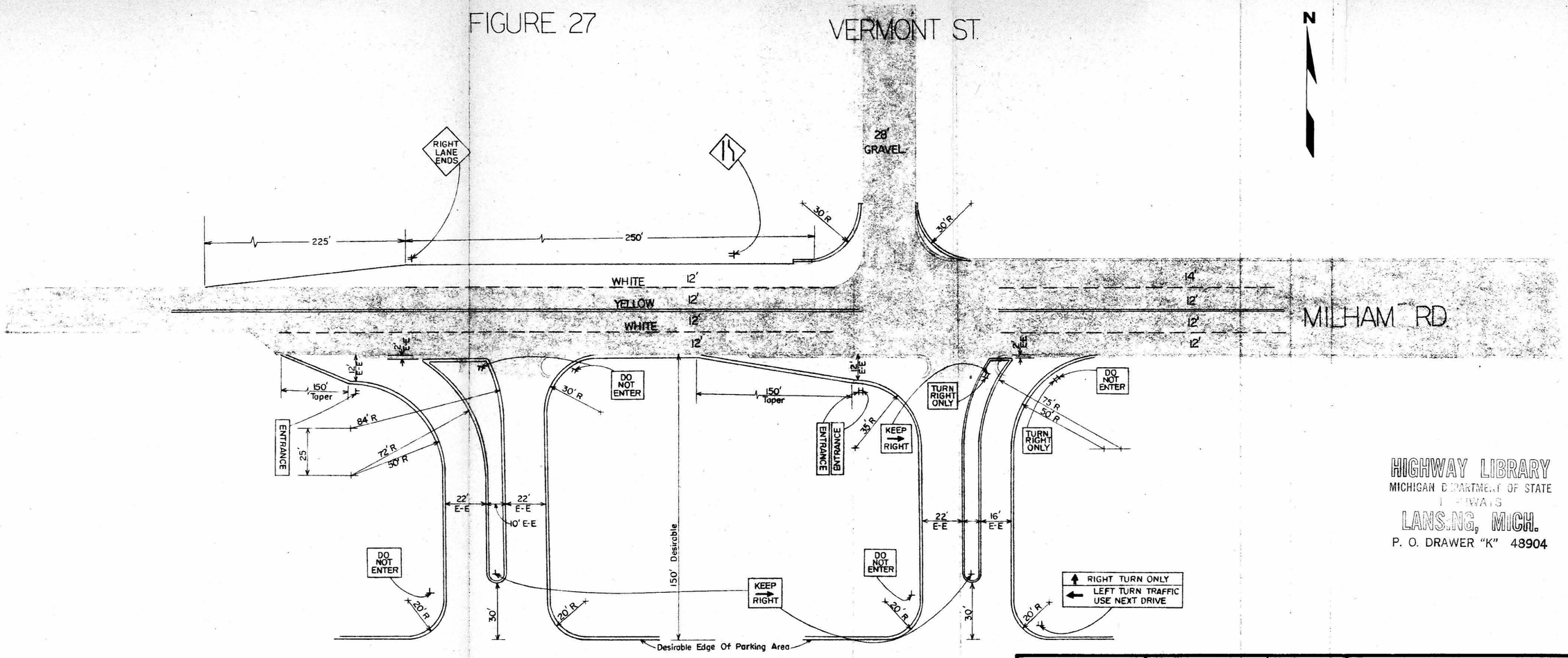
VERMONT STREET

WESTBOUND

MILHAM ROAD

FIGURE 26

FIGURE 27



SOUTHLAND SHOPPING CENTER

STATE OF MICHIGAN DEPARTMENT OF STATE HIGHWAYS — TRAFFIC DIVISION	AUTH. NO.	DRAWN DVW	PROPOSED DIRECTIONAL DRIVEWAYS TO SOUTHLAND SHOPPING CENTER
	CONT. SEC.	DATE 11-27-73	
	REF.	SCALE 1"=40'	CITY OF PORTAGE
	SHEET OF	PLAN LOCATION 12	KALAMAZOO CO.

SUMMARY OF RECOMMENDATIONS

High Accident Locations

The Department of State Police submitted 37 high accident locations for Kalamazoo County to the Michigan Department of State Highways and Transportation. Twelve of these locations are now under the jurisdiction of the City of Portage. After an indepth study of these locations, recommendations were formulated for eight of them. The locations, their recommendations and the approximate cost of these recommendations is as follows:

Location Number	Description	Recommendations	Estimated Costs
1	Westnedge Avenue at Milham Road	Skidometer tests should be conducted. Increase the radius for the northwest quadrant.	$ 250.00
		TOTAL	$ 250.00
3	Milham Road at Oakland Drive	Oversized signal heads should be installed.	$1,200.00
		Apply lane lines to change both roadways to three lanes.	140.00
		Apply painted arrows to indicate lane assignments.	840.00
		Erect Lane-Use Control signs on all four legs.	220.00
		TOTAL	$2,400.00
6	Westnedge Avenue at Idaho Street	Skidometer tests should be conducted.	$ 250.00
		TOTAL	$ 250.00
7	Milham Road at Lovers Lane	Install two overhead signals. Remove the Lovers Lane offset and provide two approach lanes for each leg of the intersection.	$5,000.00
		TOTAL	$5,000.00

Location Number	Description	Recommendations	Estimated Costs
9	Westnedge Avenue at Amos Street	Skidometer tests should be conducted.	$ 250.00
		Two "No Left Turn" signs should be installed.	44.00
		TOTAL	$ 294.00
11	Westnedge Avenue at Garden Lane	The pine tree in the northeast corner should be removed.	$ 75.00
		TOTAL	$ 75.00
12	Milham Road at Vermont Street	The extra lane for westbound Milham Road should be continued approximately 250 ft.	$ 22,136.00
		A system of directional driveways should be incorporated.	17,800.00
		TOTAL	$ 39,936.00

The total cost of the recommendations formulated at the eight high accident locations is $48,205.00.

City-Wide Recommendations

1. Apply wet pavement accident criteria to locations throughout the city to determine where slippery pavement conditions exist.

2. At any signalized location a minimum of two vehicular signal faces should be provided per approach.

3. All signal installations should have a minimum amber time of four seconds and a maximum time of 4.5 seconds.