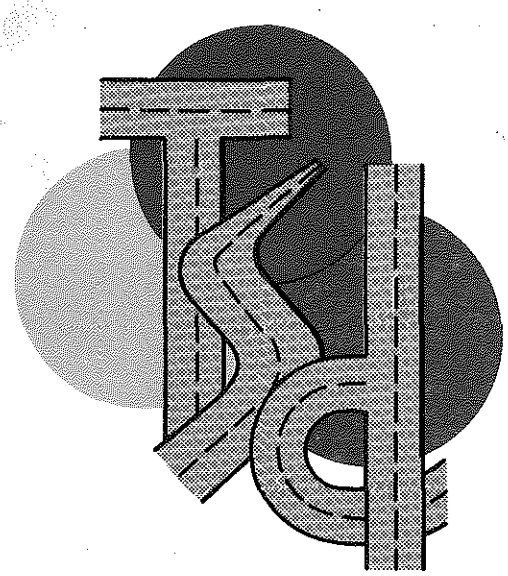
A TRAFFIC ACCIDENT ANALYSIS OF HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Report TSD-SS-169-71



TRAFFIC and SAFETY DIVISION

DEPARTMENT OF STATE HIGHWAYS
STATE OF MICHIGAN

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by

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in cooperation with

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NHTSA PROJECT #MIS-69-3(F)

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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 programs. Subsequently, various highway safety standards were developed to assure the orderly implementation of the Act.

Highway Safety Standard 4.4.9, Identification and Surveillance of Accident Locations, is one of those standards. The purpose of Standard 4.4.9 is to identify specific locations or sections of streets and highways which have high or potentially high accident experience as a basis for establishing priorities for improvement, selective enforcement or other operational practices that will eliminate or reduce the hazards at the location so identified.

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 requested and received through the Office of Highway Safety Planning in the Department of State Police a federally funded project

entitled "Traffic Accident Analysis for Cities and Counties". The intent of this new project is to provide a special traffic engineering field service 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.

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. This should be accomplished by conducting traffic accident analysis of locations which experience high accident frequencies and summarizing recommendations for corrective action.

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, an accident analysis of these high accident locations, technical evaluation of previously compiled facts and subsequent remedial recommendations.

Since a portion of the data collection phase involves accident records and reports and since the Michigan Depart-

ment of State Police is responsible for keeping all accident records in Michigan, the task of identifying and locating high accident locations in the City of Hancock (and providing an inventory of those locations) was designated as State Police responsibility. Because of the fact that an automated system of locating accidents has not yet been established on a statewide basis, the high accident locations for the City of Hancock (city streets only) were determined by manually extracting and compiling those locations with the highest number of accidents from the 1966 through 1968 city accident reports. From this list, the ten highest accident locations (numbered one to ten from the highest number of accidents to the lowest number of accidents) were selected. Once the problem locations were identified, additional accident information for the years 1969 and 1970 was compiled in order to expand the accident base at each location. Upon completion of this portion of the data collection, the Department of State Police documented and transmitted to the Traffic and Safety Division of the Department of State Highways a list along with the accident reports of the high accident locations for the City of Hancock.

The second portion of the data collection phase which is the responsibility of the Department of State Highways involves data collection utilizing the following basic steps: 1) preparation of collision diagrams and, if necessary,

physical condition diagrams for each selected location and 2) obtaining traffic counts where necessary.

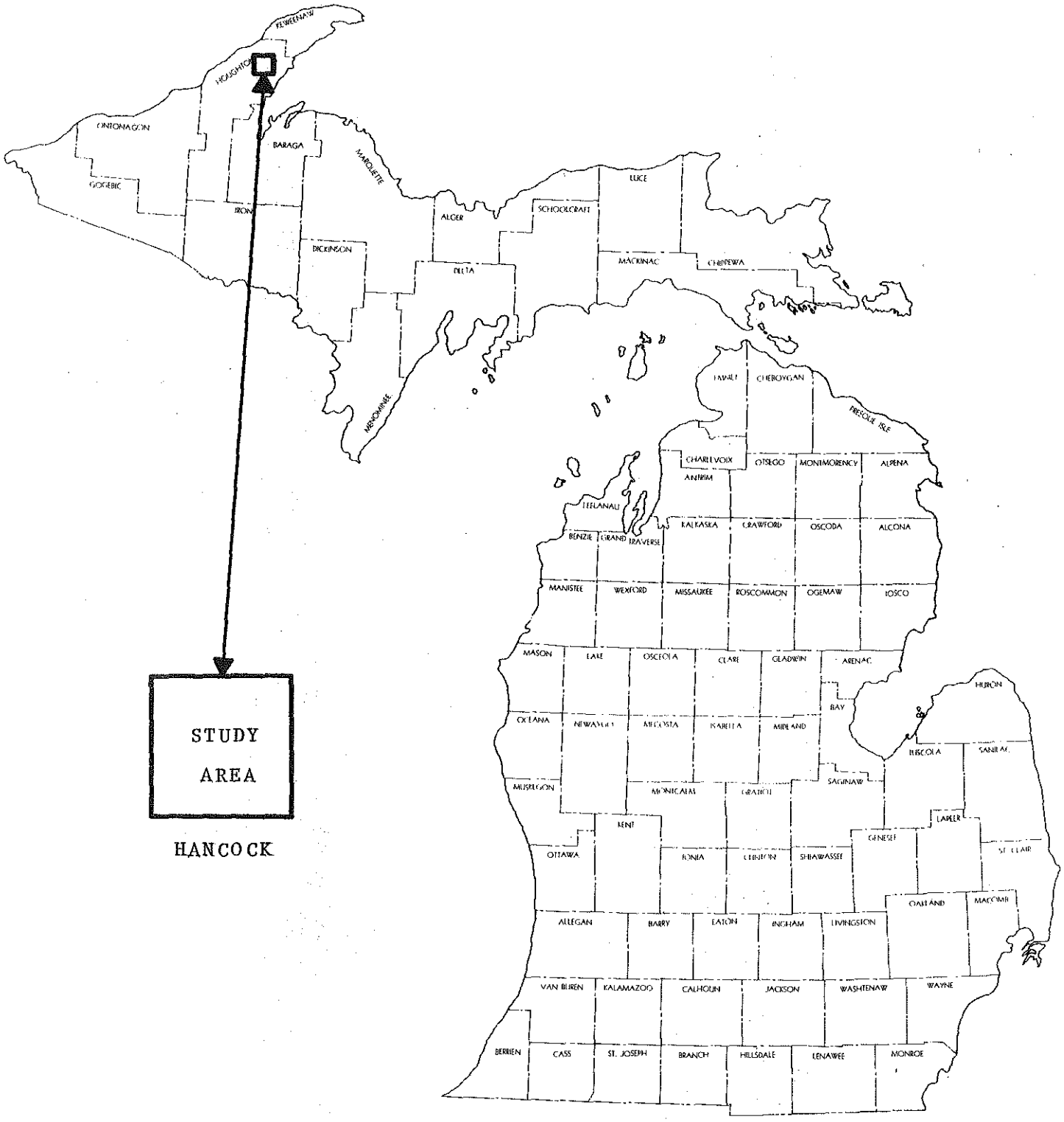
The accident analysis phase involves the analysis of the summarized facts and field data from the viewpoint of a highway traffic engineer with special attention focused on the effect which the highway environment may have had on the accident. Thus, at each high accident location, individual accident reports were reviewed in detail and the accident factors were tabulated and grouped in various tables. Collision diagrams were prepared for each location in order to identify accident patterns and to locate the accident in relation to the intersection or approaches to the intersection.

The traffic engineering analysis phase involves evaluating the summarized facts and field data and prescribing the proper remedial treatment.

STUDY AREA

The City of Hancock is located in Houghton County and is part of the famed Copper Country area of Michigan's Upper Peninsula (see Figure 1 on the following page). The twin cities of Hancock and Houghton are separated by Portage Lake and are within a short driving distance of Lake Superior. Both cities are located on rolling wooded hills which slope toward the waterway (Portage Lake) and form a picturesque basin. Hancock, like the other towns and villages in Houghton

FIGURE 1


KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
IRON
MARQUETTE
ALGER
SCHOOLCRAFT
LUCE
DICKINSON
DELTA
MACKINAC
CHIPPEWA
MENOMINEE
EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
OTSEGO
MONTMORENCY
ALPENA
ANTRIM
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
BAY
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
IOSCO
SANILAC
SAGINAW
MUSKEGON
MONTCALM
GRATIOT
LAPEER
KENT
GENESEE
OTTAWA
IONIA
CLINTON
SHIAWASSEE
ST. CLAIR
OAKLAND
MACOMB
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
STUDY
AREA
HANCOCK

County, is the outgrowth of the mining interests that once flourished in the region.

The Copper Country area is served by the Greyhound Bus Lines with depots in both Hancock and Houghton. There is no local bus line service in the area. Local transportation is provided by privately-owned automobiles and taxi companies. Three state highways, US-41, M-26 and M-203 pass through Hancock providing north-south and east-west access. The Soo Line Railroad, which is the only railroad serving the area, provides only freight service through their depot located in Houghton. North Central Airlines has flights daily from the airport located five miles northeast of Hancock.

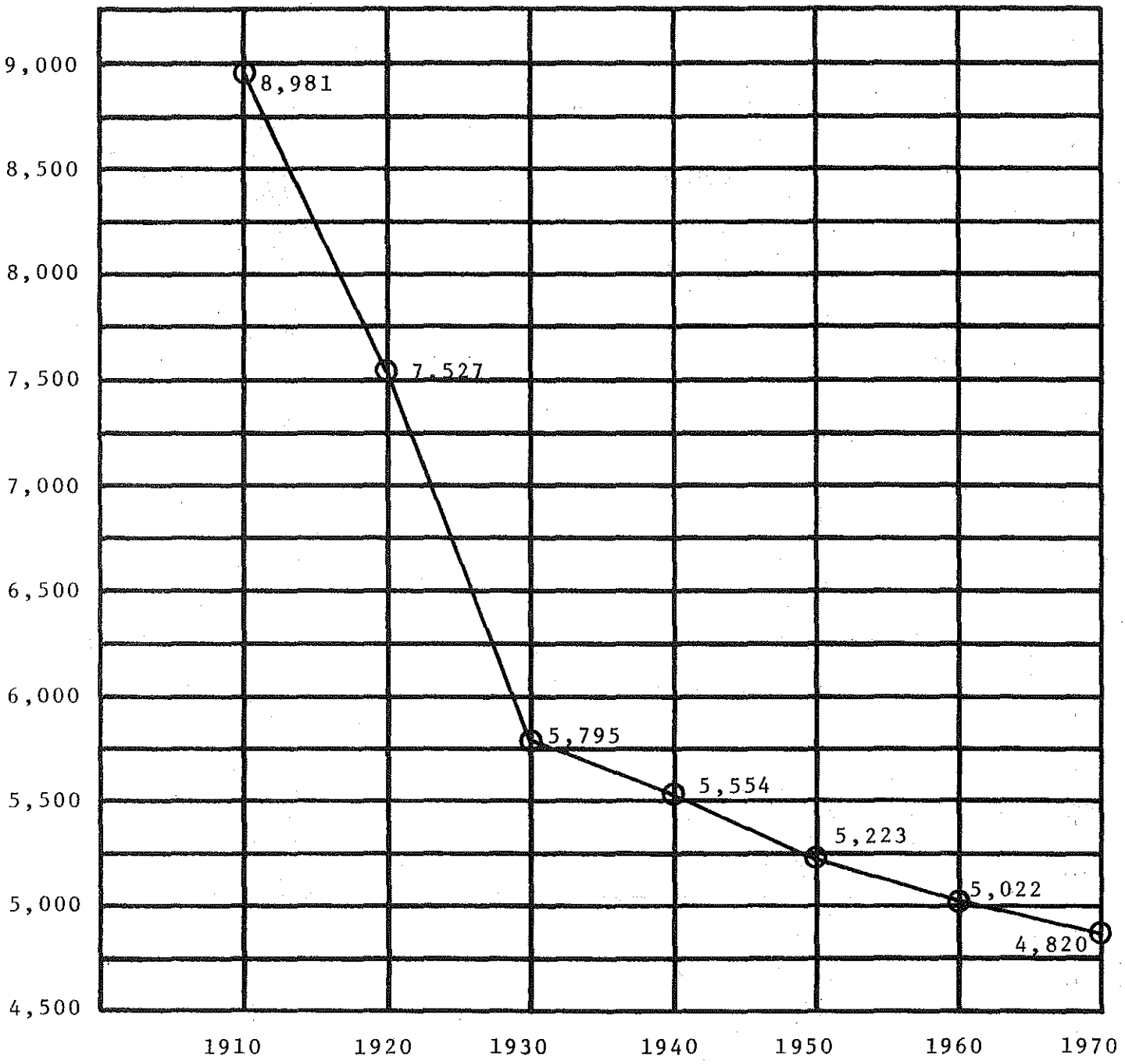
The population trend for the City of Hancock over the past 60 years is found under Figure 2 on page 7. The population has decreased every year since 1910 with the largest decrease occurring between 1910 and 1930 (35%). Overall, the City of Hancock has lost 46% of its population during the last 60 years. This population change can be attributed to the lack of employment opportunities brought about in part by the general condition of the copper industry.

The Copper Country area provides recreational opportunities for varied interests because of the very nature of the locality. The summer tourist business is increasing due to the availability of boating, skin-diving, water skiing, fishing, hunting

FIGURE 2

POPULATION TREND

CITY OF HANCOCK: 1910 - 1970



SOURCE: U. S. Bureau of the Census

and gem stone collecting. Since there is also an abundance of snowfall (averaging 185 inches per year), winter sports play an integral part in community activities. Such winter sports as skiing, skating, snow-shoeing and hockey are accelerating the development of the area as a winter playground. For those interested in history, the area is rich in early mining and lumbering lore. Also, ample opportunity is available for study and enjoyment by the nature lover and the amateur geologist.

The principle types of employment in Hancock and the surrounding area are mining, education and retail trade. Mining was largely responsible for the founding of Michigan Technological University, located in Houghton, and started by the Michigan State Legislature in 1885 as the Michigan Mining School. The college was initially started because of the demand for scientifically trained men to develop Michigan's natural resources. Since that time the facilities have been expanded and the scope of the college has broadened to include general engineering and technology. Suomi College, located in Hancock, was established in 1896 to educate the Finnish immigrants who had come into the area. It is the only college in America founded by people from Finland. Students at this junior college study liberal arts, pre-professional courses, music, business and secretarial courses.

These two institutions of higher education along with the retail trades are providing a majority of the jobs in an area that is experiencing heavy unemployment. For the Copper Country to look forward to prosperity they will have to experience continued growth in their colleges, further development of their tourist business and a revitalization of their mining industry.

According to the Nineteenth Annual Progress Report as compiled by the Local Government Division of the Michigan Department of State Highways the City of Hancock has 26.59 miles of streets. This figure includes 4.19 miles of state trunkline, 4.89 miles of major city streets and 17.51 miles of local city streets. A map showing these road types can be found on the following page.

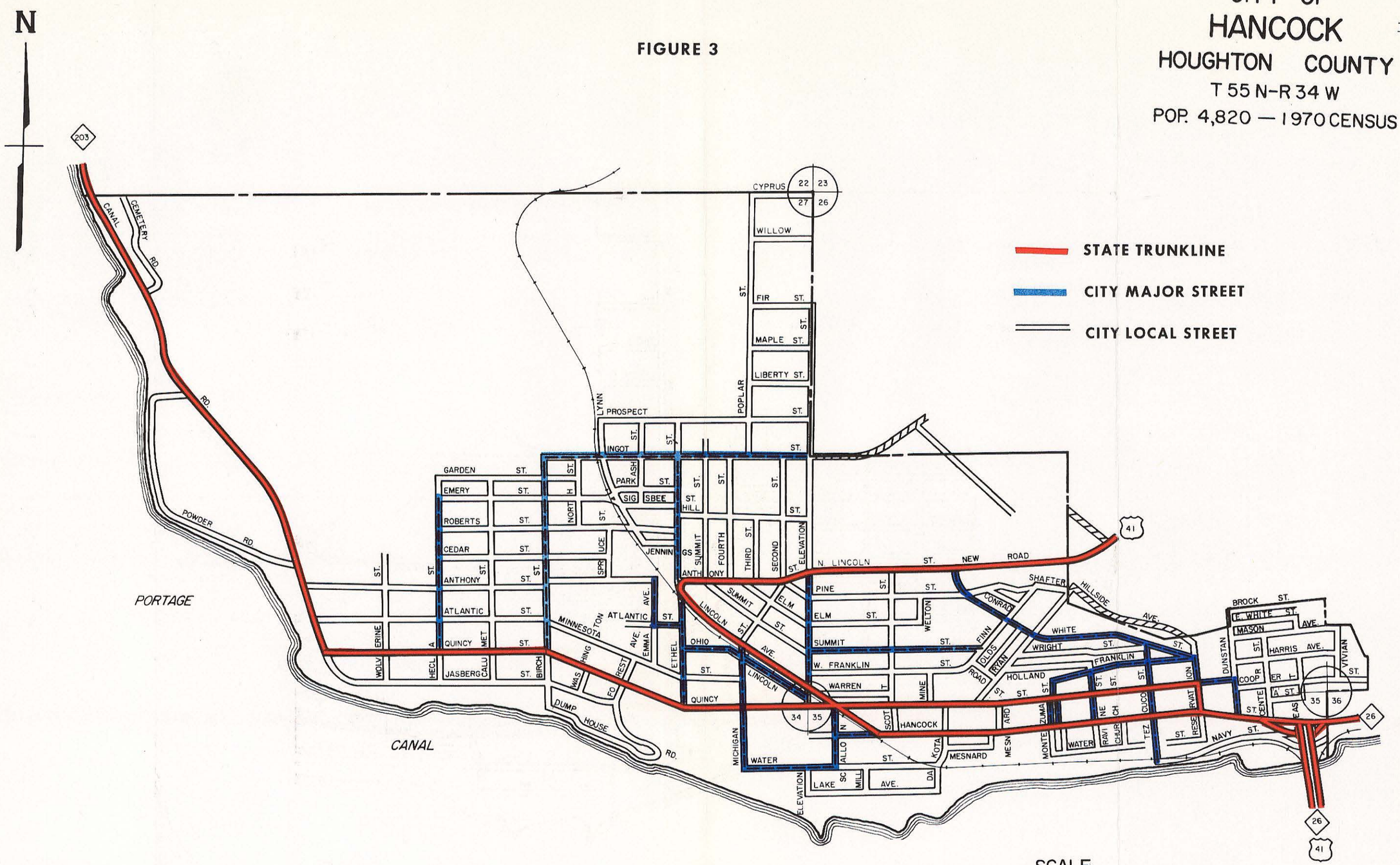
CITY OF HANCOCK

HOUGHTON COUNTY

T 55 N-R 34 W

POP. 4,820 — 1970 CENSUS

FIGURE 3



SCALE

0 1000 2000 3000 FT.

STATE TRUNKLINE

CITY MAJOR STREET

CITY LOCAL STREET

TRAFFIC ENGINEERING ANALYSIS

The traffic engineering analysis phase of this study 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 on a spot collision diagram or strip map which is used to locate the accident and determine accident patterns. An accident pattern is the prevalence of one or more types of accident occurrence. The pattern gives an indication of the type of corrective action needed at a specific location. Accident causes, however, are numerous and often difficult to determine. An accident pattern does not always exist. In this case the collisions may involve one or more serious driving hazards such as slippery pavement, snow or fog, drinking drivers, defective equipment, excessive speed and inadequate traffic controls. In many cases these hazards may be eliminated or at best controlled. 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.

In the City of Hancock the traffic engineering analysis began when the State Police, after compiling the accident

data for the city streets in Hancock, transmitted to the Michigan Department of State Highways ten high accident locations (see spot map on the following page). Additional statistical information was collected on the reported traffic accidents in Hancock and on the vehicle registrations in Houghton County. Both were tabulated over the five-year study period from 1966 to 1970. Table 1 (see p. 14) which contains this information shows that reported traffic accidents increased by 69.4% from 1966 to 1969 and then decreased by 13.9% in 1970. There was a total of 1,092 reported traffic accidents (city streets only) in the City of Hancock during the five-year study period for an average of about 218 accidents per year. The ten high accident locations accounted for 59 of the total reported accidents in the city. This figure is only 5.4% of the reported accidents. It would appear from these figures that the greatest portion of the City of Hancock's reported accidents have not occurred at any specific locations but are scattered throughout the entire city. Even so, the city as a whole doesn't experience an alarming accident criticality.

To further document the various facts present at the ten high accident locations, tables 2 through 8 were prepared to tabulate and chart specific data (see pps. 17 - 21).

F I G U R E 4

CITY OF HANCOCK

HOUGHTON COUNTY

T 55 N-R 34 W

POP. 4,820 — 1970 CENSUS

S P O T M A P

F O R

H I G H A C C I D E N T

L O C A T I O N S

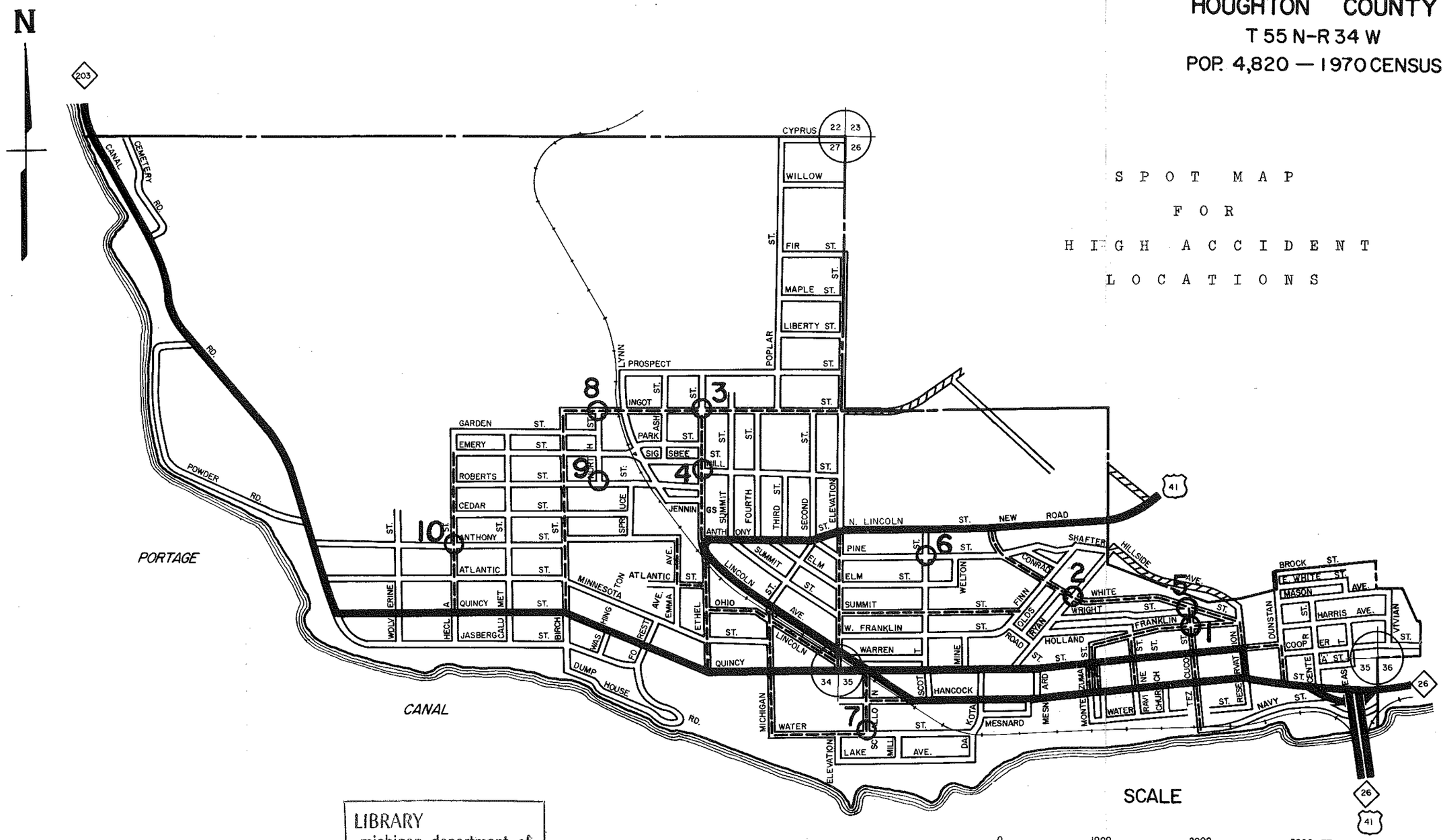


Table 1

REPORTED TRAFFIC ACCIDENTS IN THE CITY OF HANCOCK

Year	Total	Property Damage	Injury	Fatal	Persons Injured	Persons Killed
1966	157	116	40	1	54	4
1967	203	166	36	1	57	1
1968	237	212	25	0	33	0
1969	266	236	30	0	51	0
1970	229	197	31	1	47	1

COMPARISON OF ACCIDENT FREQUENCY

Year	Hancock City Streets	Houghton County Roads	Total Accidents State of Mich.
1966	157	195	302,880
1967	203	214	299,004
1968	237	225	305,495
1969	266	243	331,223
1970	229	280	313,715

PERCENTAGE OF CHANGE FOR THE ABOVE TOTALS

1966 - 67	29.3	9.7	-1.3
1967 - 68	16.7	5.1	2.2
1968 - 69	12.2	8.0	8.4
1969 - 70	-13.9	15.2	-5.3

VEHICLE REGISTRATIONS IN HOUGHTON COUNTY

Year	Pass.	Comm.	Farm Vehicle	Trailer	Trailer Coach	Motor-cycles	Muni-cipal	Total Plates
1966	-	-	-	-	-	-	-	14,932
1967	12,645	2,139	112	1,355	75	397	11	16,734
1968	12,775	2,301	113	1,537	81	394	12	17,213
1969	12,559	2,412	-	1,711	-	458	6	17,146
1970	12,659	2,509	-	1,874	-	541	11	17,594

2. Monthly and Daily Accident Occurrence
3. Annual Accident Summary
4. Daily and Hourly Accident Occurrence
5. Age of Drivers Involved in Accidents
6. Residence of Drivers Involved in Accidents
7. Weather Conditions at the Scene of Accidents
8. Pavement Conditions at the Scene of Accidents

Table 2 shows that the peak accident month was January which had 20.2% of the reported accidents. This month falls just short of having twice as many accidents as the next closest months which are December and February. These three winter months together accounted for 44% of the total accidents. This high percentage can be accounted for by the severe winters that this community experiences. The peak accident day was Friday which had almost 29% of the reported accidents.

The information summarized in Table 3 shows that of the 59 accidents at the ten high accident locations 53 resulted in property damage while only six resulted in personal injury. The fact that the accident severity was so low can be partially accounted for by the number of parking accidents (22) and by the number of accidents that occurred at low speeds on snowy or icy roadways (28). There were no fatal accidents during the five-year study period at the ten high accident locations.

Table 4 shows the peak accident hour as 8:00 to 9:00 p.m. with the next closest hours being 9:00 to 10:00 a.m. and 12:00 noon to 1:00 p.m. The peak accident periods were 11:00 a.m. to 2:00 p.m. and 7:00 to 10:00 p.m. both with 22% of the accidents. The early morning hours (12:00 to 5:00 a.m.) accounted for only four accidents or 6.8% over the five-year study period.

Tables 5 and 6 contain the age and residence of the drivers involved in the accidents while Tables 7 and 8 show the weather conditions and pavement conditions at the scenes of the accidents. Eighty-seven percent of the drivers involved in the accidents were residents of Houghton County with 41% residing in the City of Hancock. Seventy-three percent of the accidents occurred when the weather was clear or cloudy, and 17% occurred during snowfall. Almost 60% of the accidents that occurred at the ten high accident locations happened when pavement conditions were wet, snowy or icy. These percentages on weather conditions are not unusual for an area that experiences the snowfall that the City of Hancock does.

In the analysis of the ten high accident locations we encountered six locations where 18 in. stop signs were used. In our discussion with the city manager of Hancock and the Chief of Police, Messrs. John Sullivan and Joseph Karry respectively, we were informed that 18 in. stop signs

ACCIDENT ANALYSIS

Table 2

MONTHLY AND DAILY ACCIDENT OCCURRENCE

TEN HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Period Studied: 1966 through 1970

Month	Day of the Week							Monthly Total	Of Total
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.		
January	4		4	1	2	1		12	20.2
February		1	2		2	1	1	7	11.9
March					2			2	3.4
April				1				1	1.7
May	1				1	1	1	4	6.8
June					1			1	1.7
July	1		1	1			1	4	6.8
August	1		1	1	2		2	7	11.9
September		1			1	1		3	5.0
October	1				3	2		6	10.2
November		2		2			1	5	8.5
December	1				3	1	2	7	11.9
Day Total	9	4	8	6	17	7	8	59	100.0
% of Total	15.3	6.8	13.5	10.2	28.8	11.9	13.5	100.0	100.0

Peak Accident Day: Friday

Peak Accident Month: January

ACCIDENT ANALYSIS

Table 3

ANNUAL ACCIDENT SUMMARY

TEN HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Period Studied: 1966 through 1970

Accident Type	Day	Night	Total
Fatal Accident			
Personal Injury Acc.	3	3	6
Property Damage Acc.	32	21	53
TOTAL	35	24	59

Month	Fatal		Injury		Property Damage		Sub Total		Total
	Day	Night	Day	Night	Day	Night	Day	Night	
January					5	7	5	7	12
February					7		7		7
March					1	1	1	1	2
April					1		1		1
May					2	2	2	2	4
June			1				1		1
July			1		3		4		4
August			1		3	3	4	3	7
September					2	1	2	1	3
October				2	2	2	2	4	6
November					3	2	3	2	5
December				1	3	3	3	4	7
Sub Total			3	3	32	21	35	24	59
TOTAL			6		53		59		59

Table 4

DAILY AND HOURLY ACCIDENT OCCURRENCE

TEN HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Period Studied: 1966 through 1970

Hour	Day of the Week							Hour Total	% of Total
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.		
12 - 1AM					1			1	1.7
1 - 2AM						1		1	1.7
2 - 3AM				1				1	1.7
3 - 4AM		1						1	1.7
4 - 5AM									
5 - 6AM									
6 - 7AM									
7 - 8AM	1							1	1.7
8 - 9AM	2							2	3.4
9 - 10AM		1			5			6	10.2
10 - 11AM			1					1	1.7
11 - 12AM				1		2		3	5.0
12 - 1PM		1		1	1		3	6	10.2
1 - 2PM	1		1		2			4	6.8
2 - 3PM							2	2	3.4
3 - 4PM				1	1			2	3.4
4 - 5PM			2	1			2	5	8.5
5 - 6PM			1		2	1		4	6.8
6 - 7PM	1		1			1		3	5.0
7 - 8PM				1	1			2	3.4
8 - 9PM	1		1		3	2		7	11.9
9 - 10PM	1	1	1		1			4	6.8
10 - 11PM							1	1	1.7
11 - 12PM	2							2	3.4
Not Stated									
Day Total	9	4	8	6	17	7	8	59	100.0
% of Total	15.3	6.8	13.5	10.2	28.8	11.9	13.5	100.0	100.0

Peak Accident Hour: 8 - 9 p.m.

Peak Accident Day: Friday

Table 5

AGE OF DRIVERS INVOLVED IN ACCIDENTS

TEN HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Period Studied: 1966 through 1970

Age Group	Number of Drivers Involved in				Percent
	Fatal	Injury	Property Damage	Total	
Under 16					
16 - 19		1	14	15	16.1
20 - 24		1	15	16	17.2
25 - 34		1	13	14	15.1
35 - 44		2	12	14	15.1
45 - 54			14	14	15.1
55 - 64		2	9	11	11.8
65 - 74			3	3	3.2
75 & Over		1	2	3	3.2
Not Stated			3	3	3.2
TOTAL		8	85	93	

Table 6

RESIDENCE OF DRIVERS INVOLVED IN ACCIDENTS

Residence	Number of Drivers Involved in				Percent
	Fatal	Injury	Property Damage	Total	
City		4	34	38	40.9
County		4	39	43	46.2
Michigan			11	11	11.8
Out of State			1	1	1.1
Not Stated					
TOTAL		8	85	93	100.0

Table 7

WEATHER CONDITIONS AT SCENE OF ACCIDENTS

TEN HIGH ACCIDENT LOCATIONS IN THE CITY OF HANCOCK

Period Studied: 1966 through 1970

Weather	Severity of Accident				Percent
	Fatal	Injury	Property Damage	Total	
Clear or Cloudy		5	38	43	72.9
Rain		1	5	6	10.2
Fog					
Snow or Sleet			10	10	16.9
Not Stated					
TOTAL		6	53	59	100.0

Table 8

PAVEMENT CONDITIONS AT SCENE OF ACCIDENTS

Pavement	Severity of Accident				Percent
	Fatal	Injury	Property Damage	Total	
Dry		4	20	24	40.7
Wet		1	6	7	11.9
Snowy/Icy			15	15	25.4
Icy		1	12	13	22.0
Not Stated					
TOTAL		6	53	59	100.0

could be found at other locations throughout the city. According to the Michigan Manual of Uniform Traffic Control Devices the minimum size for stop signs is 24 in. x 24 in. (R1-1-24 - Appendix II, p. 65). It is recommended that all 18 in. stop signs in the City of Hancock be replaced by 24 in. signs. We are aware of the high cost of replacing all the signs at once. We suggest, however, that a replacement program be initiated immediately with the ten high accident locations receiving top priority.

The analysis of the ten high accident locations also showed that in many cases the first parking stalls were located too close to the intersections. According to the Michigan Vehicle Code, Section 257.674 of Act 300, Public Acts of 1949 as amended (MSA 9.2374), "No person shall park a vehicle, except when necessary to avoid conflict with other traffic or in compliance with law or the directions of a police officer or traffic control device, within 20 ft of a crosswalk, or if none, then within 15 ft of the intersection of property lines at an intersection of highways". It is strongly recommended that the Vehicle Code Law concerning this issue be implemented as soon as possible. One immediate benefit resulting from compliance with this law is the improvement of sight distances at unsignalized locations.

Further observation of the ten high accident locations and the surrounding city streets indicated a lack of center-

line markings in quite a few instances. On all major rural highways having an even number of lanes, and on many urban streets and less important rural roads, centerlines are necessary and should be applied throughout the entire length of the pavement. The centerline on a two-way city street having only one lane for moving traffic in each direction shall be a yellow broken line (see Office Memorandum No. 5, Appendix II, pp. 73 - 74). As a guide to the application of centerline markings, the following warrants are suggested:

1. Centerlines are desirable on all paved highways and as a minimum should be placed throughout the length of:
   a. Two-lane pavements carrying an ADT (Average Daily Traffic) in excess of 1,000 vehicles
   b. Two-lane pavements narrower than 20 ft carrying an ADT in excess of 500 vehicles
   c. Two-lane pavements narrower than 18 ft but not less than 16 ft in width carrying an ADT in excess of 300 vehicles. Centerlines should not be used on pavements narrower than 16 ft
   d. All four, six and eight lane undivided pavements
2. Centerlines should be placed at other locations where accident experience indicates their need

and on hard surface roads in areas where driver visibility is likely to be reduced frequently as by fog.

(See Part III, Section B, pps. 278 - 279 of the Manual - Appendix II, pps. 71 - 72.)

After the analysis of the ten high accident locations was complete, it was apparent that no engineering recommendations would be feasible for five of these locations. There were no accident patterns at these five 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 five locations. The collision diagrams and pictures for each of these will be found on the page following the discussion. The collision diagrams and pictures for the remaining locations are found in Appendix I.

LOCATION 1 TEZCUCO STREET AT FRANKLIN STREET

Tezcuco Street and Franklin Street form a standard right-angle intersection. The only traffic controls present are two stop signs on Franklin Street giving Tezcuco Street the right of way. The stop sign on the southwest corner is 24 in. wide, and the sign on the northeast corner is 18 in. wide.

Tezcuco Street has a two-lane bituminous pavement 38 ft wide north of the intersection and 46 ft wide south of the intersection. Ninety degree angle parking is allowed on the west side of Tezcuco Street while parallel parking is allowed on the east side of Tezcuco Street north of the intersection. Parking is prohibited on Tezcuco Street along that portion abuting the southeast quadrant. The alignment of Tezcuco Street consists of a positive gradient in the northerly direction.

Franklin Street has a two-lane bituminous pavement 25 ft wide west of the intersection and 29 ft wide east of the intersection. Parking is prohibited along both sides of the east leg of Franklin Street while parallel parking is allowed along both sides of the west leg. The sight distance at the intersection for eastbound traffic on Franklin Street is poor due to parked vehicles. The sight distance at the intersection for westbound traffic on Franklin Street is adequate.

There were 18 accidents at this location during the five-year study period. Eleven of the 18 accidents or 61% were parking accidents with ten of these involving the angle parking on Tezcuco Street. The remaining accidents at this location consisted of six right-angle accidents and one sideswipe. Five of the six right-angle accidents involved careless driving with the remaining accident reportedly caused by a sight obstruction (parked vehicle).

Recommendations

The collision diagram for this location indicates that parking accidents were the predominate type. Furthermore, 91% of the parking accidents involved the angle parking on Tezcuco Street. For this reason it is recommended that the angle parking on Tezcuco Street be replaced by parallel parking. This will remove the conflict that exists between vehicles backing from their parking stalls and moving traffic on Tezcuco Street. This change should also improve the sight distance for eastbound traffic on Franklin Street which will help reduce future right-angle accidents.

It is further recommended that the 18 in. stop sign on the northeast corner and the non-standard 24 in. sign on the southwest corner both be replaced by standard 24 in. signs (see Part I, Section B, p. 14 of the Michigan Manual of Uniform Traffic Control Devices - Appendix II, p. 65) as a part of the city-wide replacement program that has already been recommended.

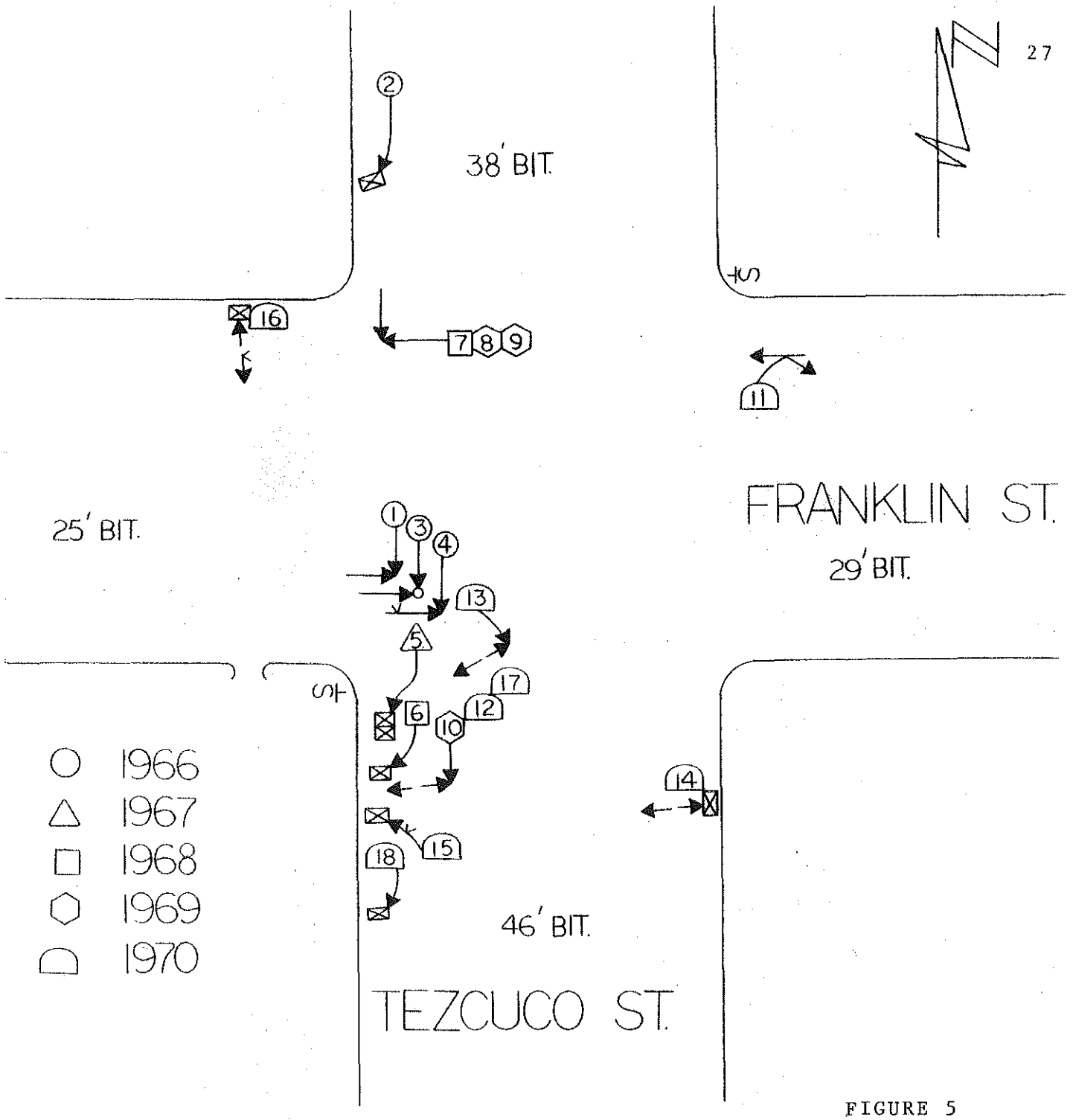


FIGURE 5

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location TEZCUCO ST. at FRANKLIN ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 18 **P.D.** 17
Injury 1 (1) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 1 **Date** 7-8-71

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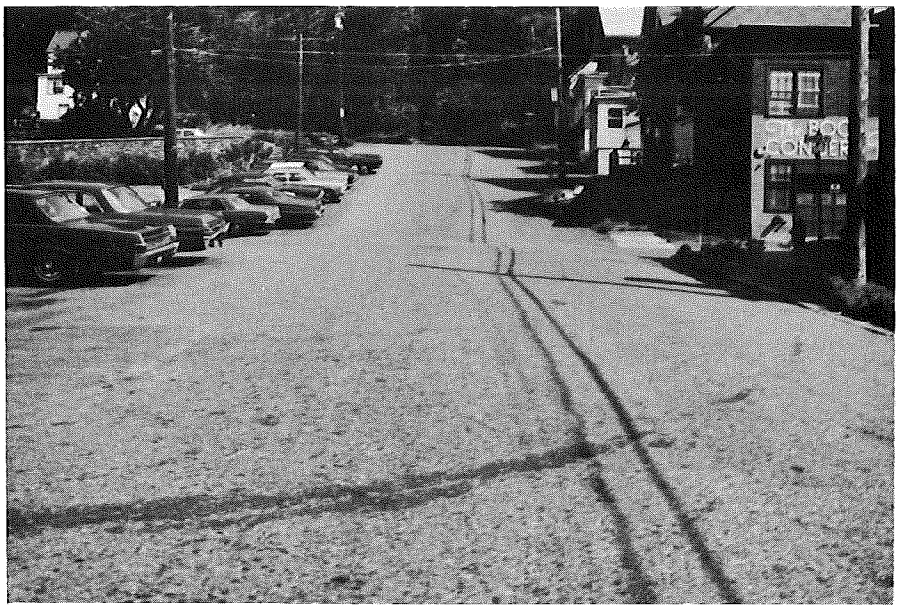
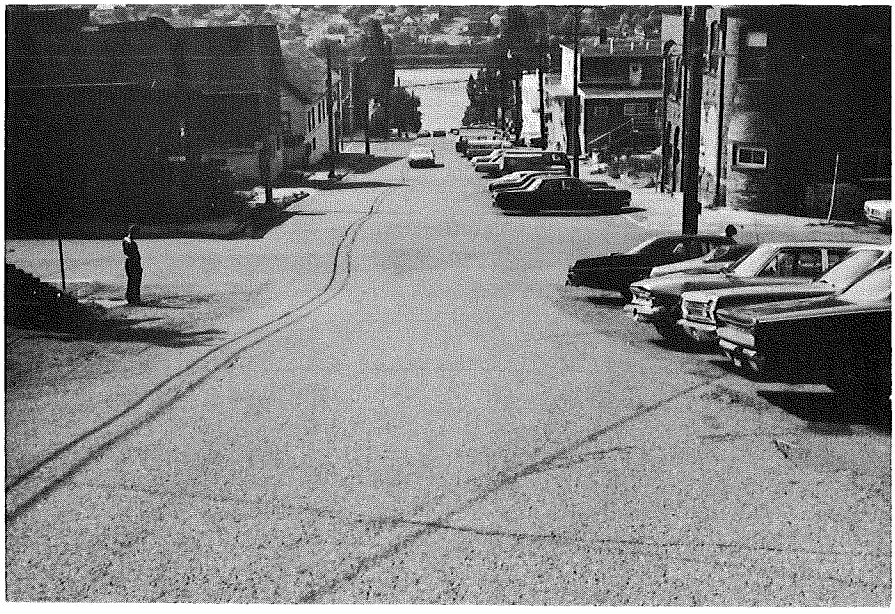


NORTHBOUND

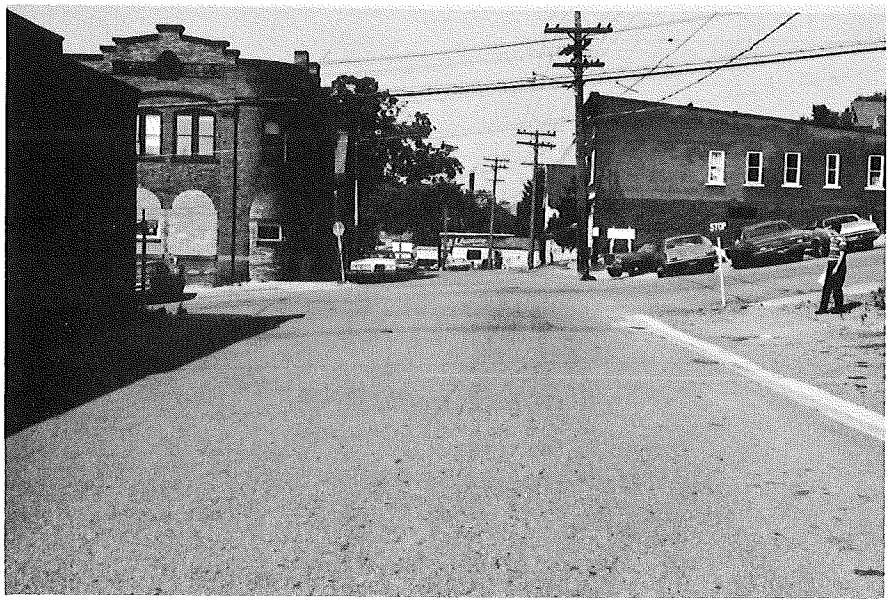
TEZCUCO STREET



SOUTHBOUND

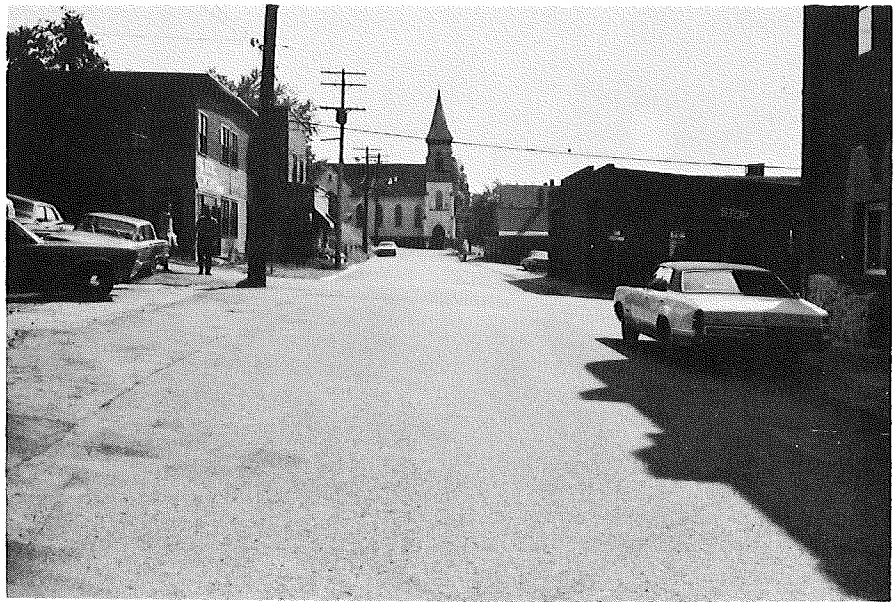
TEZCUCO STREET

FIGURE 5a



WESTBOUND

FRANKLIN STREET



EASTBOUND

FRANKLIN STREET

FIGURE 5b

LOCATION 2 WHITE STREET AT RYAN STREET

White Street and Ryan Street form a standard right-angle intersection with White Street having the right of way. White Street is a two-lane bituminous roadway 28 ft wide northwest of the intersection and 22 ft wide southeast of the intersection. Parking is prohibited on the north side of White Street in the northeast quadrant. Ryan Street is a two-lane bituminous roadway 19 ft wide southwest of the intersection and 25 ft wide northeast of the intersection. The alignment of Ryan Street consists of a positive gradient in the northeasterly direction. Every winter the southwest leg of Ryan Street is closed from the first snow until springtime due to the steep grade.

The traffic controls at this location consist of a 24 in. stop sign on the northwesterly corner of Ryan Street and an 18 in. stop sign on the southeasterly corner. There are no centerline markings for either White Street or Ryan Street.

The accident picture for the five-year study period shows a total of eight accidents. There were two right angles, two sideswipes, one parking and three head-on accidents. Seven of the eight accidents occurred on snowy or icy pavement.

Recommendations

Even though snow and ice contributed heavily to the occurrence of accidents at this location, it is our opinion that a potential hazard exists on White Street due to the 22 ft width. Six of the eight accidents over the five-year study period can be attributed to the narrowness of the roadway. Thus, it is recommended that White Street be centerline marked to make it easier for drivers to keep their vehicles on their own side of the roadway (see Part III, Section B, pps. 278 - 279 of the Manual - Appendix II, pps. 71 - 72).

It is further recommended that the 18 in. stop sign on the southeast corner and the non-standard 24 in. sign on the northwest corner both be replaced by standard 24 in. signs (see Part I, Section B, p. 14 of the Manual - Appendix II, p. 65) as a part of the city-wide replacement program that has already been recommended.

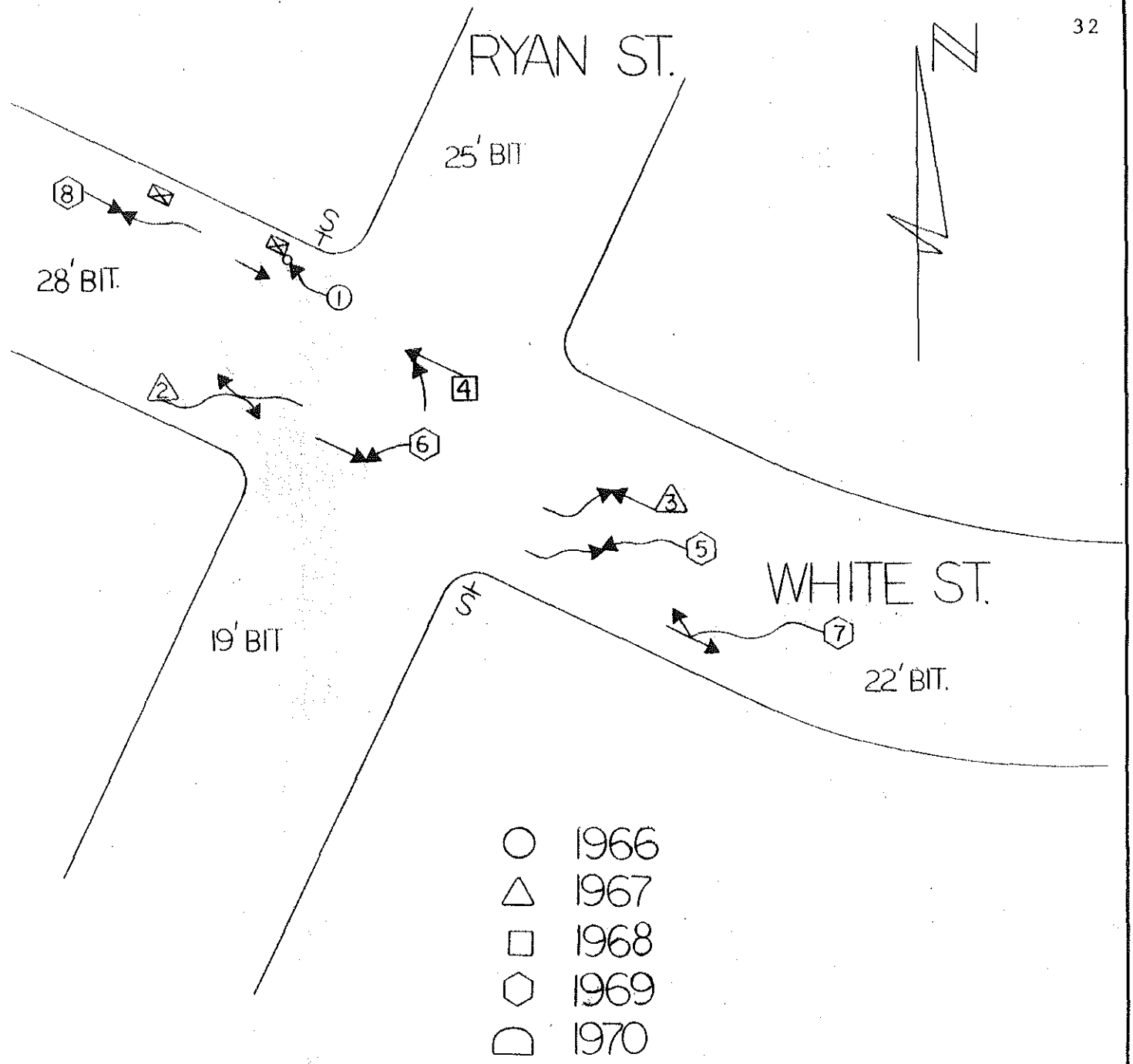


FIGURE 6

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location RYAN ST. at WHITE ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 8 **P.D.** 7
Injury 1 (1) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 2 **Date** 7-8-70

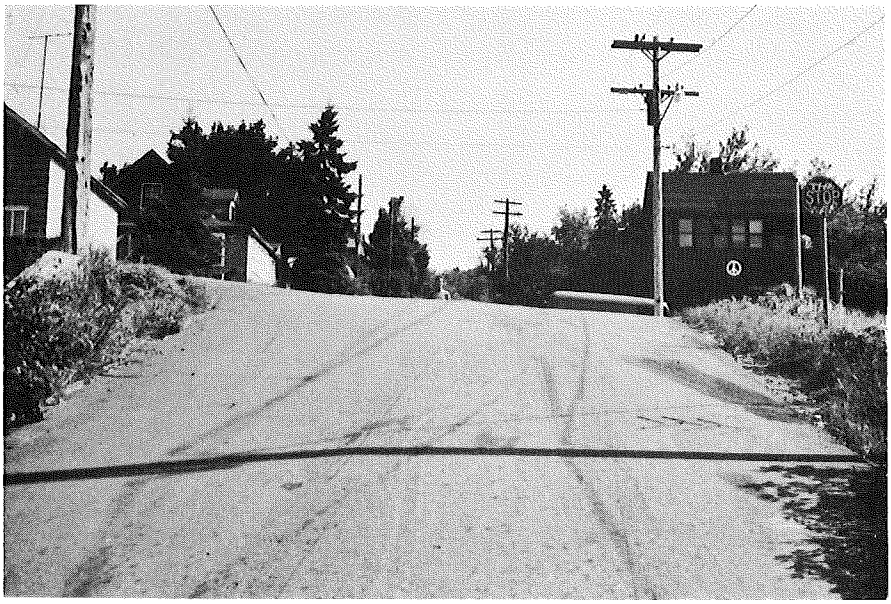
Form 1547 B (Rev. 11/70)

SOUTHWESTBOUND

RYAN STREET

SOUTHEASTBOUND

WHITE STREET



NORTHEASTBOUND

RYAN STREET

FIGURE 6a

LOCATION 3 ETHEL AVENUE AT INGOT STREET

Ethel Avenue at Ingot Street forms a standard right-angle intersection with Ingot Street having the right of way. A residential area is located north of Ingot Street while south of Ingot Street there is a vacant lot in the southwest quadrant and a parking lot for a supermarket in the southeast quadrant.

Ingot Street is a two-lane bituminous roadway 38 ft wide east of the intersection and 36 ft wide west of the intersection. Parallel parking is allowed on both sides of Ingot Street. The alignment of Ingot Street consists of a positive gradient in the easterly direction. This gradient is used to hold the annual soap box derby. For this purpose Ingot Street is divided into four lanes.

Ethel Avenue has a two-lane bituminous pavement 34 ft wide north of the intersection and 40 ft wide south of the intersection. Parallel parking is allowed on Ethel Avenue except for the area in front of the supermarket where angle parking is permitted. The sight distance for a north or southbound vehicle stopped at the intersection is adequate for both the east and west directions.

The only traffic controls present at this location are two 18 in. stop signs on Ethel Avenue. The stop sign on the northwest corner is not visible to approaching traffic

due to tree foliage (see picture on p. 38).

Seven of the eight accidents at this location during the five-year study period were parking accidents. All of the parking accidents involved the angle parking in front of the supermarket. Four of the parking accidents occurred when angle parked vehicles backed across Ethel Avenue and struck a parallel parked vehicle.

Recommendations

Due to the fact that all the parking accidents at this location involved the angle parking in front of the supermarket, it is recommended that this parking be replaced by parallel parking. This proposed change in parking will eliminate the conflict that exists between angle parked vehicles on the east side of Ethel Avenue and parallel parked vehicles on the west side. Also, the problem of vehicles backing into moving traffic will be alleviated. It is felt that due to the existence of the parking lot next to the store, there will be no excessive hardship experienced by the supermarket from the loss of a few parking stalls.

It is further recommended that the trees located in front of the stop sign on the northwest corner of Ethel Avenue be trimmed to remove the sight obstruction for southbound vehicles. Also, both 18 in. stop signs should be replaced by 24 in. signs (see Part I, Section B, p. 14 of

the Manual - Appendix II, p. 65) as a part of the city-wide replacement program that has already been recommended.

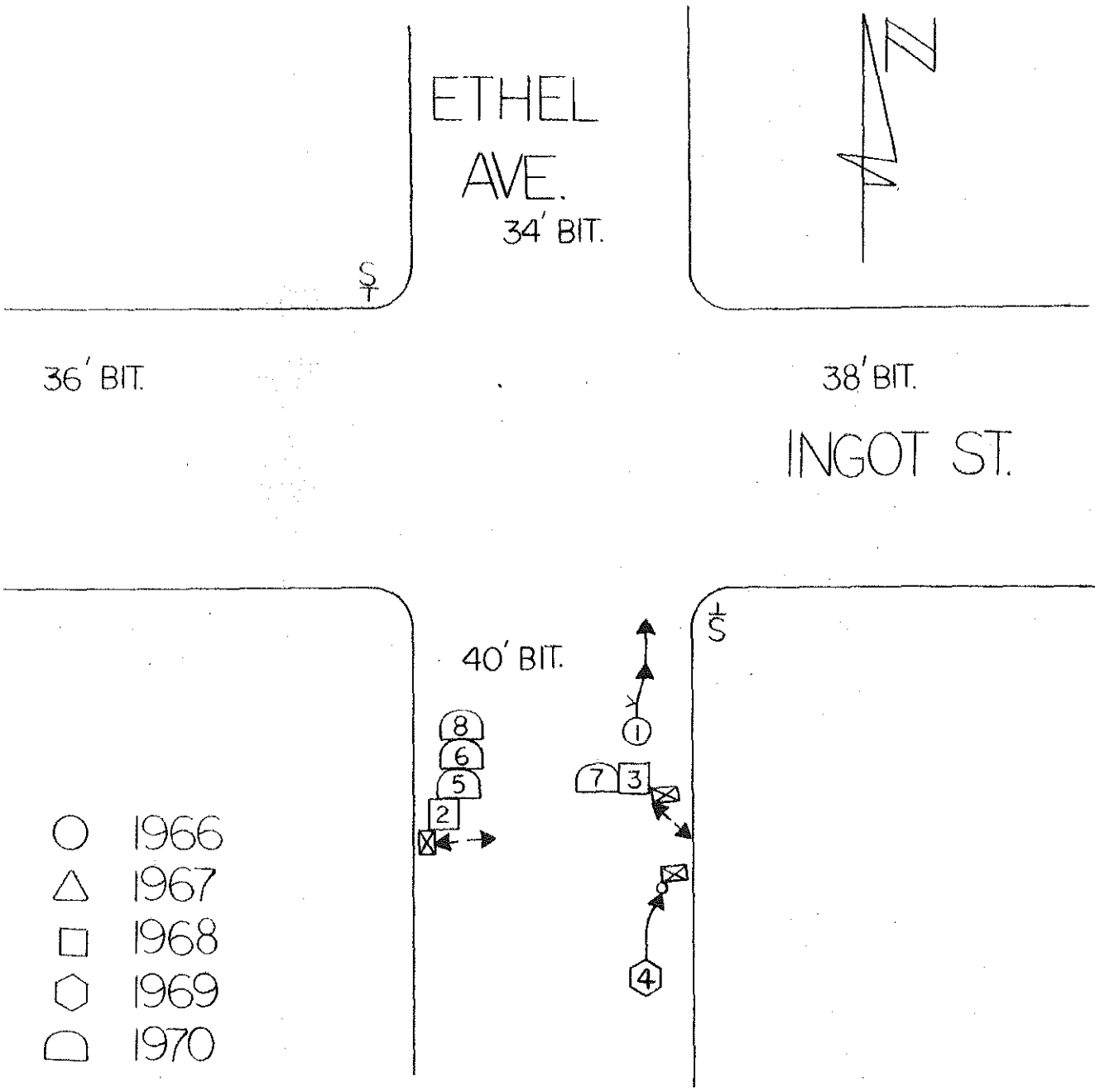


FIGURE 7

LEGEND	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
Stop & Go Signal (S, R, F, Y) — Stop Sign S — Flashing Beacon — Yield Sign Y	Location ETHEL AVE.. at INGOT ST. CITY OF HANCOCK HOUGHTON CO.
Fatal — Injury — Skidding — Jackknife — Overturned — Backing — Pedestrian (X) — Tree — Out of Control — Driver Intent — Deer (V) — Violator	Period: 1966 THRU 1970 Accidents – Total 8 P.D. 7 Injury 1 (1) Fatal 0 ( ) C.S. ____ Miles ____ Drawn DVW Plan No. LOCATION 3 Date 7-9-71

Form 1547 B (Rev. 11/70)

SOUTHBOUND

ETHEL AVENUE

EASTBOUND

INGOT STREET

NORTHBOUND

ETHEL AVENUE

FIGURE 7a

LOCATION 4 ETHEL AVENUE AT HILL STREET

Ethel Avenue at Hill Street is a "T" intersection with Ethel Avenue having the right of way. This intersection is located in a residential area. Ethel Avenue is a two-lane 35 ft wide bituminous roadway and Hill Street is a two-lane 29 ft wide bituminous roadway. Parallel parking is permitted on both Ethel Avenue and Hill Street. The sight distance at the intersection for westbound Hill Street is obstructed somewhat by parked cars on Ethel Avenue.

The only traffic control present is a stop sign for westbound Hill Street that is located 90 ft west of the intersection. In our discussion with Mr. John Sullivan, City Manager of Hancock, and Joseph Karry, Chief of Police, we were informed that the city owned only the property up to the curb line. The proprietor of a grocery store located in the northeast quadrant owns the property from the curb line north. The stop sign was not placed at the corner of the intersection because the owner of the grocery store would not allow it to be placed on his property.

There were six accidents at this location during the five-year study period. There were three right angles, one rear-end, one sideswipe and one parking accident. Four of the six accidents occurred on snowy or icy pavement.

Recommendations

Because the stop sign on Hill Street is located 90 ft from the intersection, it is recommended that this sign be moved to the northeast corner of Hill Street. It is desirable that appropriate arrangements be made to erect the sign at the point where traffic is legally required to stop. The safety of motorists at this location is jeopardized by the present location of the stop sign. Thus, the city should use whatever means are necessary to arrange the proper stop sign installation.

Furthermore, this 18 in. stop sign is non-standard. Thus, when it is moved, it should be replaced by a 24 in. sign (see Part I, Section B, p. 14 of the Manual - Appendix II, p. 65).

Lastly, the sight distance at this intersection for westbound Hill Street is obstructed by parked vehicles in the southeast quadrant. In all three of the right-angle accidents the operators on westbound Hill Street reportedly did not see northbound Ethel Avenue traffic. It is recommended that the parking be removed for 75 ft along the southeast quadrant of Ethel Avenue to alleviate the sight distance problem.

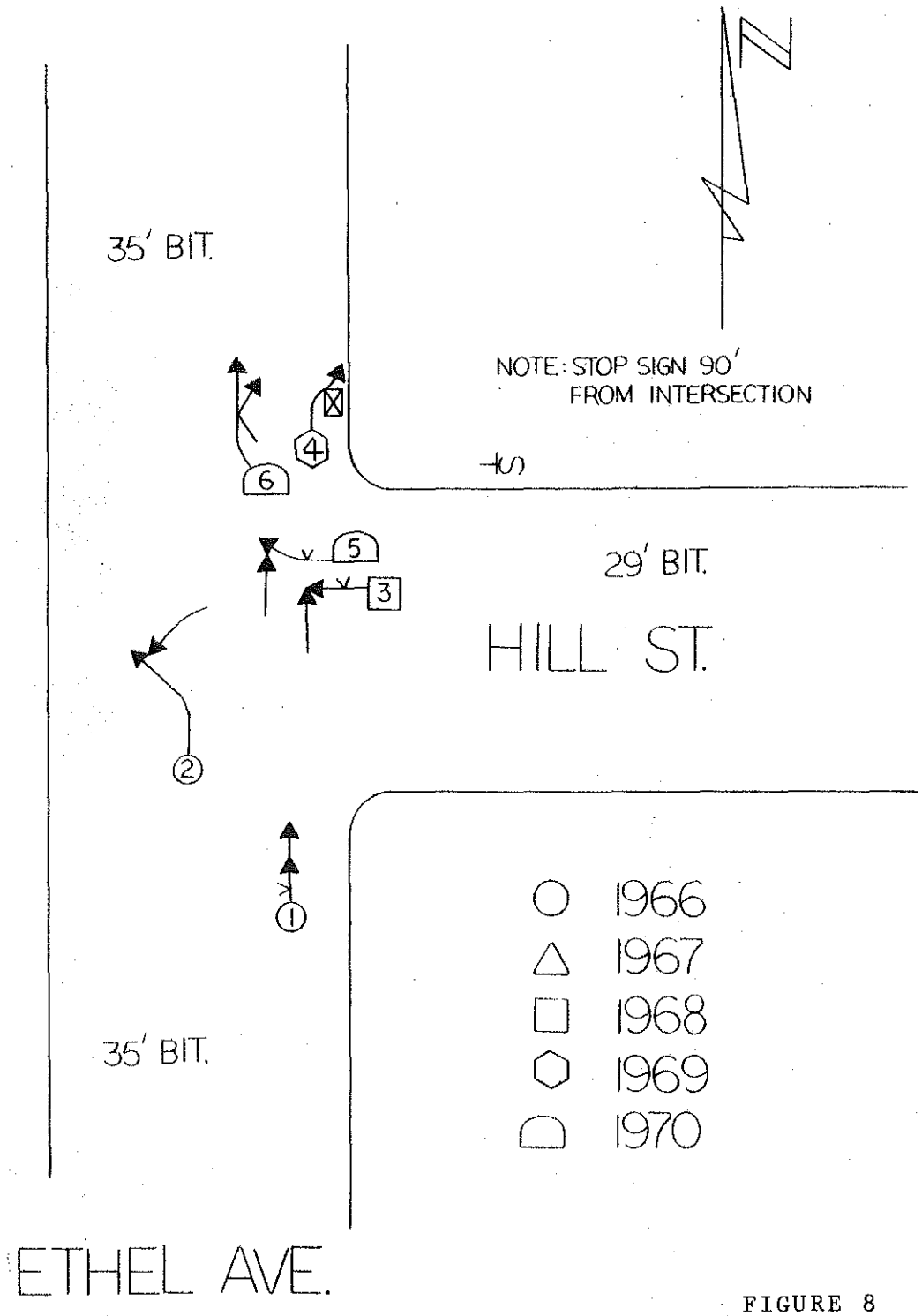
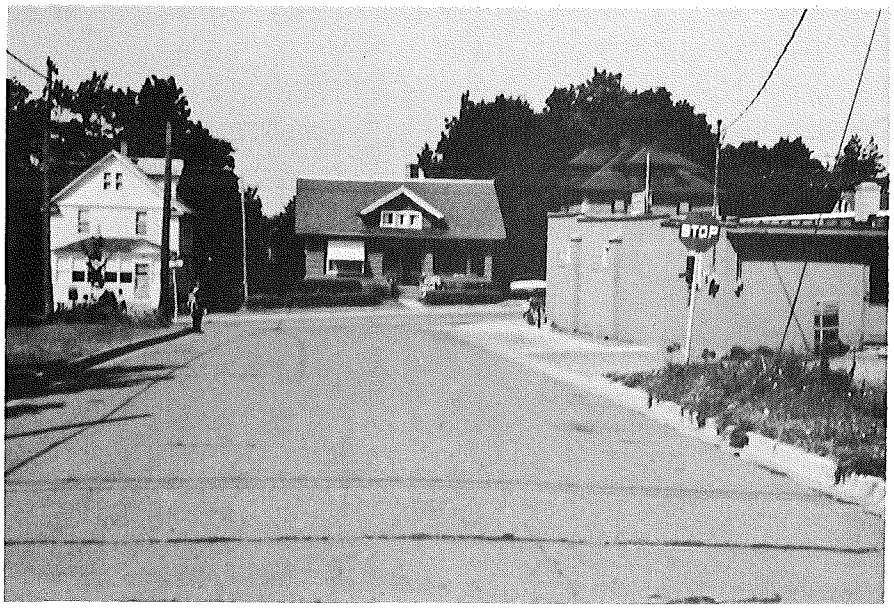


FIGURE 8

LEGEND	MICHIGAN DEPARTMENT OF STATE HIGHWAYS TRAFFIC AND SAFETY DIVISION
Stop & Go Signal (S, R, Y, F, Y) — Stop Sign S — Yield Sign Y Flashing Beacon	Location ETHEL AVE. at HILL ST. CITY OF HANCOCK HOUGHTON CO.
Fatal Injury Skidding Jackknife Overturned Backing Pedestrian (X) Tree Out of Control Driver Intent Deer (V) Violator	Period: 1966 THRU 1970 Accidents – Total 6 P.D. 6 Injury 0 ( ) Fatal 0 ( ) C.S. ____ Miles ____ Drawn DVW Plan No. LOCATION 4 Date 7-9-71

Form 1547 B (Rev. 11/70)



WESTBOUND

HILL STREET

SOUTHBOUND

ETHEL AVENUE

NORTHBOUND

ETHEL AVENUE

FIGURE 8a

LOCATION 5 WHITE STREET AT TEZCUCO STREET AND WRIGHT STREET

White Street and Tezcuco Street form a "T" intersection with Wright Street joining the intersection at the junction of the "T". This intersection is located in a residential area just north of the Central Business District of the city. White Street, which has the right of way, is well traveled because it enables residents north of Hancock to travel south without actually driving through the Central Business District. The right turn movement from eastbound White Street to southbound Tezcuco Street is very heavy due to the ease of access this route provides to eastbound US-41 and M-26.

White Street has a two-lane bituminous pavement that is only 20 ft wide. There is curb and gutter on both sides of the street and sidewalk on the south side. The alignment of White Street consists of a negative gradient in the easterly direction accompanied by a gradual right-hand turn. The intersection at Tezcuco Street is not apparent to east or westbound White Street traffic.

Tezcuco Street has a two-lane 46 ft wide bituminous pavement. The alignment of Tezcuco Street consists of a steep negative gradient in the southerly direction. Angle parking is allowed on the west side of Tezcuco and parallel parking is allowed on the east side. The sight distance from

Tezcuco Street at the intersection is poor due to the steep grade.

Wright Street has a two-lane 19 ft wide bituminous pavement. The alignment of Wright Street consists of a positive gradient in the easterly direction. Parallel parking is allowed on both sides of the street. The sight distance from Wright Street at the intersection is poor due to the steep grade.

The existing traffic control at this location consists of an 18 in. stop sign on the southeast corner for northbound Tezcuco Street traffic. There are no other traffic controls at this intersection.

The collision diagram for this location indicates a total of five accidents during the five-year study period. There were two head-on accidents, two rear-ends and one right angle between 1966 and 1970. All five of these accidents occurred on snowy or icy pavement. Two of the five accidents could be attributed in some respect to the narrowness of White Street.

Recommendations

Even though there were only two accidents that could be attributed to the 20 ft width of White Street, it is our opinion that a potential problem does exist. Operators will

instinctively shy away from the high curb and thus have a tendency to drive down the center of the roadway. Therefore, it is recommended that White Street be centerline marked giving vehicle operators a guide enabling them to keep their vehicles on their own side of the roadway (see Part III, Section B, pps. 278 - 279 of the Manual - Appendix II, pps. 71 - 72).

A further problem on White Street is the fact that the intersection is not apparent to east or westbound motorists. Also, because of the restricted sight distances from Tezcuco and Wright Streets, extreme caution should be exercised by anyone on White Street approaching the intersection. For these reasons it is recommended that side road warning signs (see Part I, Section C, p. 91 of the Manual - Appendix II, p. 68) be erected for both east and westbound White Street.

A problem that exists on Wright Street involves the absence of any traffic controls. This creates a conflict between the right turning movement from White Street and the through movements from Wright Street because they both have the right of way. For this reason it is recommended that a 24 in. stop sign (see Part I, Section B, p. 14 of the Manual - Appendix II, p. 65) be erected for Wright Street traffic. This will remove the conflict that exists by giving only White Street the right of way.

Lastly, it is recommended that the 18 in. stop sign on

the southeast corner of Tezcuco Street be replaced by a 24 in. sign (see Part I, Section B, p. 14 of the Manual - Appendix II, p. 65) as a part of the city-wide replacement program that has already been recommended.

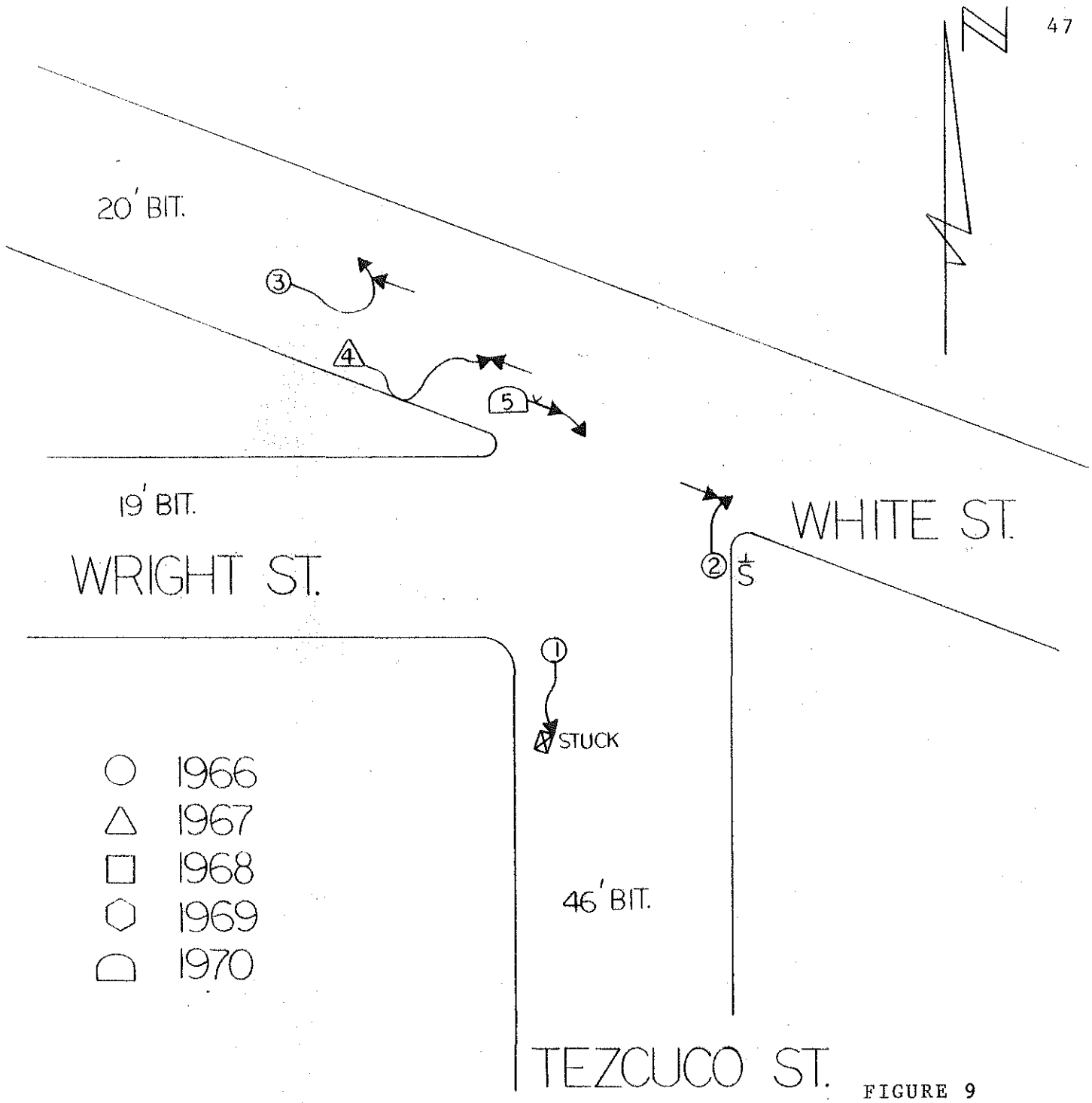


FIGURE 9

LEGEND

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location WHITE ST. at TEZCUCO ST. and WRIGHT ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970

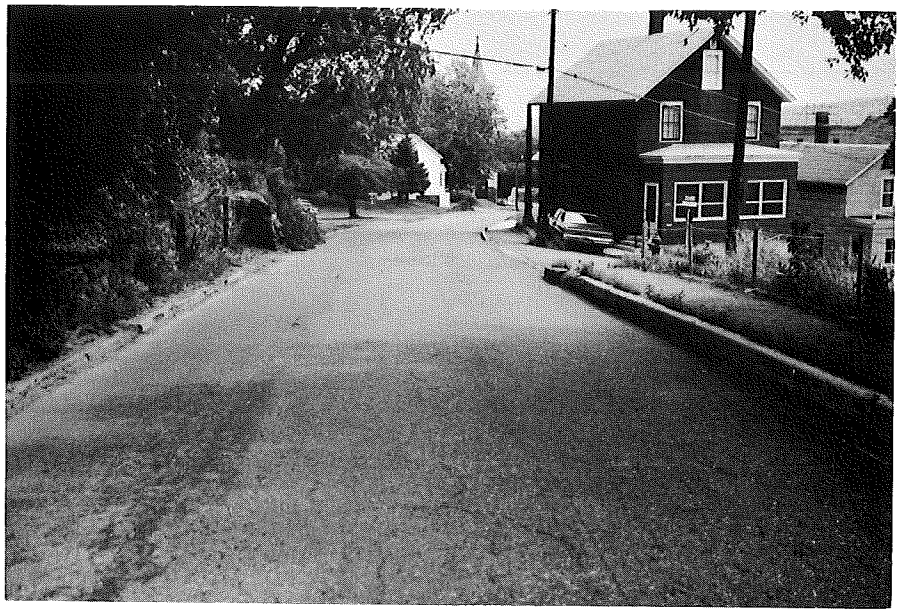
Accidents – Total 5 **P.D.** 5

Injury 0 ( ) **Fatal** 0 ( )

C.S. _____ **Miles** _____ **Drawn** DVW

Plan No. LOCATION 5 **Date** 7-9-71

Form 1547 B (Rev. 11/70)



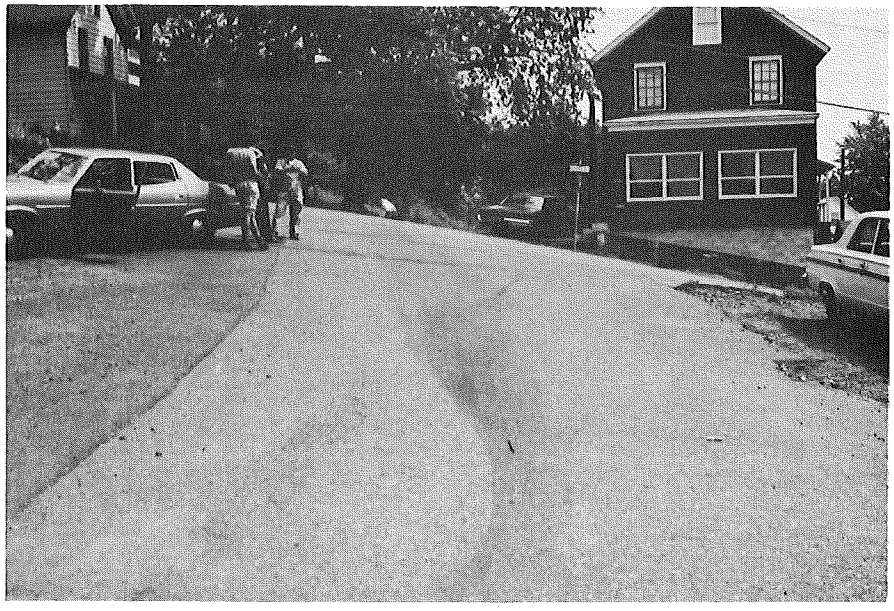
SOUTHEASTBOUND

WHITE STREET

NORTHWESTBOUND

WHITE STREET

FIGURE 9a



EASTBOUND

WRIGHT STREET

NORTHBOUND

TEZCUCO STREET

FIGURE 9b

SUMMARY OF RECOMMENDATIONS

The Department of State Police submitted ten high accident locations for the City of Hancock to the Michigan Department of State Highways. After an indepth study of these locations, recommendations were formulated for five of them. The locations and their recommendations are as follows:

Location Number	Location Description	Quantity	Recommendations
1	Tezcuco Street at Franklin Street	2	R1-1-24 - Change angle parking to parallel parking on Tezcuco Street
2	White Street at Ryan Street	2	R1-1-24 - Center-line markings on White Street
3	Ethel Avenue at Ingot Street	2	R1-1-24 - Change angle parking to parallel parking on Ethel Avenue. Trim trees in front of the stop sign on the north-west corner of Ethel Avenue
4	Ethel Avenue at Hill Street		Move stop sign to the northeast corner of Hill Street. Remove 75 ft of parking along the southeast quadrant of Ethel Avenue

Location Number	Location Description	Quantity	Recommendations
5	White Street at Tezcuco Street and Wright Street	2 2	W2-2-30 R1-1-24 Centerline markings on White Street

Furthermore, recommendations were formulated that should be implemented at all locations throughout the City of Hancock. These recommendations are as follows:

1. All 18 in. stop signs in the City of Hancock should be replaced by 24 in. signs.
2. All parking stalls should be located a minimum distance of 20 ft from a crosswalk, or if none, then a minimum of 15 ft from the intersection of property lines at an intersection of highways.
3. Centerlines should be applied throughout the City of Hancock following the suggested warrants as found in the Michigan Manual of Uniform Traffic Control Devices.

205 ? Not Read

APPENDIX I

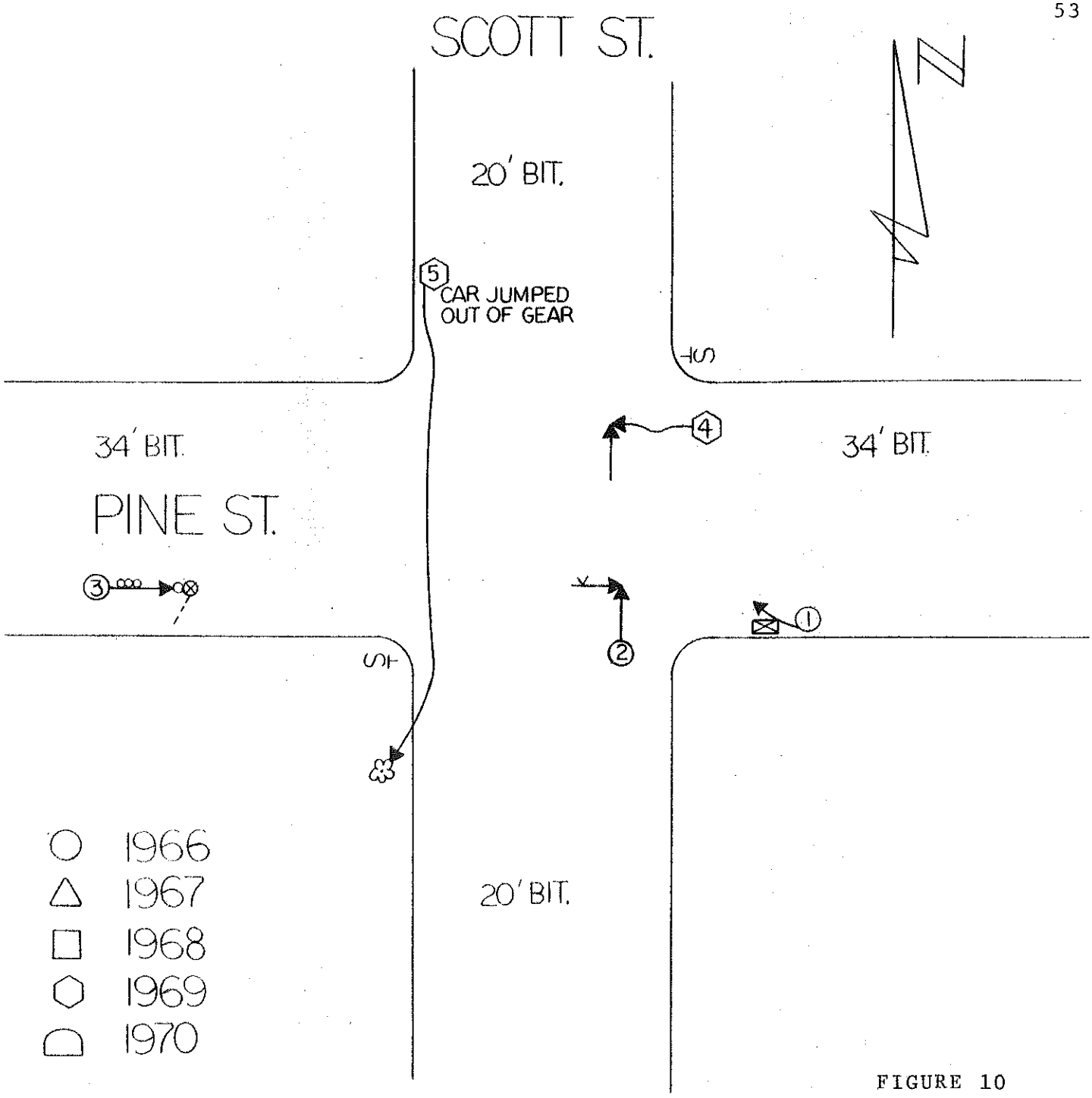


FIGURE 10

LEGEND

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location SCOTT ST. at PINE ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970

Accidents – Total 5 **P.D.** 5

Injury 0 ( ) **Fatal** 0 ( )

C.S. _____ **Miles** _____ **Drawn** DVV

Plan No. LOCATION 6 **Date** 7-12-71

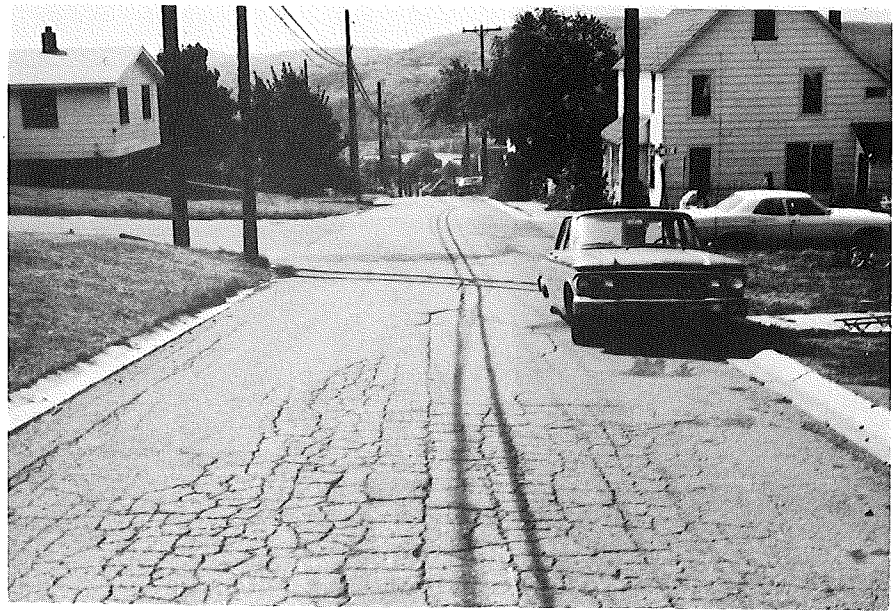
Form 1547 B (Rev. 11/70)

WESTBOUND

PINE STREET

SOUTHBOUND

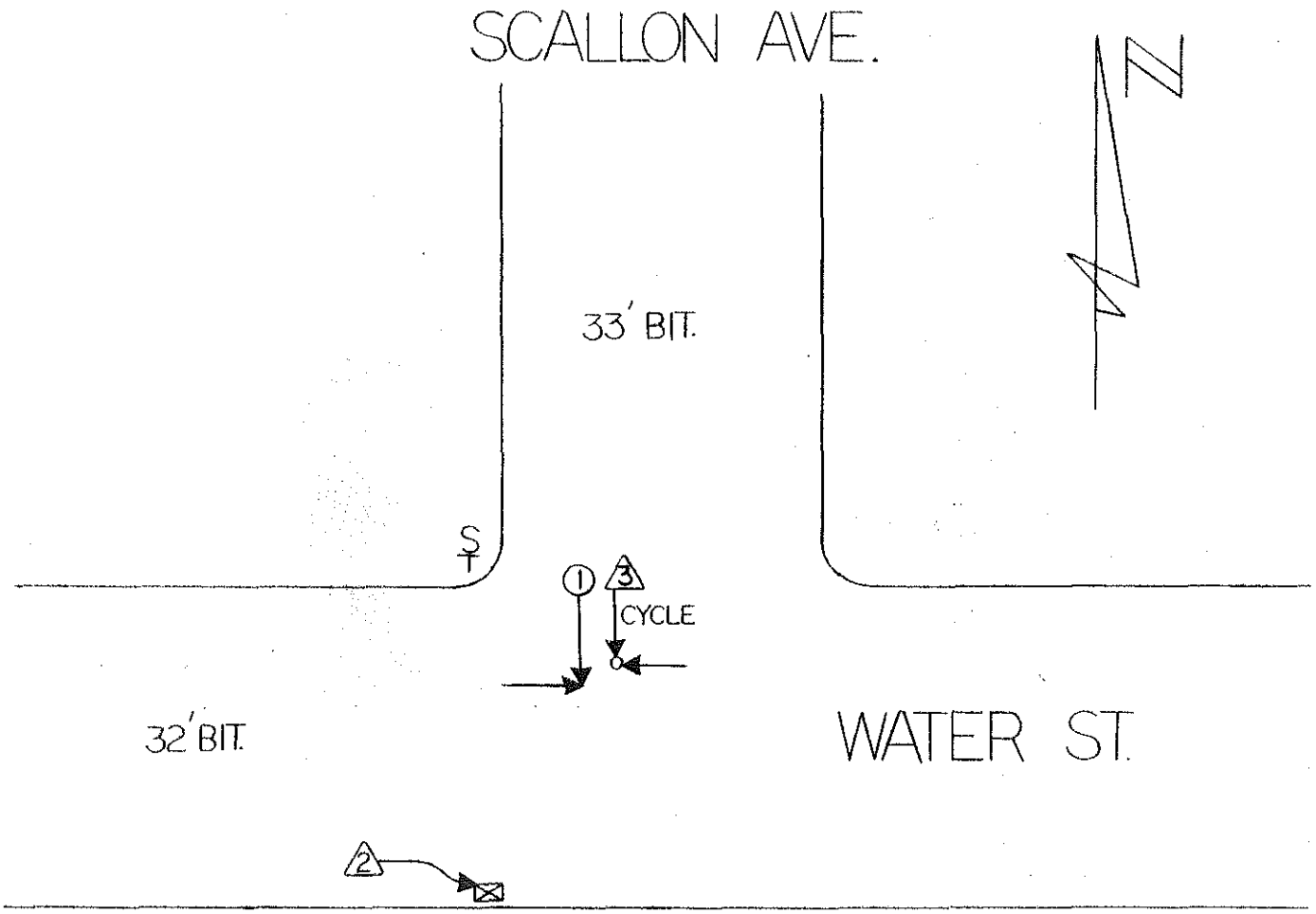
SCOTT STREET



EASTBOUND

PINE STREET

FIGURE 10a



○ 1966
△ 1967
□ 1968
⬡ 1969
⌓ 1970

FIGURE 11

LEGEND

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

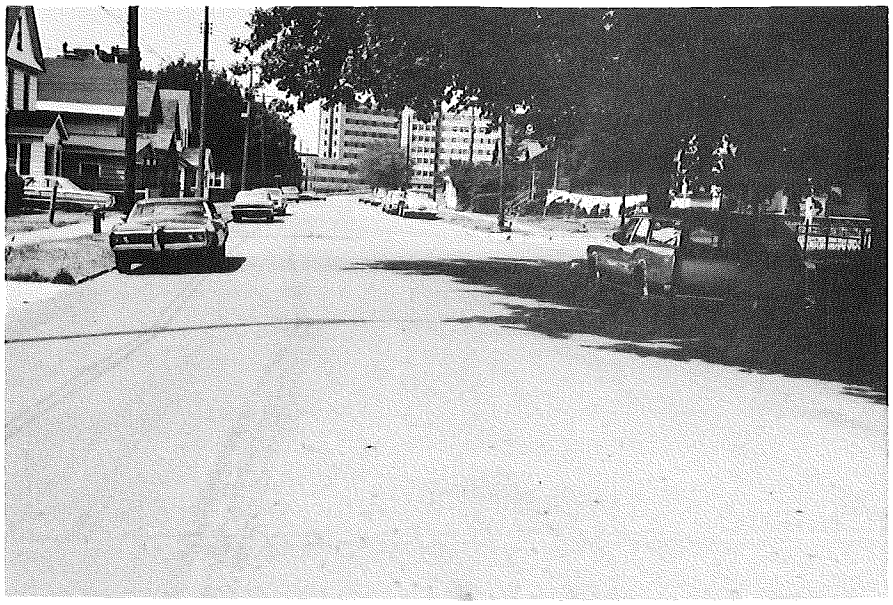
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian (X)
Tree
Out of Control
Driver Intent
Deer (V)
Violator

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location WATER ST. at SCALLON AVE.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 3 **P.D.** 2
Injury 1 (1) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 7 **Date** 7-12-71

Form 1547 B (Rev. 11/70)

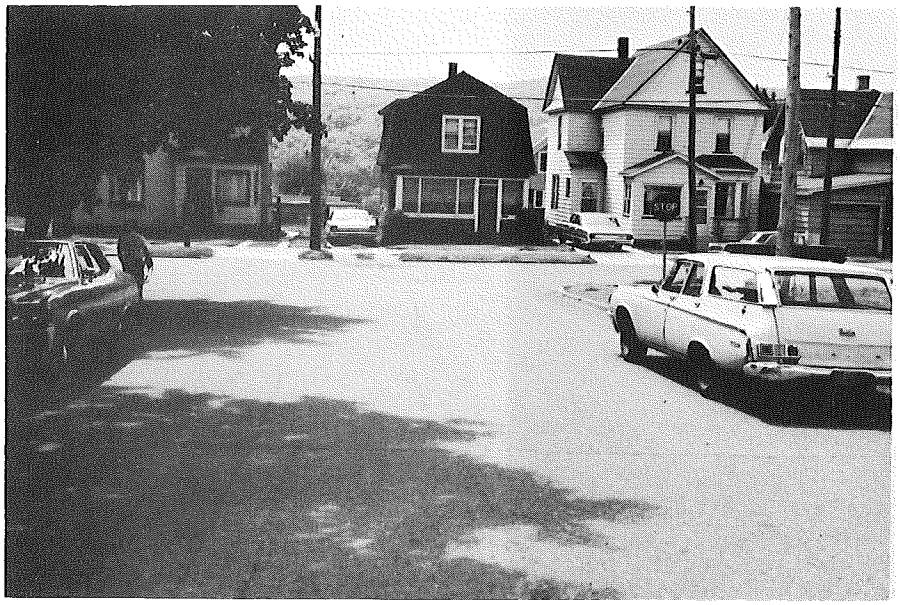


WESTBOUND

WATER STREET

SOUTHBOUND

SCALLON AVENUE



EASTBOUND

WATER STREET

FIGURE 11a

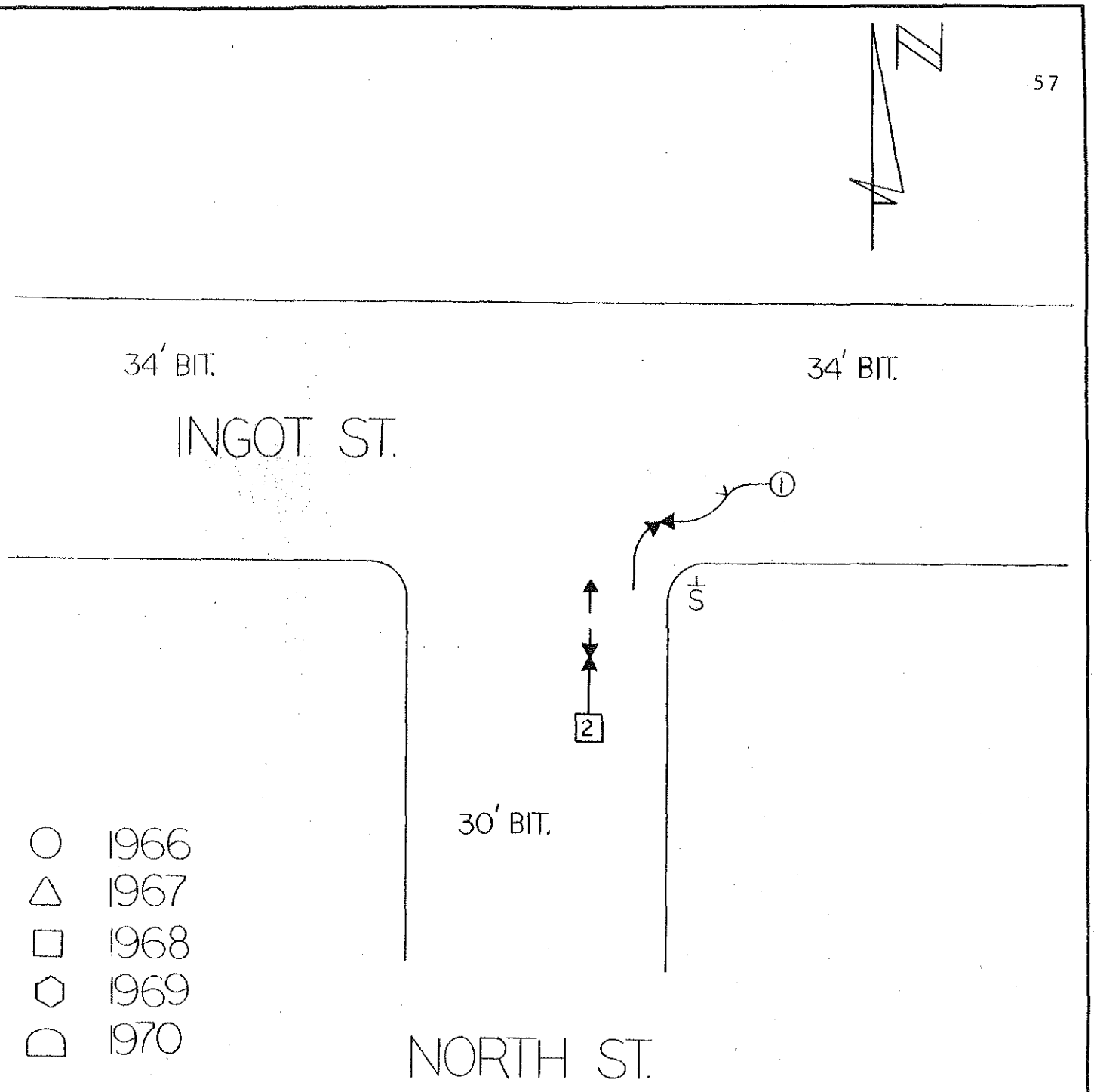


FIGURE 12

LEGEND

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location INGOT ST. at NORTH ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 2 **P.D.** 2
Injury 0 ( ) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 8 **Date** 7-12-71

Form 1547 B (Rev. 11/70)

EASTBOUND

INGOT STREET

NORTHBOUND

NORTH STREET

WESTBOUND

INGOT STREET

FIGURE 12a

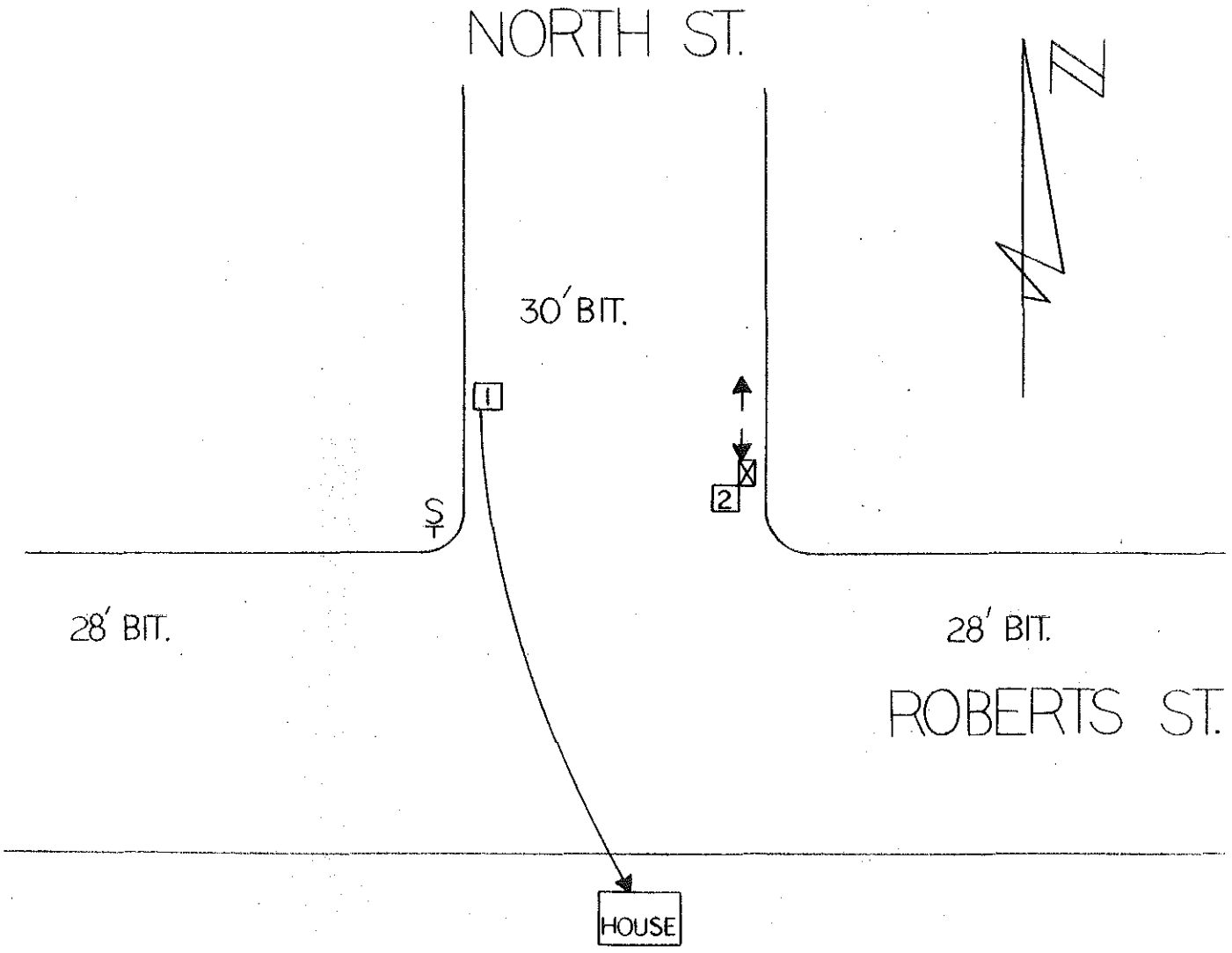


FIGURE 13

LEGEND

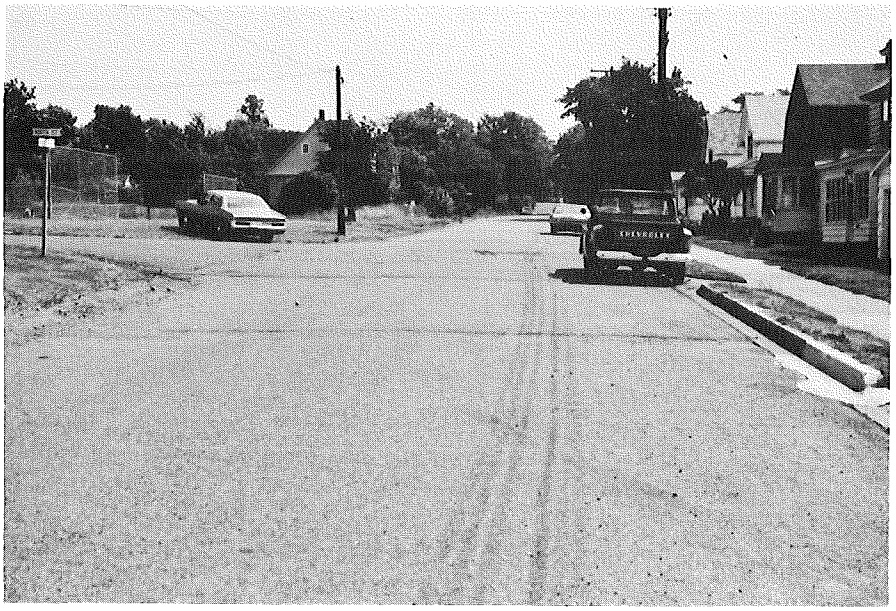
Stop & Go Signal — S, R, Y, F
Flashing Beacon
Stop Sign — S
Yield Sign — Y
Fatal
Injury
Skidding
Jackknife
Overturned
Backing
Pedestrian — X
Tree
Out of Control
Driver Intent
Deer — V
Violator — Y

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location ROBERTS ST. at NORTH ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 2 **P.D.** 2
Injury 0 ( ) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 9 **Date** 7-12-71

Form 1547 B (Rev. 11/70)



EASTBOUND

ROBERTS STREET

SOUTHBOUND

NORTH STREET

WESTBOUND

ROBERTS STREET

FIGURE 13a

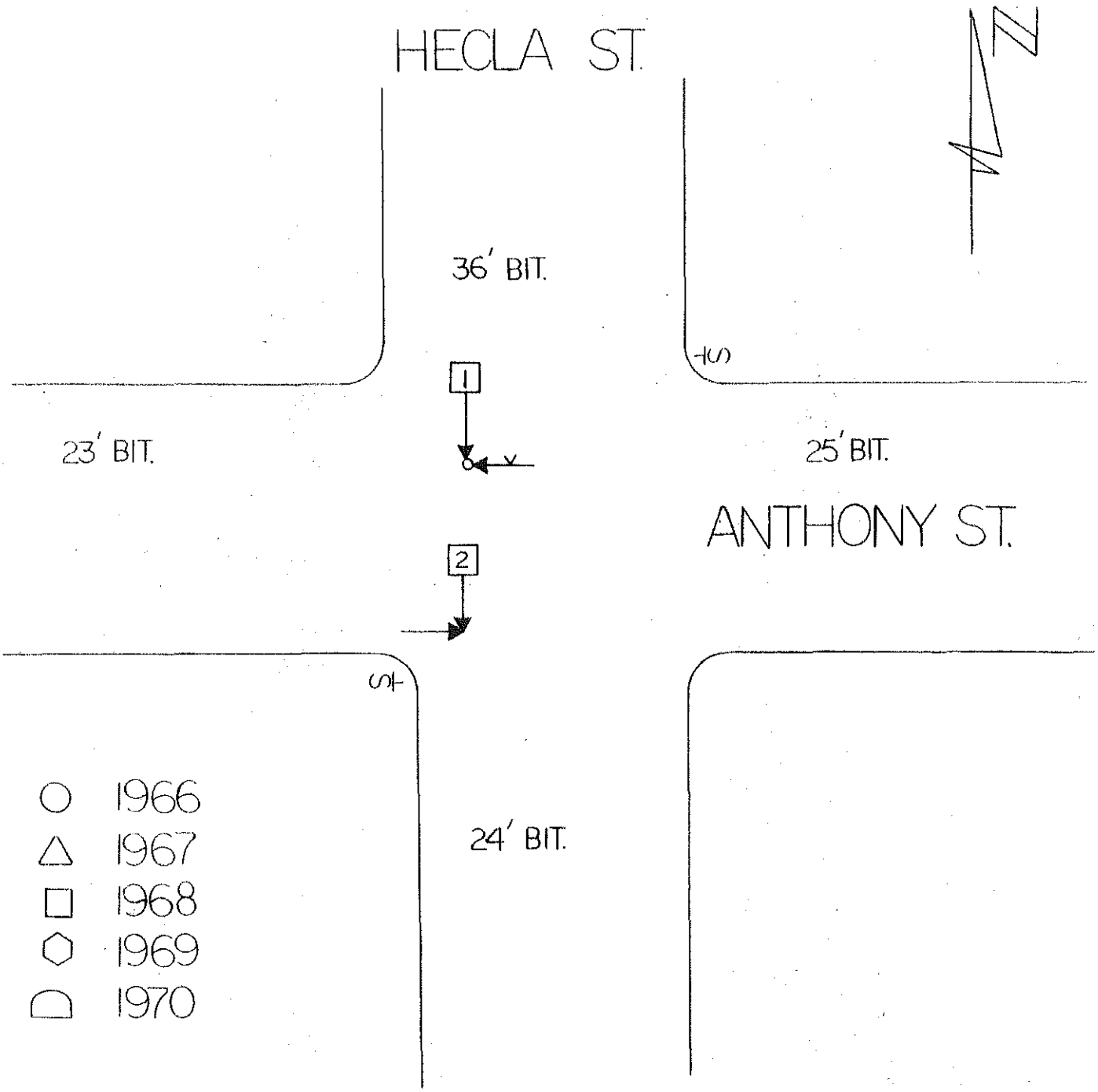


FIGURE 14

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

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location HECLA ST. at ANTHONY ST.
CITY OF HANCOCK
HOUGHTON CO.

Period: 1966 THRU 1970
Accidents – Total 2 **P.D.** 1
Injury 1 (1) **Fatal** 0 ( )
C.S. _____ **Miles** _____ **Drawn** DVW
Plan No. LOCATION 10 **Date** 7-13-71

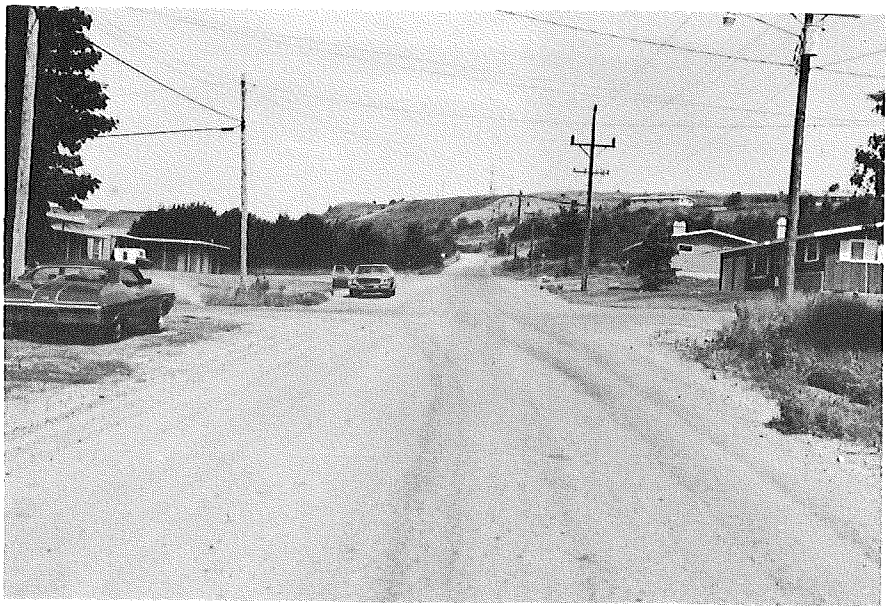
Form 1547 B (Rev. 11/70)

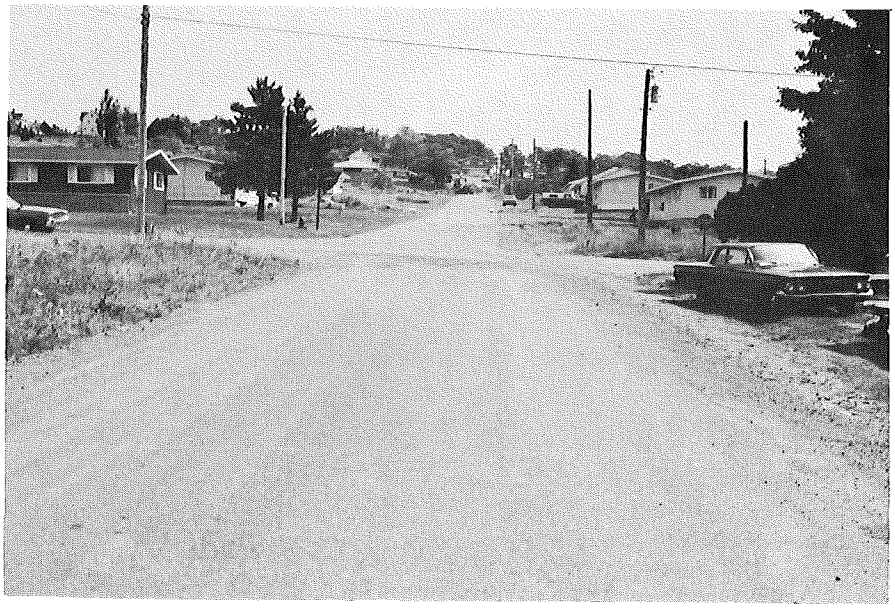
WESTBOUND

ANTHONY STREET

NORTHBOUND

HECLA STREET





EASTBOUND

ANTHONY STREET

FIGURE 14a

APPENDIX II

Section B. Regulatory Signs

Regulatory Signs shall be used to inform highway users of traffic laws or regulations that apply at given places or on given highways. They are essential to indicate the applicability of legal requirements that would not otherwise be apparent. Great care must be exercised to see that they are erected wherever needed to fulfill this purpose, but unnecessary mandates should be avoided.

Included among regulatory signs are some, like those marking the end of a restricted zone, that are related to operational controls though not in themselves imposing any obligations or prohibitions.

Regulatory signs shall be erected at those locations where the regulations apply and shall be mounted so as to be easily visible and legible to the motorist whose actions they are to govern. Signs that have been erected but are no longer applicable shall be removed. Regulatory signs cannot be expected to command respect and obedience unless the regulations thereon set forth are adequately enforced.

Regulatory signs are classified in the following groups:

(1)	Right-of-Way a. "STOP" Sign b. "YIELD" Sign	(R1 Series)
(2)	Speed	(R2 Series)
(3)	Movement a. Turning b. Alignment c. One Way d. Exclusion	(R3 Series)
(4)	Parking	(R4 Series)
(5)	Pedestrian	(R5 Series)
(6)	Miscellaneous	(R6 Series)

With few exceptions, hereinafter detailed in the specifications for individual signs, regulatory signs are rectangular in shape with the larger dimension vertical and have black legends on white backgrounds. The principal exceptions referred to are the "STOP" sign, the Yield sign, the One Way arrow, and the Parking signs.

STOP SIGN

Reflectorized

R1-1-24	24″ x 24″	(8″ letters)
R1-1-30	30″ x 30″	(12″ letters)
R1-1-36	36″ x 36″	(12″ letters)

All "STOP" signs shall be reflectorized or internally illuminated so that the shape, color, and legend will be comparable to that in day time conditions and will not produce detrimental glare to traffic.

The "STOP" sign may be supplemented by two alternating red flashing beacons in the face or by one red flashing beacon directly above the sign. Such beacon(s) shall be operated continuously.

Place at the point where it is desired to have traffic stop, or as near thereto as possible at the following locations:

1. On streets or highways intersecting a through street or highway.
2. Railroad crossing where a stop is required by order of the appropriate public authority.
3. Opposite all Stop lines applied on the pavement, except at intersections controlled by a traffic control signal.
4. At intersections where a flashing red beacon exists.

There shall be no "STOP" signs on approaches to an intersection where such approaches are controlled by a traffic control signal.

An overhead internally illuminated "STOP" sign may be used in lieu of roadside "STOP" signs.

Secondary messages shall not be used on the face of a "STOP" sign. At a four-way stop intersection, each "STOP" sign may

Section C. Warning Signs

Introduction

Warning signs shall be used for the purpose of warning traffic of existing or potentially hazardous conditions either on or adjacent to the roadway. Warning signs require caution on the part of the motorist and may call for reduction of speed or other maneuver in the interest of his own safety and that of other motorists and pedestrians. Adequate warnings are of great assistance to the vehicle operator and are valuable in safeguarding and expediting traffic. However, the use of warning signs should be kept to a minimum. Too frequent use of them or their unnecessary use to warn of conditions which are apparent tends to bring disrespect for all signs.

The conditions warranting warning signs are classified in the following groups according to the type of conditions to which they are applied:

1.	Changes in Horizontal Alignments	(W1 Series)
2.	Intersections	(W2 Series)
3.	Advance Warning of Control Devices	(W3 Series)
4.	Converging Traffic Lanes	(W4 Series)
5.	Narrow Roadways	(W5 Series)
6.	Changes in Highway Design	(W6 Series)
7.	Grades	(W7 Series)
8.	Roadway Surface Conditions	(W8 Series)
9.	Schools and Pedestrians	(W9 Series)
10.	Railroad Crossings	(W10 Series)
11.	Entrances and Crossings	(W11 Series)
12.	Miscellaneous	(W12 Series)
13.	Construction and Maintenance	(W13 Series)*

Warning signs with certain exceptions shall be diamond-shaped (square with one diagonal vertical) and shall have a "Highway Yellow" background with black legend. These exceptions are

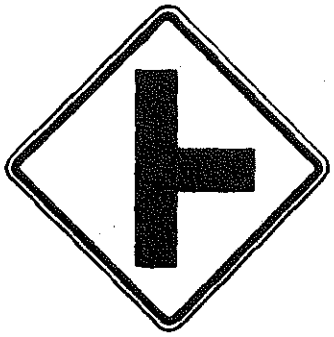
*Special warning signs for highway construction and maintenance projects are to be found in Part II of this Manual.

the Railroad Crossing signs, the Target Arrow signs, the Curve Speed panel, the Exit Speed sign, the Obstruction panel, and the Lattice Background. Other exceptions to the diamond shape are provided for in the case of temporary signs for highway construction and maintenance.

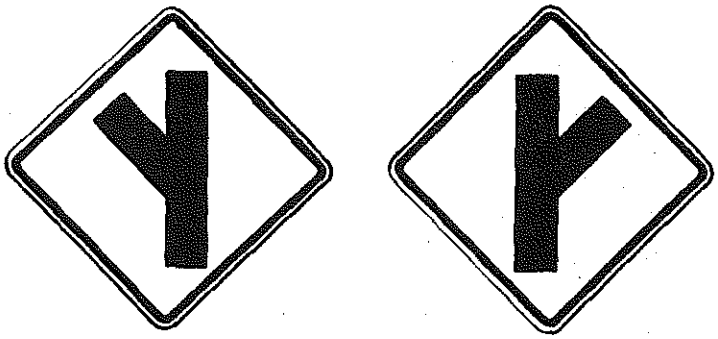
The use of warning signs should be limited to those standard signs set forth in this section. However, after the Engineer has exhausted all possibilities, it may be found that no standard sign fits the situation and warning signs, other than those specified, may be required. Such signs shall conform with the general specifications for size (30″ minimum), shape, and color of warning signs. All warning signs having significance during hours of darkness shall be reflectorized or illuminated.

SIDE ROAD SIGN

Reflectorized



W2-2-30 30″ x 30″
W2-2-36 36″ x 36″



W2-3-30 30″ x 30″
W2-3-36 36″ x 36″

The Side Road sign, showing a side road symbol, either left or right, and at an angle of either 90 or 45 degrees, may be used in advance of a side road intersection following the same criteria given for the Cross Road sign (W2-1).

The relative importance of the intersecting roads may be shown by different widths of line.

For placement see figure 1-11.

Section B. Pavement and Curb Markings

Materials

Pavement and curb markings are generally placed with paint, however, a number of substitutes, such as thermoplastics, flat units, and metal inserts may be used. Paint substitutes, when used, shall conform to the color, reflectorization, and dimension specifications for paint markings.

Paint substitutes on or in the pavement surface shall be set so that their upper surfaces are essentially flush with the pavement surface. They may be placed in continuous contact or separated by small spaces, approximately equal to the length of a single unit. Either type of line may be used where a solid line is prescribed in this Manual. Particular care shall be taken to assure accurate alinement and spacing.

Paint substitutes shall be not less than 4″ in diameter, if round, or not less than 4″ in width and of equivalent minimum area if of other shape. They shall be spaced not more than 16″ apart, center to center, on transverse lines and not more than 36″ apart on longitudinal lines. They shall have rounded surfaces that present a smooth contour to the wheels of vehicles and shall not project more than ¾ of an inch above the level of the pavement. They shall be permanently fixed in place.

The use of raised bars (commonly known as "jiggle bars") to discourage the use of certain pavement areas is allowed.

Built-in pavement markings of white or colored concrete or inlaid bricks or blocks are not adaptable to reflectorization nor to any change in layout for traffic conditions and their use is not recommended.

Large mushroom buttons or bars of cast iron or concrete several inches high, with or without reflectors, light symbols, or messages, shall not be used for pavement markings. In their application, they are in effect, curbs or islands and are restricted to such applications.

Colors

Pavement markings shall be white or highway yellow in color. The use of black between the white segments of a broken pavement line is permissible where the pavement itself does not provide sufficient contrast. This use of black does not establish

it as a standard color for pavement marking, but is only a means of achieving contrast on a light colored pavement.

White shall be used for:

1. Centerlines on two-lane rural roads and city streets.
2. Lane lines.
3. Pavement edge lines.
4. Paved shoulder markings.
5. Channelizing lines.
6. Approaches to obstructions which may be passed on either side.
7. Special markings at interchanges.
8. Turn markings.
9. Stop lines.
10. Crosswalk lines.
11. Parking space limit lines.
12. Word and symbol markings.

Yellow shall be used for:

1. Barrier lines:
   a. Double center lines on multi-lane pavements.
   b. No passing zones on two and three lane roads.
   c. Pavement width transitions.
   d. Approaches to obstructions which must be passed on the right.
   e. Excluded areas within the roadway.
2. Curb markings:
   a. Parking prohibitions.
   b. Traffic islands.

Width of Lines

Center lines, lane lines, and barrier lines shall be 4 to 6 inches wide. The width of a channelizing line may vary from a minimum of 4″ to a maximum of 12″, depending on the emphasis required. Pavement edge lines shall be 4″ wide. Transverse lines on pavements must be wider than longitudinal lines to be equally visible.

Reflectorization

All pavement markings having application at night shall be reflectorized.

Maintenance

All markings shall be maintained in effective condition at all times. The frequency of repainting depends on the type of surface, composition, and rate of application of paint, climate, and volume of traffic. Particular care should be taken, especially in the case of broken lines, to paint over the old markings as exactly as possible. Otherwise, they will appear increasingly ragged after successive repaintings.

Center Lines

A center line is used to designate the center of the traveled part of a roadway carrying traffic in both directions. Under some circumstances, as at a pavement-width transition, where parking is allowed on one side, or where a truck lane is provided, it need not be at the geometrical center of the pavement. On all major rural highways having an even number of lanes, and on many urban streets and less important rural roads, center lines are necessary and should be applied throughout the entire length of the pavement. In urban locations and on some rural roads where a continuous center line is not provided, short sections of center line are useful on approaches to busy intersections, marked crosswalks, railroad crossings, around curves or at hillcrests. When so used, the center line serves both to warn of any unusual conditions and to organize and control traffic through a hazardous or congested zone.

The center line on a two-lane paved rural highway shall be a broken white line, not less than 4 nor more than 6 inches wide. Line segments may be 20 feet in length with 30-foot gaps or 15-foot segments separated by 25-foot gaps. On four-lane undivided rural pavements, or on pavements of a greater even number of lanes, the center line shall consist of two solid yellow lines, each not less than 4″ nor more than 6″ wide, separated by a space of not less than 3″. Lines dividing a one-way roadway into two or more lanes are lane lines.

As a guide to the application of center line markings, the following warrants are suggested:

1. Center lines are desirable on all paved highways and as a minimum should be placed throughout the length of:
   a. Two-lane pavements carrying an ADT (Average Daily Traffic) in excess of 1,000 vehicles.
   b. Two-lane pavements narrower than 20′ carrying an ADT in excess of 500 vehicles.
   c. Two-lane pavements narrower than 18′ but not less than 16′ in width carrying an ADT in excess of 300 vehicles. Center lines should not be used on pavements narrower than 16′.
   d. All four, six, and eight lane undivided pavements.
2. Center lines should be placed at other locations where accident experience indicates their need, and on hard surface roads in areas where driver visibility is likely to be reduced frequently as by fog.

The center line on a two-way city street having only one lane for moving traffic in each direction shall be a solid white line. Such line shall be not less than 4 nor more than 6 inches wide.

A double solid yellow line shall be used on a two-way street with four or more lanes for moving traffic except where a single lane has been reserved for left turning vehicles or where one or more lanes are in use for reversible lane control. In such cases, a solid white line shall be used as shown in figure 3-16.

On a two way street, where it is desired to exclude traffic from a portion of pavement between traffic moving in opposite directions the double solid yellow line shall be used.

Lane Lines

Lane lines are helpful in the organization of traffic in its proper channels, and in increasing the efficiency of the use of the roadway surface at congested locations. They should be used:

1. On all rural highways with an odd number of traffic lanes.
2. In addition to the center line, on all undivided rural highways of four or more lanes.
3. At the approaches to important intersections and cross-

OFFICE MEMORANDUM

MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

NOV 10 1971

To: All Holders on Record This Date of the 1963 Edition of the "Michigan Manual of Uniform Traffic Control Devices"

From: Henrik E. Stafseth, Director, Michigan Department of State Highways
John R. Plants, Director, Michigan Department of State Police

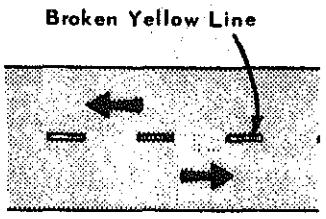
Subject: Change Memorandum No. 5

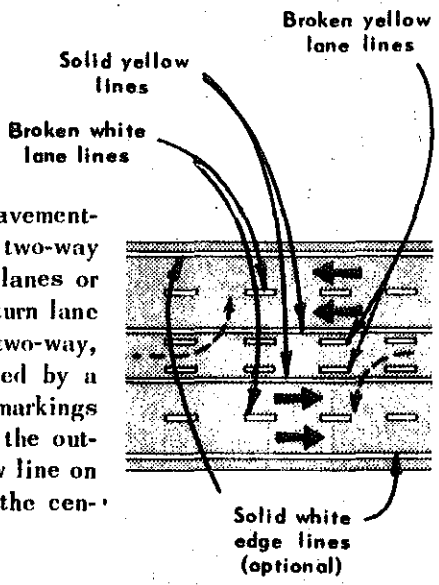
In order to more nearly conform to the design and application of traffic control devices prescribed by the 1971 edition of the National "Manual on Uniform Traffic Control Devices" (MUTCD) and to comply with recent revisions to the "Michigan Vehicle Code" (MVC), it is necessary that the following changes in the "Michigan Manual of Uniform Traffic Control Devices" (MMUTCD) be made. These and other changes to the 1963 edition of the MMUTCD will ultimately be encompassed in a revised edition of the MMUTCD. However, this Change Memorandum will serve to authorize interim changes of more urgent concern to state, county and municipal agencies.

In instances where "may" is used in this memorandum, the 1971 edition of the MUTCD and forthcoming revised edition of the MMUTCD possibly will read "shall". The purpose of using "may" in this memorandum is to temporarily permit the extended use of existing sign inventories.

The interim changes, numerically designated, follow (code numbers shown beneath sign illustrations are from the MUTCD sign coding system):

1. On all two-lane, two-way, hard-surface roadways, beginning with the 1972 pavement-marking season, any center-line marking placed shall be a broken yellow line. Line width, segment length, and the marking of "no-passing" zones shall be the same as currently specified by the MMUTCD.

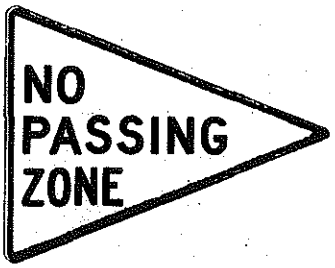




2. Beginning with the 1972 pavement-marking season, on each two-way roadway consisting of three lanes or more, where a two-way, left-turn lane is to be designated, the two-way, left-turn lane shall be marked by a single-direction, no-passing markings (4-inch solid yellow line on the outside and 4-inch broken yellow line on the inside) on each edge of the center lane.

3. By December 31, 1972, the limits of no-passing zones at vertical curves, identified by pavement markings and/or "DO NOT PASS" and "PASS WITH CARE" signs, shall be established where the minimum sight distance measured between points 3.75 feet (maximum) above the roadway surface becomes less than that specified by the table on page 281 (MMUTCD).

4. In accordance with section 257.640 (MVC), a pennant-shaped sign, having a black legend "NO PASSING ZONE" and border on a yellow reflectorized background, shall be located on the left side of the roadway opposite the beginning of each no-passing zone identified by a "DO NOT PASS" sign and/or no-passing zone pavement markings. Consideration of item #3 should be taken into account when locating these signs.



W14-3
36" x 48" x 48"