SIXTH ANNUAL REPORT
OF
MICHIGAN'S OVERALL HIGHWAY
SAFETY IMPROVEMENT PROGRAM

August 31, 1979

MICHIGAN DEPARTMENT
OF
TRANSPORTATION

This report was prepared by the Traffic and Safety, Local Government, and Maintenance Divisions, and the Railroad Contact Section, Bureau of Highways.

The opinions, findings, and conclusions expressed in this publication are those of the author and not necessarily those of the Federal Highway Administration.

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TABLE OF CONTENTS

Introduction

This is the sixth annual report covering Michigan's overall highway safety improvement program activities. Our intent is to provide the reader with an informational source outlining the various types of safety programs. Discussions of each program detailing the project selection process is included as is the evaluation of completed projects within three safety programs.

Section 1 of the report contains an overview of the subprograms within the Categorical Safety Program. It should be noted that Michigan has obligated as of June 30, 1979, 43 million of the 49 million dollars available. 1978 Highway Safety Act monies in three of the subprograms will be totally obligated by October, 1, 1979. Evaluations of completed projects within the Hazard Elimination Safety Program are also included.

Section 2 reports on the activities of Michigan's 100 percent state funded Safety (Ms) Program. Evaluations of completed MS projects are included.

The third section discusses other state and federally funded activities which include safety related work, totally or in part, with the scope of the project.

Section 3 also includes updated discussions on the Michigan Accident Location Index (MALI) and the Michigan Dimensional Accident Surveillance (MIDAS) Model.

Sections 4 and 5 present recent developments in highway safety that have been implemented; are in the process of being implemented, or are being studied for implementation within Michigan's safety activities. Included are updated discussions on a Positive Guidance Project; Broad Emergency Assistance Radio (BEAR); Network Simulation Model (NETSIM); and the Interchange Prioritization Study. Other items are also discussed in more detail.

During fiscal 1977, the Michigan Department of Transportation established an overall prioritization safety program for determining the immediate and long-range goals of the department relating to safety. We again comment on our progress during the past year.

Michigan State Safety Commission

The Michigan State Safety Commission has been involved in safety activities throughout the state since its legislative establishment in 1941. The Commission membership is composed of the Governor (honorary chairman), Secretary of State, Superintendent of Public Instruction, State Transportation Director, and Director of State Police. The Commission's purpose relative to traffic safety is (1) to consult and cooperate with all departments of state government to promote uniform and effective programs, (2) to interchange information among state departments, (3) to cooperate with federal and local governments in regulating highway traffic, and (4) to encourage safety education. In addition, the Commission acts as the advisory body to the Michigan Office of Highway Safety Planning in the development of annual highway safety plans and programs; proposes highway safety program priorities; and takes an active role in the support of highway safety legislation. The Commission has three primary accomplishments annually: (1) improved awareness and liaison among persons, affiliated with the commission, who have a continuing professional interest in traffic safety, (2) discussion among the commissioners on pending or proposed traffic safety legislation, and (3) monthly monitoring of crash trends.

In order to assist the Commission in accomplishing its objectives, the Michigan Traffic Safety Information Council was established in 1970. The information council is responsible for coordinating the activities of their member departments and carrying out the public information and education activities of the Commission. In addition, the information council is responsible for the development of cooperative public information and education efforts between public and private sector agencies.

Recently the Commission has further expanded its available safety resources with the establishment of a Professional Advisory Panel and Regional Steering Committees. The professional advisory panel is composed of highway safety professionals and selected private citizens with an interest in highway safety. The advisory panel cooperates in the conduct of Commission programs, investigates traffic safety problems, and makes recommendations to the Commission. Members of the advisory panel may be asked to serve on special committees, task forces, or other groups in conducting Commission programs. The Commission may refer specific problems to the advisory panel to seek and recommend solutions.

The Commission implemented the regional steering committee concept to develop a means for disseminating information and coordinating traffic safety programs on a statewide basis. Regional steering committees composed of local representatives of the four major departments which compose the Commission, were formed throughout the state. The main objectives of the regional steering committee are as follows:

1. To keep the regional committee aware of the positions and programs of the State Safety Commission.

2. To create an opportunity for the regional representatives of the various departments to become acquainted and develop a basis for cooperation and coordination of activities.

3. To discuss traffic safety problems and programs within their specific regions.

4. To act as spokesman for the State Safety Commission within the region.

A major activity of the regional steering committees is to provide a nucleus of professional expertise around which to develop or support local organizations.

The State Safety Commission and its organizational components are a unique concept to the state of Michigan. The Commission is promoting highway safety in Michigan through the cooperation of the commissioners and their departments or agencies and such other public and private organizations as may be interested in highway safety. The principle intent of the Commission is to move toward the greatest possible level of transportation safety for citizens and visitors to the state of Michigan.

Michigan's Overall Prioritized Safety Program

1. Interstate Freeway System

   A. Continue the "Yellow Book" program on the interstate system.

      To date, 69 percent of the 935 miles requiring upgrading by this program has been completed, while 30 percent has been programmed and is in the design stage and 1 percent is unprogrammed or inactive. However, since safety guidelines change periodically, it is often necessary to make safety improvements to some of the earlier Yellow Book projects. This work consists mainly of bridge rail replacements, ramp and crossroad safety improvements and replacement of Type A guardrail.

   B. Develop and implement an improved Interstate Safety (Is) spot improvement program based upon accident data to provide cost-beneficial expenditures (priority ranking of interchanges).

      Phase 2 of the Interchange Prioritization Study outlines the procedures to be followed in the analyzation/prioritization process. This phase addresses five steps: alternate solutions, estimated costs and benefits, cost effectiveness of the alternate solutions, implementation, and project evaluation. Currently we are in step 4 of this process with two interchange studies.

      The Michigan Accident Location Index (MALI) program is now totally operational on the state's total trunkline system and the local road system in all 83 counties. Through this program we can identify high accident locations on all roadways.

   C. Develop and implement a program sensitive to run-off-roadway accidents to allow cost-beneficial expenditures using interstate funding.

      We have developed a prioritization program using a five-year accident history for the total freeway system in Michigan. Attention is focused on accident severity for segments of roadways. We can analyze any type of accident pattern that occurs over that five-year period which includes run-off-roadway type accidents. However, we cannot determine what side (left or right) the run-off-roadway accidents occur.

2. Noninterstate Freeway System

   A. Develop and implement an improved Michigan Safety (Ms) spot improvement program based upon accident data.

      Now that the initial Michigan Accident Location Index (MALI) program is completed on all road systems within the state and Stage I of the MIDAS model is operational, the department can improve the effectiveness of the Ms program. For instance, we now have the capability to rank trunkline locations by type of

accidents. Our efforts can therefore be focused on concentrations of correctable accident patterns occurring over a 5-year or greater period.

B. Develop and implement a program sensitive to run-off-roadway accident data using available funding. See response to 1C.

C. Complete "Yellow Book" work with available funds other than Ms.

To date, 193 miles or 39 percent of the total 500 miles of noninterstate freeway system that requires upgrading has either been completed or let to contract.

3. Free Access Trunkline System

A. Develop and implement an improved Michigan Spot Safety (Ms) Improvement Program based upon accident data. See response to objective 2A.

B. Insert greater safety awareness into MCP (minor construction program).

This is a continuous activity and has been implemented as a result of coordinating efforts of a departmentwide highway safety steering committee.

C. "Yellow Book" work (Roadside Safety Improvement Program).

a. Perform Task 1 on the free access trunkline system. Task 1 includes the installation of buffered-end sections to eliminate straight guardrail endings.

Work authorizations have been issued on all noninterstate trunklines to install buffered-end sections. The work is being completed by state forces and local contract agencies and is 88 percent completed.

b. Perform Task 2 on the free access state trunkline system. Task 2 includes upgrading guardrails proximate to structures, replacement of inadequate bridge railings, or retrofitting guardrails to the existing railing system.

A separate 10-year program had originally been developed for Task 2 work. This program is now being accelerated by including this work within other program projects such as resurfacing, shoulder reconstruction, and bridge overlays and is usually funded with 100 percent state funds. It is estimated that the total cost of this program will be $15,000,000.

c. Perform Task 3 on the free access state trunkline system. Task 3 includes improvement of the roadside to current "Yellow Book" standards. This work is to be completed with available funds other than Ms.

Due to lack of funds, few specific Task 3 projects have been initiated. However, guardrail modernization work is currently being included with road resurfacing projects as resources permit. The costs for Task 3 are included in the category of Other State Funded Projects on page 18.

4. Nontrunkline

A. Accelerate the development of the Michigan Accident Location Index (MALI).

The MALI project is currently totally operational on the state trunkline system and the local road system in all 83 counties. The MALI project is now adding at-grade railroad crossings to the county indexes. This addition has a targeted completion date of December 1979. Currently 53 county indexes have the railroad crossings included.

B. Develop and implement a spot safety improvement program utilizing available funds.

The Traffic Engineering Services program provides the capability of identifying, analyzing, and correcting problem accident locations on the local road system. During fiscal 1979, 89 spot locations in 33 different local jurisdictions were reviewed, analyzed, and recommendations issued. The completion of the MALI project on the local system will have a positive effect on this program.

C. Develop and implement run-off-roadway accident program utilizing available federal funds.

A specific program aimed at the run-off-roadway problem has been initiated with the completion of the MALI project on the local road system. We currently have several realignment type projects being processed that directly relate to the run-off-roadway problem.

D. Encourage the development of local awareness and expertise in highway safety activities.

Traffic safety seminars are continually being offered at the beginning and advanced levels by both Wayne State and Michigan State University to local officials responsible for highway safety in their community. In addition, new courses are being developed to serve the needs of graduate engineers embarking on a career in traffic engineering.

As another means of creating local awareness, Regional Safety Committees have been established in each of the department's nine districts. Membership consists of representatives from the same state departments that are represented on the State Safety Commission plus an engineer from the affected district traffic office.

The purpose of these committees is to establish a two-way communication system between the Regional Safety Committee and the local officials within their respective district. Each committee operates independently with meetings scheduled generally on a bimonthly basis.

PROGRAM SUMMARY
FISCAL YEAR 1978-79

		Total Costs
FEDERAL CATEGORICAL SAFETY FUNDS-OBLIGATED		
Rail-Highway Crossings		$ 7,581,012
Pavement Marking Demonstration Program		1,896,066
High Hazard Obstacle		3,682,056
Safer Off-System Safety		9,477,997
Special Bridge Replacement		4,966,463
Transitional Quarter Funds		9,707,900
	Total	$ 43,311,494
OTHER FEDERAL FUNDS		
Interstate Safety (Is)		1,679,999
Yellow Book Program		7,569,340
Urban Programs		25,005,936
Federal Aid Primary Program		15,490,052
Federal Aid Secondary Program		6,650,888
Federal Aid Off System		1,161,607
	Total	$ 57,557,822
STATE FUNDED SAFETY PROJECTS		
Ms - safety program		$ 3,160,513
OTHER STATE FUNDED PROJECTS (Safety Items Only)		
Mb - bituminous resurfacing		$ 7,984,918
Mbr - bituminous reconstruction		7,480,384
M - miscellaneous construction		7,034,126
Mnm - nonmotorized vehicle facility		533,335
Msh - shoulder edge treatment		5,023,803
Mbd - bridge deck		581,135
	Total	$28,637,701
SPECIAL PROJECTS		
Impact Attenuators (cost included in Ms and HH totals)		$ 1,137,350
STATE-LOCAL MATCHING MONIES		16,529,620
	Total Safety Expenditures	$149,197,150

SECTION 1

THE 1976 AND 1978

HIGHWAY SAFETY ACTS IN MICHIGAN

PART 1

CATEGORICAL SAFETY PROGRAM

FISCAL YEAR 1978-79

The 1976 and 1978 Highway Safety Acts in Michigan

Michigan has during the past July 1, 1978, to June 30, 1979, fiscal year obligated over 66 percent of the funds apportioned by the 1976 and 1978 Highway Safety Acts for the Categorical Safety Programs. We are still retaining monies within various discontinued subprograms to provide for possible active project overruns.

Each subprogram of the Categorical Safety Program showed increases over last year's reported amounts. The largest increases were in the Hazard Elimination Program, 351.9 percent, and the Special Bridge Replacement Program, 263.4 percent. These programs were followed by the Rail Highway Crossings Program and the Pavement Marking Demonstration Program, both with 36.8 percent increases.

Evaluations of completed Categorical Safety Program projects included in this report show a time of recovery (TOR) factor of 5.8 years. Evaluations of completed Michigan Safety (Ms) projects have a TOR of 4.01 years. Anticipated National Safety Cost figures for 1978, the last calendar year in the after period, were used for both types of projects.

Administrative responsibilities for the categorical safety subprograms included in the 1976 Highway Safety Act are assigned to the Michigan Department of State Highways and Transportation's Local Government and Traffic and Safety Divisions. The Local Government Division processes most requests that originate for off-trunkline projects. The Traffic and Safety Divison processes all trunkline projects and those that are submitted through the division's Community Assistance Program for off-trunkline projects. The Office of Highway Safety Planning and the Michigan Department of State Police act as advisors due to a federally funded Section 402 grant for the Community Assistance Program.

The Transition Quarter (TQ) funds that Michigan received when the fiscal year was changed from a July 1 to June 30 period to an October 1 to September 30 period, has allowed Michigan to obligate an additional $17 million towards safety related work items. This fund has allowed Michigan greater flexibility for completing more projects within a shorter time frame.

Following is a more detailed discussion of each subprogram of the Categorical Safety Program and an evaluation of completed projects.

Rail Highway Crossings

This subprogram of the Categorical Safety Program contains two separate programs; Rail-Highway Crossing Protection (RRP), and Rail-Highway Crossing Safety (RRS).

The purpose of the RRP program is to eliminate hazards associated with rail-highway crossing through separation, reconstruction of existing structures, or the elimination of grade crossings by consolidating railways. Construction costs may qualify for 100 percent federal funds while right-of-way costs are limited to a maximum of 70 percent federal funds. The cost to the railroad cannot exceed 5 percent. Title 23 Section 104 requires that

10 percent or less of all funds apportioned to a state during any fiscal year may be used for this program.

The purpose of the RRS program is directed at reducing accident severity through the installation of standard signs, pavement markings, train-activated warning devices, crossing illumination, improvements of the crossing surface, and the consolidation or separation of crossings. All signing and pavement markings must conform to the MMUTCD. All improvements are to be determined from a priority listing in accordance with methodology in the Federal Aid Highway Program Manual. At least 50 percent of authorized funds are available for the above project types.

Administrative responsibilities for this section of the Categorical Safety Program are jointly shared by the department's Local Government Division and the Bureau of Highways' railroad contact engineer. Projects on the local roads system are administered by the Local Government Division while projects on the state trunkline system are administered by the railroad contact engineer. The safety of all rail-highway crossings within the state is shared with the department's Railroad Safety Unit, the railroads, and local highway authorities.

The Rail-Highway Crossing Improvement Program for fiscal year 1979 obligated $7,581,012 of 1976 and 1978 HSA monies. Since enactment of the 1973 HSA, the department has obligated a total of $22.3 million.

The criteria used in the railroad priority determination sheet on page 1-11 does not consider accidents that may have occurred. However accident potential is considered in the charts, found on pages 6 through 9, for the various types of crossing protection. These charts provide an exposure factor for the crossing based on vehicular traffic versus the type of protection present with the resultant answer being expressed as probable vehicle-train accidents annually. Projects which consolidate several railway lines to a section of common railway provide the greatest cost benefit ratio when using these charts. Locations in urban areas also have a people factor included because of pedestrian traffic. We are computerizing the data contained in the accident potential charts and the priority determination sheet plus actual accident data. Through the analysis capabilities of the computer program, when operational, a more meaningful priority assignment can be determined.

Pavement Marking Demonstration Program

The purpose of this program is to show that vehicle and pedestrian safety can be increased through the standard application of pavement markings.

This program provides 100 percent federal funding for surveying no passing zones and the marking of any paved public highway except for interstate routes. Paved highways that had not been previously marked or had markings which were not in accordance with the MMUTCD were eligible. All costs for materials, labor, equipment rental or depreciation charges required to place markings initially and renew markings over a two-year period for evaluation purposes are funded. Higher type pavement markings such as hot applied thermoplastic materials are funded but require a complete cost-effectiveness analysis. Also eligible are costs incurred for data collection, analysis, and evaluation activities.

The department's Local Government Division has administrative responsibility for this program with the Traffic and Safety Division acting in an advisory capacity.

The initial participation among Michigan's 83 counties was 95 percent. The requests for renewal paintings continues at approximately the same rate with the 79 counties participating in the program.

High priority was given to marking all unmarked two-lane rural highways and all no-passing zones on roads and streets under local (county) authority. Pavement marking standards in the Michigan Manual of Uniform Traffic Control Devices 1973 edition (MMUTCD) were followed in addition to the requirements found in Volume 6, Chapter 8, Section 3, Subsection 5, of the Federal Aid Highway Program Manual.

Federal standards required that centerline markings were to be applied on all paved roadways 16 feet wide or wider that carried an average of 250 or more vehicles per day. The MMUTCD adds to the pavement width requirement that a prevailing speed of greater than 35 mph must also exist. The federal standards for edgeline marking requiring a paved surface 20 feet or wider with an ADT of 250 or more vehicles, were compiled with all routes marked were chosen by the local authorities based on the above-mentioned criteria.

By June 30, 1979, a total of $7,603,883 in PMS funds had been obligated, $1,896,066 during fiscal year 1978. The total allocated amount for fiscal 1979 will be expended prior to September 30, 1979.

High Hazard Obstacle/Roadside Obstacle

Sections 152 and 153 of Title 23 United States Code provide funding to reduce the hazards at locations on the federal aid system identified as high-accident locations and to eliminate or shield potentially hazardous roadside obstacles.

The project types eligible for Section 152 funding include, but is not limited to, intersection improvements, cross section modifications, skid resistance treatments, and alignment changes. It is intended that these projects be spot improvements, not major reconstruction at lengthy sections of roadway.

Project types eligible for funding under Section 153 include, but is not limited to, replacement of nonyielding supports, relocation of roadside obstacles such as utility poles and deep ditches; eliminate exposed bridge end posts, culvert ends, bridge abutments or piers, and guardrail endings; improve guardrails to current standards; and eliminate narrow bridges.

This department's Local Government Division has the administrative responsibilty for locations that are off the state trunkline system with the Traffic and Safety Division acting in an advisory capacity. Locations on the state trunkline system are administered and engineered by the Traffic and Safety Division.

Local agencies, through the efforts of the department's Local Government Division and Community Assistance Program, are submitting locations which

are more cost beneficial. Projects being submitted are showing 15 years or less of cost recovery time.

Project selection on all roadway systems is improving because of the availability of more computerized accident data. With the development of computerized correctable accident pattern data, we can be more selective in choosing various types of improvements. The average cost TOR (time of return) for projects on the trunkline system is approximately six years. See the completed evaluations of projects on pages 12 and 13. The reason for the low TOR can be attributed to a screening process which takes the following factors into consideration:

A. Number and severity of accidents.
B. Presence of "correctable patterns" and reoccurring patterns.
C. Practicality - potential for improvement, size of project, consideration of potential right-of-way and/or drainage problems, and necessity of securing participation from municipalities.
D. Operational considerations such as increased capacity, providing for left and right turns, roadside control, and removal of obvious "bottlenecks."
E. Area factors - potential growth, traffic generators, and uniformity of treatment with a route.
F. Consideration is given to expanding an intersection to its "ultimate cross section" in selecting appropriate treatment and project limits.
G. Operational changes rather than reconstruction, such as signs, signals, or pavement markings.

The 1978 Highway Safety Act appropriations to Michigan were $4,782,938 in Fiscal Year 78 and $4,775,634 for Fiscal Year 79. As of June 30, 1979, a total of $36,248,997 had been obligated since enactment of the 1973 HSA with $9,477,997 being obligated during Fiscal Year 1979.

Safer Off-Systems Program

Sections 101(e) 219 and 315 of Title 23 United States Code makes provisions which enable state and local road officials to construct and improve off-system roads and bridges. Projects which significantly contribute to the safety of the traveling public are considered high priority.

Toll roads and roads under the jurisdiction of and maintained by a public authority or are not available for public travel are not eligible for project funding.

The selection of projects should be low cost corrections of high hazard locations, elimination of roadside obstacles, structure widening, or the installation and upgrading of traffic control devices. The highway agency distributes available funds throughout the state and cooperates with local road officials in the selection of projects to maximize the funds available.

The department's Local Government Division has the administrative responsibilities for this program. The Traffic and Safety Division provides traffic engineering consultation as needed.

During fiscal 1979 $5,282,505 of SOS funds were obligated which represented the remaining balance of Michigan's 1976 HSA allocation. Additionally the Railroad Off-System Program (RRO) accounted for another $4,195,492 for a total of $9,477,997.

We currently have a backlog of $11 million of projects eligible for SOS funding. Approximately $6 million of this total has already been submitted for federal approval. The remaining $5 million has not been submitted for federal approval because Congress did not make an allocation as part of the 1978 HSA. We strongly urge that this type of inaction does not continue.

Special Bridge Replacement Program

Section 144 of Title 23 of the United States Code provides financial assistance to replace bridges over waterways or other topographical barriers that are considered significantly important and are unsafe because of structural deficiencies, physical deterioration or functional obsolescence. The program in Michigan is administered by the department's Local Government Division.

Bridges under local jurisdiction have been surveyed for structural adequacy and are ranked for priority of replacement in accordance with critical need based on the local agency's financial resources, importance of the bridge to the area, and the structural condition of the existing bridge. From 1972 through June 30, 1979, $20,139,694 in Federal Aid funds have been obligated. During fiscal 1979 a total of $4,966,463 was obligated.

We currently have a backlog of approximately 330 structures to be improved. A typical improvement costs between $200,000 and $250,000 and occasionally exceeds $1,000,000. Additional funds required to improve all currently listed deficient structures, less additional inflationary costs, would be approximately $53,000,000.

Michigan received $9,123,207 from the Federal Bridge Replacement Program in 1979 and expects to receive at least that amount for the next three years from that program.

Also, $5,000,000 per year is allocated from the state's gas and weight tax for critical bridges.

From these two programs, Michigan expects to participate (10%) in the construction of approximately 65 bridges this year.

Transition Quarter Funds

Michigan extended the 1975-76 fiscal year from June 30, 1976, to September 30, 1976 to coincide with the October 1 to September 30 federal fiscal year. As a result of this extension, Michigan received a fifth quarter allotment (Transition Quarter TQ) of federal funds to be used as needed. During fiscal 1979 Michigan obligated $9,707,900 of TQ funds for a 3-year total of $44,815,554. This money was mainly directed to safety type projects.

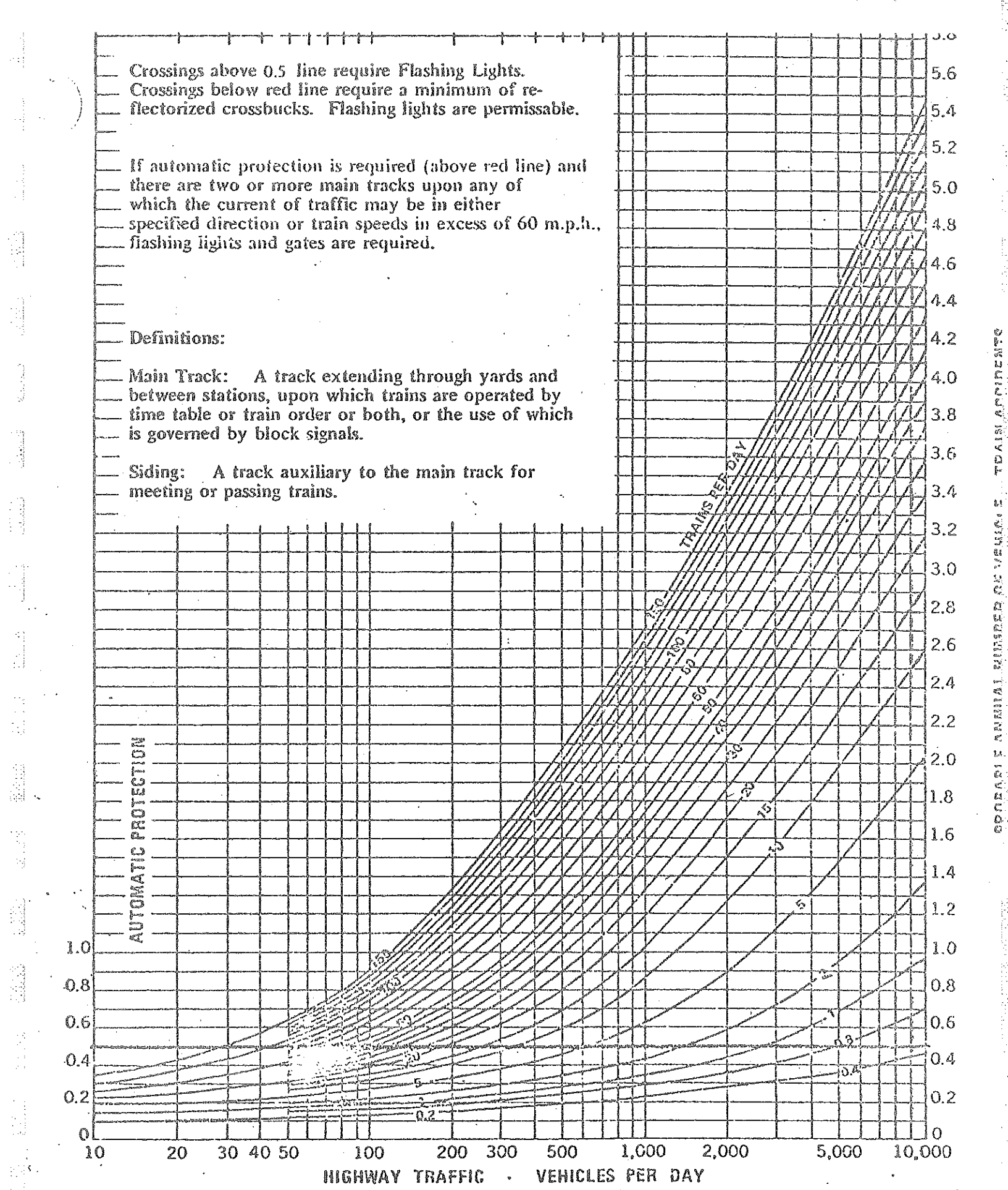
HHS
SECTIONS 203, 230
RAILROAD PRIORITY
DETERMINATION

DATE: _____

CROSSING - _____

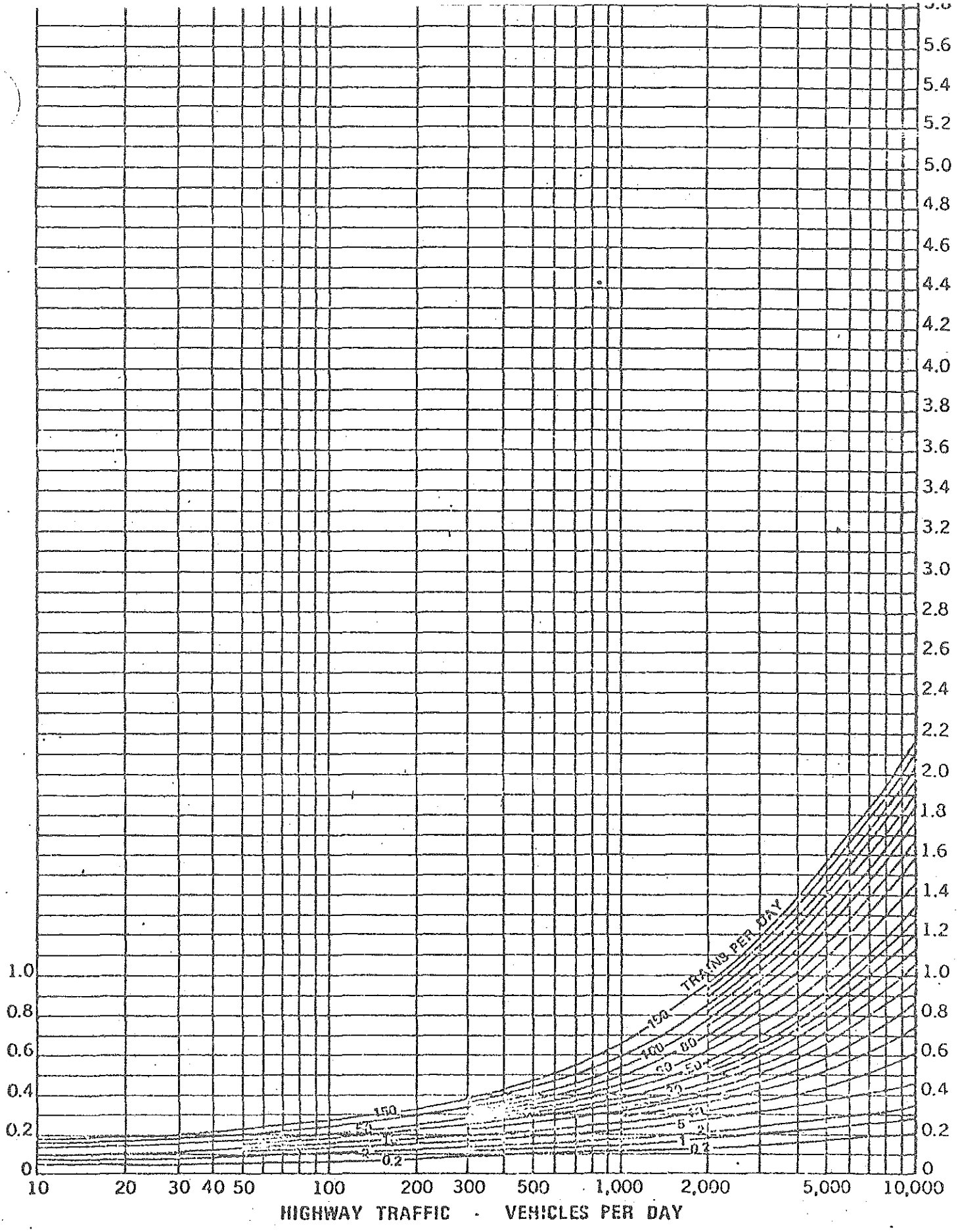
Determination of Points

CRITERIA	MAX. POINTS	RELATIVE INFORMATION	ACTUAL POINTS	REVISED POINTS
MPSC - (Priority & Order)	40			
Speed	10			
Chart - ADT, No. Trains	20			
Alignment & Sight -	10			
No. Tracks -(Max. For 2)	5			
Condition of Approaches	5			
School Busses -	5			
No. Trains -	5		_____	_____
TOTAL POINTS				
Other Criteria - Circumstances which affect priority, not included above. 10 Points.				
TOTAL POINTS			_____	_____



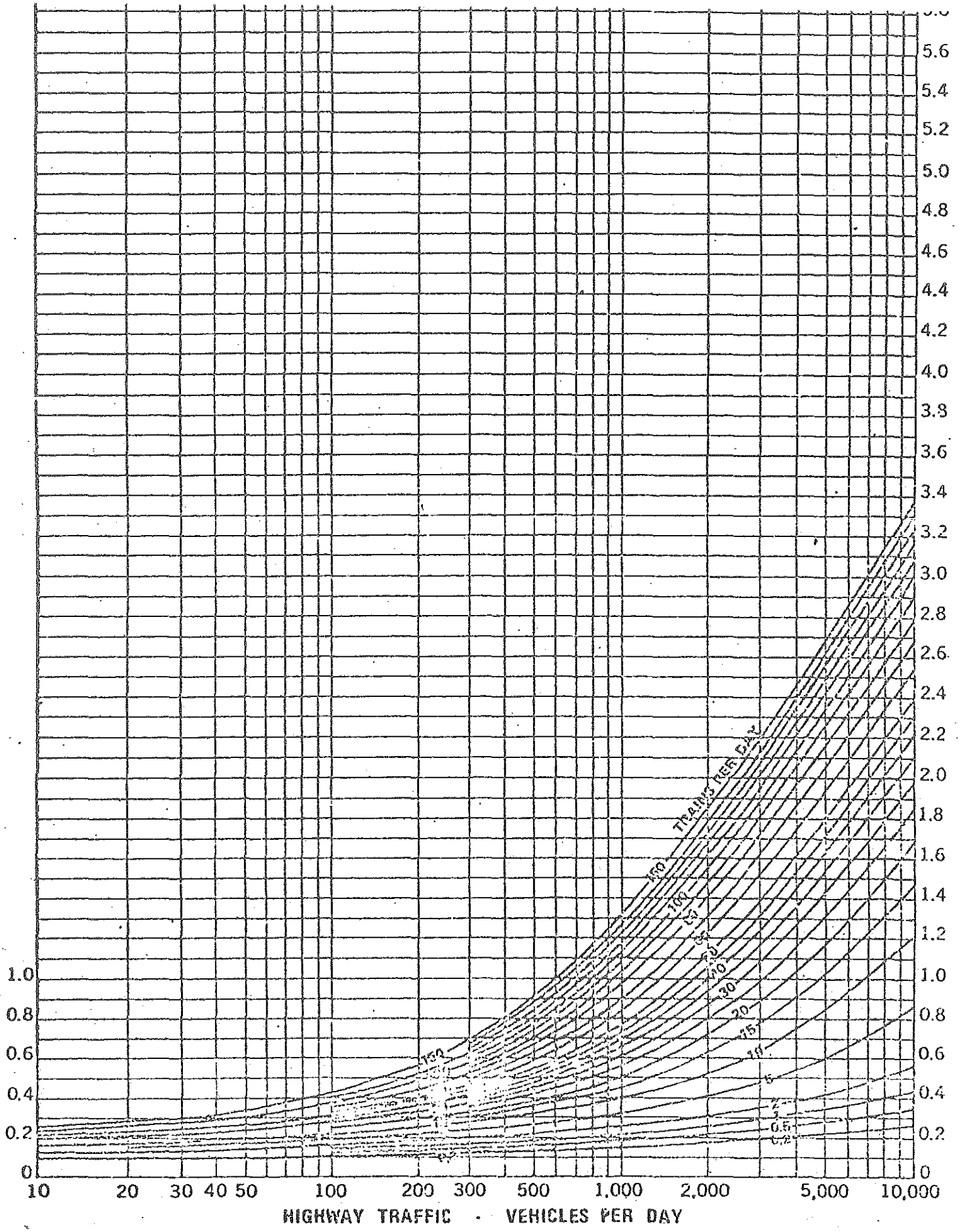
PROBABLE ANNUAL NUMBER OF VEHICLE - TRAIN ACCIDENTS

AT GRADE CROSSINGS PROTECTED BY SIGNS ONLY



PROBABLE ANNUAL NUMBER OF VEHICLE - TRAIN ACCIDENTS

GRADE CROSSINGS PROTECTED BY AUTOMATIC GATES



AT GRADE CROSSINGS PROTECTED BY FLASHING LIGHTS

TABLE 3

STATE _____ FIPS CODE (Alpha)

PAVEMENT MARKING DEMONSTRATION PROGRAM

ANNUAL REPORT 1979

QUANTITIES AND COST OF MARKINGS PLACED

TYPE OF MARKINGS PLACED	QUANTITIES AND COST ($1,000) OF MARKINGS PLACED, *JULY 1, 1978 TO JUNE 30, 1979										Total Quantities and Cost of Markings Placed July 1, 1978 To June 30, 1979		Cumulative Total Quantities and Cost of Markings Placed to June 30, 1979	
	FEDERAL-AID SYSTEM						OFF THE FEDERAL-AID SYSTEM							
	Urban		Primary		Secondary		State Jurisdiction		Local Jurisdiction					
	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost
Centerlines Only					5,397	701,508.00			3,452	420,627.20	8,849	1,122,135.20	32,253	4,451,295.20
Edgelines Only					4,594	545,574.60			1,923	228,356.25	6,517	773,930.91	29,428	2,437,610.91
Both Centerlines and Edgelines													3,565	576,728
Sub-Total					9,991	1,247,082.66			5,375	648,983.45	14,366	1,896,066.11		6,888,906.11
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
Railroad-highway Grade Crossings					324	26,700.16			315	25,959.15	639	52,659.31	2,686	221,349
Pedestrian Crossings 1/				Cold Plastic 181		18,157.92			28	2,809.96	209	20,967.88	880	88,286
Other School				Cold Plastic 184		50,182.32		Cold Plastic 36		9,818.28	220	60,000.60		
				Reg. Paint 68		4,624.00			34	2,312.00	102	6,936.00	1,352	270,262
Sub-Total						99,664.30			413	40,898.39	1,170	140,563.79	4,918	579,897
GRAND TOTAL						1,346,746.96				689,881.84		2,036,629.50		7,468,803

*If reporting period is other than July 1, 1978 to June 30, 1979 indicate dates: _____

1/ Show number of intersections in "Number" column.

What percent of the total miles marked during the year ending June 30, 1979 was marked for the first time? 0 %

TABLE 1

STATE _____ FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1979
PROCEDURAL AND STATUS INFORMATION

Line	Highway System	HIGHWAY LOCATION REFERENCE SYSTEM		TRAFFIC RECORDS SYSTEM		HAZARDOUS LOCATIONS	
		Miles Covered (Percent) (1)	Expected Completion (Year) (2)	Volume Data (Percent) (3)	Highway Data Correlation (Y,N,U) (4)	Location Criteria *(5)	Project Priority Selection *(6)
101	Interstate	100		100	U	AERSZ	CEIPR
102	State - F.A.	100		100	Y	AERSZ	CEIPR
103	State - Non-F.A.	100		100	Y	AERSZ	CEIPR
104	Local - F.A.	100		100	U	AERS	CEIPR
105	Local - Non-F.A.	100		100	U	AERS	CEIPR

Line	Highway System	ROADSIDE OBSTACLES Project Priority Selection *(7)	SKID IMPROVEMENT Project Selection *(8)	HAZARDOUS BRIDGES Project Selection *(9)	RAILROAD-GRADE CROSSINGS					
					Inventory Update *(10)	Project Priority Selection *(11)	Compliance With MUTCD			
							Crossings Upgraded **7/1/73-6/30/79 (12)	Not Complying Number (13)	Not Complying % (14)	Compliance Target Date (15)
201	Interstate	AEHIRV	AEGIPRSVW	AGRVW						
202	State - F.A.	AEHIRV	AEGIPRSVW	AGRVW	N	ACIPTVW	N/A #	0	0	N/A
203	State - Non-F.A.	AEHIRV	AEGIPRSVW	AGRVW	N	ACIPTVW	N/A #	0	0	N/A
204	Local - F.A.	AEHIRV	AEGIPRSVW	AGRVW	N	ACIPTVW	ALL	0	0	N/A
205	Local - Non-F.A.	AEHIRV	AEGIPRSVW	AGRVW	N	ACIPTVW	ALL	0	0	N/A

F.A. = Federal-Aid
* = If more than one code applies, show all appropriate codes.
** = See instructions.
Describe "Y" Codes on separate sheet and attach to this table.

The crossbuck signs at all stati[illegible] protected State trunkline crossings were brought into compliance with the MUTCD by a statewide program in 1967. Advance warning signs and pavement markings on the trunkline system are continually maintained in compliance with the MUTCD.

Indicate reporting period:
7/1/73-6/30/79 ____
7/1/78-6/30/79 ____

SECTION 1

PART 2

EVALUATION DATA SUBMITTED FOR THE

CATEGORICAL SAFETY PROGRAM

Evaluation Data High Hazard Program

Evaluation data for projects completed during 1974 or 1975 is shown on the following page. These projects were funded by the HHS or ROS subprograms with 1973 HSA monies.

By applying anticipated 1978 NSC accident costs of $150,000/fatal accident; $ 6,400/injury accident; and $ 930/property damage accident, the before period accident costs is $6,580,340. The after period accident cost becomes $5,266,610 which shows a net savings of $437,910 through a reduction of accidents and accident severity. The total cost of all projects is $2,555,500. The TOR in this instance is 5.8 years.

We have developed an evaluation data sheet that covers 3-year before and after periods, see page 14. The data indicated on this sheet has been patterned after the requirements of a short course recently presented by FHWA personnel entitled "Identification and Evaluation of Highway Safety Projects" at Michigan State University. We anticipate that an evaluation based on this course format can be completed as a follow-up to this report by the end of December 1979.

TABLE 2

Page 1 of 1

STATE _____ FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1979
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line		Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS										Evaluation Status (16)	Exposure (Millions)			Rural or Urban (20)	Number of Lanes (21)	Divided or (2
							Before					After						Before (17)	After (18)	Units (19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO (14)	Tot. (15)							
01		HH	10	197.0	1	X	36	0	39	126	165	36	0	40	121	161	F	46.74	51.28	V	U	5	U
02		HH	10	37.7	1	X	36	0	1	2	3	36	1	12	13	26	F	27.17	22.02	V	U	4	U
03		HH	12	111.7	3	X	36	1	81	130	212	36	3	38	93	134	F	88.95	71.85	V	U	4	U
04		HH	12	86.0	1	X	36	0	35	45	80	36	1	29	35	65	F	24.92	26.35	V	R	4	U
05		HH	12	208.9	1	X	36	0	22	95	117	36	0	34	81	115	F	22.74	23.61	V	U	2	U
06		HH	12	119.8	1	X	36	0	4	10	14	36	0	5	8	13	F	11.18	11.45	V	R	2	U
07		HH	12	1292.1	5	X	36	5	241	459	705	36	1	175	473	598	F	138.13	160.07	V	U	4	U
08		HH	21	130.6	0.2	M	36	1	16	17	34	36	0	9	11	20	F	16.63	20.25	M	U	6	D
09		HH	21	80.0	0.2	M	36	0	15	39	54	36	0	15	37	52	F	8.79	8.00	M	U	4	U
10		HH	26	35.4	0.2	M	36	0	26	43	69	36	0	18	33	51	F	3.67	4.00	M	U	4	U
11		HH	26	130.4	0.6	M	36	1	78	201	280	36	0	56	176	237	F	28.98	26.95	M	U	5	U
12		RO	68	36.2	1	L	36	1	2	5	8	36	0	2	2	4	F	25.53	24.36	V	U	4	U
13		RO	90	89.7	9.9	M	36	1	51	86	138	36	1	49	134	184	F	326.75	342.66	M	U	6	D
14																							
15				2555.5				10	611	1258	1879		7	482	1217	1660		770.18	792.85				

LOCATION:	C.S.	TYPE IMPROVEMENT:	COST	PREPARED BY:
	M.P.		FEDERAL	
CITY:	JOB NO.		STATE	DATE:
COUNTY:	ITEM NO.	COMPL. PERIOD:	OTHER	
FUND:	DATE LET		TOTAL	SIGNALIZED:

ACCIDENT STATISTICS

	BEFORE										AFTER										NUMBER & % CHANGE :	
PERIOD										TOTAL										TOTAL		
FATAL (KILLED)																						
INJURY (INJURED)																						
PROPERTY DAMAGE																						
TOTAL ACCIDENTS																						
DAYLIGHT																						
DARKNESS																						
DRY SURFACE																						
WET SURFACE																						
SNOW/ICE																						
SEVERITY	F(K)	I(I)	PD	F(K)	I(I)	PD	F(K)	I(I)	PD		F(K)	I(I)	PD	F(K)	I(I)	PD	F(K)	I(I)	PD			
ALL ACCIDENTS																						
CORRECTIBLE ACC.																						
'19__ V.S.C. ACCIDENT COSTS																						
AADT																						
REMARKS:																						

14

SECTION 2

THE 1978-79

MICHIGAN SAFETY (Ms) PROGRAM

Michigan Safety (Ms) Program

This program provides for the surveillance, implementation, and evaluation of spot safety improvements on the state trunkline system in order to minimize accident frequency and severity. The Traffic and Safety Division's Safety Programs Unit continues to be responsible for the administration, development, and implementation of this program which is funded exclusively with $6 million of state funds.

The annual review procedure is initiated by the identification of disproportionate accident frequencies and/or patterns through computer-generated printout listings. Additional locations can be identified through other sources such as citizen complaints, district requests, or field observations. The Michigan Dimensional Accident Surveillance (MIDAS) model provides a computerized accident data set capable of 20 possible outputs ranging from total number of accidents to specific accident patterns to road or environmental conditions. This information is in the form of a histogram which is a graphical illustration of the accident frequency distribution. The number of sites where collisions were reported, if any, and the magnitude of the frequency are indicated. A sufficient English description is also provided for the ready identification of the roadway name, crossroad, and other pertinent reference information.

The analysis of locations exhibiting disproportionate accident frequencies is accomplished through the selection of various geometric, environmental, and traffic characteristics. This procedure permits the identification of statistically significant outliers of a specific accident pattern for which known corrective treatments are available. For example, left-turn related accidents can be examined on 2-, 3-, 4-, or 5-lane roadways to determine the need for either exclusive turn lanes or traffic control modifications where appropriate. The analysis procedure also includes a review of past traffic information, pertinent correspondence, an analysis of computer-generated collision diagrams, and an on-site field inspection. Based on these factors, alternate corrective treatments are formulated from which operational traffic control changes and/or geometric safety improvements are implemented.

Typical projects may involve intersectional geometric revisions such as vertical or horizontal grade corrections, exclusive right- or left-turn lanes, radii improvements, friction resistant treatments, or the addition of roadside control. Each year evaluation studies are conducted to determine the effectiveness of the corrective measures in terms of accident reduction and injury avoidance. These evaluations are used to forecast expected reductions for candidate improvement projects. The National Safety Council values for property damage, injury, or fatal accidents are used in conjunction with the forecasted reductions to estimate anticipated safety benefits.

Continuing efforts are being made to improve the effectiveness of the Safety (Ms) Program by further developing the analytical capabilities of MIDAS model. At the present time, a federal grant (402 funding) is being used in order to accomplish this. A complete discussion of the status of the MIDAS model can be found on page 29.

Narrow Bridge Program

The department's Traffic and Safety Division completed a comprehensive 5-year accident study (1971-75) of narrow bridge locations with the ratio of bridge width to approach width (BW/AW) being 1.3 or less. As indicated in last year's report, the uppermost threshold ratio of 1.3 represents that point where the comparison of accident frequency to ratio becomes rather constant as ratios are increased. The methodology used was derived from the Texas Transportation Institute's bridge safety index (BSI) concept described in the Transportation Research Board's National Cooperative Highway Research Program (NCHRP), Research Results Digest, Digest 98 - December 1977.

The selection of the 1.3 threshold ratio resulted in the identification of 412 bridge locations. Due to analysis time required and manpower constraints, it was not possible to review each of these locations. As a result, a more in-depth analysis of potential candidates was conducted only in the following categories: high accident locations experiencing 20 or more injury accidents in a 5-year period; locations with a structure width of 23 feet or less with at least one reported injury accident; bridges 23 feet or less in width with no reported accidents; and bridges of variable width having BW/AW ratios less than one. An analysis of these categories allowed the review of both high accident locations as well as those bridge sites having narrow widths regardless of accident frequency. This resulted in a composite list of 55 potential bridge reconstruction candidates.

The intent of this narrow bridge analysis was to provide additional data for a relative safety rating of structures on the free access trunkline system. This rating, in addition to other factors considered to be pertinent, could be used to formulate the prioritization of potential bridge reconstruction projects for future programs. With the future upgrading of the MIDAS model, it should become possible to conduct a continued analysis of all narrow bridge sites using additional road and traffic characteristics resulting in a more comprehensive and expeditious review process.

Evaluation Data for Ms Projects

Evaluation data for 16 Ms projects completed during 1974 or 1975 is shown on the following page.

The National Safety Council's accident costs for 1978 have not been received as of yet. However, based on accident cost increases over the past two years, we anticipate approximate costs of $150,000 per fatal accident, $6,400 per injury accident, and $930 per property damage only accident. Multiplying these costs by the appropriate total per accident severity, the savings per 3-year period would be $843,530 or $281,177 per year. This method indicates a time of recovery (TOR) of 4.01 years.

TABLE 2

STATE _____ FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1979
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line		Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS										Evaluation Status (16)	Exposure (Millions)			Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
							Before						After					Before (17)	After (18)	Units (19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO (14)	Tot. (15)							
01		SL	10	$10.0	1	X	36	0	2	8	10	36	0	3	8	11	F	52.49	58.90	V	R	4	D
02		SL	12	$104.4	1	X	36	0	13	16	29	36	0	3	17	20	F	21.60	21.60	V	R	2	U
03		SL	12	$8.9	1	X	36	0	2	11	13	36	0	4	2	6	F	28.89	30.11	V	R	4	D
04		SL	12	$120.0	1	X	36	1	18	20	39	36	0	13	22	35	F	14.80	18.62	V	U	2	U
05		SL	13	$97.2	1	X	36	2	3	6	11	36	0	1	2	3	F	17.82	19.63	V	R	2	U
06		SL	19	$7.5	1	X	36	0	23	64	87	36	0	14	58	72	F	125.28	111.05	V	U	6	D
07		SL	19	$4.6	1	X	36	0	21	64	85	36	0	24	54	78	F	41.47	40.82	V	U	2	U
08		SL	19	$28.2	1	X	36	0	34	82	116	36	0	38	66	104	F	91.37	91.08	X	U	4	D
09		SL	21	$407.2	0.3	M	36	1	60	76	137	36	1	60	102	163	F	4.19	3.48	M	R	2	U
10		SL	21	$25.0	0.2	M	36	0	20	31	51	36	0	18	19	37	F	2.91	2.90	M	U	2	U
11		SL	21	$51.6	0.1	M	36	0	8	18	26	36	0	37	76	113	F	4.15	4.33	M	U	4	U
12		SL	24	$97.7	0.100	M	36	0	40	104	144	36	0	17	45	62	F	11.92	13.69	M	U	4	U
13		SL	26	$69.7	1.5	M	36	1	40	53	94	36	1	23	33	57	F	130.70	134.79	M	U	4	D
14		SL	26	$43.9	0.282	M	36	0	22	91	113	36	0	32	83	115	F	18.43	19.76	M	U	4	U
15																							

TABLE 2

Page 2 of 2

STATE _____ FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1979
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line	Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS										Evaluation Status (16)	Exposure (Millions)			Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
						Before					After						Before (17)	After (18)	Units (19)			
						Mos. (6)	Fat. (7)	Inj. (8)	PDO (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO (14)	Tot. (15)							
01	SL	26	$29.1	1.27	M	36	0	16	33	49	36	0	13	16	29	F	75.16	67.67	M	U	8	D
02	SL	42	$23.9	0.137	M	36	0	34	108	142	36	0	15	41	56	F	6.10	5.91	M	U	8	U
03																						
04			$1128.9				5	356	785	1146		2	315	644	961		647,28	644.34				
05																						
06																						
07																						
08																						
09																						
10																						
11																						
12																						
13																						
14																						
15																						

SECTION 3

OTHER SAFETY-RELATED PROJECTS

FISCAL YEAR 1978-79

Introduction

Michigan programs several other types of projects that are safety related. Projects falling within this category include federal aid urban, federal aid primary, federal aid secondary, federal aid off-system projects, and 100 percent state and local funded projects.

Typical safety-related work items accomplished through these projects are: intersectional geometric improvements, signal modernizations, rail-highway crossing and signal improvements, roadside control, guardrail modernization, obstacle removal, resurfacing for skidproofing, median barrier construction, side slope improvement, and shoulder improvements.

Federal Aid Urban Program

This program provides the impetus to improve roads that service the centers of urbanized areas. Any construction project that qualifies for funding on any federal aid system is considered an eligible activity. Project selection is based on a predetermined planning process outlined in Title 23 Section 134.

Most urban projects include widening of traffic lanes, improvement of turning movements, upgrading of traffic signals, replacement of signs, widening of intersections, removal of roadside obstacles, and restrictions on parking. Many projects also include the replacing and upgrading of rail-highway crossings. The very nature of the Urban System Program basically is the upgrading of the existing major street systems under the jurisdiction of local agencies.

In addition, an emphasis has been on spot improvements of the TOPICS and TSM type projects, including bus turnouts, transfer points, bike paths, and vanpool-carpool studies.

Projects such as intersection improvements, elimination of unnecessary guardrail through slope grading, modification of crossovers, elimination of sight restrictions, guardrail installations when obstacle could not be relocated, widening to improve capacity, and resurfacing can be considered as safety oriented in part or totally.

During the old fiscal 1979 year, a total of $35,722,766 was obligated with $25,005,936 being safety related.

Federal Aid Primary Program

Projects within this program are on state trunklines and rural arterial routes that extend into or through urban areas considered to be part of a system of main connecting roads important to statewide and regional travel that service the interstate system.

The types of projects funded by this program include, but are not limited to, the construction of bus passenger loading areas and facilities, exclusive bus lanes, traffic control devices, bridge railing and bridge deck replacement.

During fiscal 1979 $15,490,052 was obligated that is safety related.

Federal Aid Secondary Program

This program provides the state and local road agencies with monetary assistance for improvement of federal secondary routes. It is a federal requirement that fifty percent or more of Michigan's apportionment be made available to the local road agencies for projects on secondary routes. Projects under local agency jurisdiction are selected by the local officials and the department on a cooperative basis.

For fiscal 1979 Michigan's secondary apportionment was $14,806,608 of which 66 percent or $9,772,361 was allotted to 83 county road commissions. The remainder was available for use by the state on the state trunkline system.

During calendar 1978, over 100 contracts totaling $15,383,830 were awarded for projects on routes under local agency jurisdiction. $12,790,169 of this contract total was federal funds.

An analysis indicates that 6,650,888 was attributable to safety, etc.

Federal Aid Off System Program

This program provides federal funds for safety-oriented projects on local agency roads located off the federal-aid system. Projects may be constructed in cities, villages under 5,000 population, and rural areas.

Congress did not appropriate funds for fiscal 1979 so Michigan did not receive an apportionment. However, the Federal Highway Administration did permit all states to obligate unused funds appropriated in prior years on a first-come first-served basis. Michigan obligated federal funds of $2,046,000 for 19 projects on local agency routes.

An analysis indicates $1,161,607 are attributed to safety, etc.

Michigan Funded Projects

In addition to the Safety (Ms) Program, there are several other state funded programs within which safety-related work is performed.

The determination of which project types are safety related is relatively time consuming. For instance, resurfacing projects are checked against skid test data within the project limits. Those areas, where the skid number was low, are considered as safety expenditures. The same criteria was used in determining which bridge deck would be credited as a safety item.

Projects which replaced bridge railings, improved traffic signals, eliminated guardrail through grading, extended culverts, upgraded guardrail type, installed flared guardrail endings, etc., were evaluated similar to projects submitted for federal aid funding. If the project would have qualified for federal funds, 100 percent of the cost was considered safety. The percentage of safety items on other projects varied considerably.

Pedestrian and bicycle construction projects were considered 100 percent safety related if total segregation from the automobile conflict was established. Shoulder improvements were also considered 100 percent safety related because of the large percentage of right side, ran-off-roadway accidents and published research confirming the value of stabilized shoulders.

Mb Bituminous Resurfacing - This program is primarily aimed at the driving surface of highways. During fiscal 1979 there were 41 such projects let to contract. Resurfacing of highways that exhibit low coefficients of wet sliding friction, a high percentage of wet surface accidents, or have uneven surfaces are of primary concern. Correction of superelevation has also been accomplished through this program. The cost of these projects totaled $17,674,631; $7,984,918 for safety.

Mbr Bituminous Reconstruction - This program focuses on the surface and base of highways. Projects may include minor widening and roadside control with curb and gutter and enclosed drainage. During fiscal 1978, 47 projects were let to contract at a cost of $11,000,565 of which $7,480,384 was identified as safety related.

M Miscellaneous Construction - During fiscal 1978, there were 31 projects costing $10,222,373 let to contract. One project was for revision of ramps at $169,967 and one project was for joint repair and shoulder paving at a cost of $312,786. The bridge railing and cable guardrail were replaced on another project at a cost of $183,746. One bridge deck resurfacing project was done for $62,590. The total that could be attributed toward safety was $7,034,126.

Mbd - Bridge Deck - Projects in this program correct bridge decks that have exhibited spalling to the point where rebars are exposed, the bridge deck leaks, or the bridge deck is slippery when wet. In most cases the deck is waterproofed after completing any required minor deck repair and a latex modified mortar, concrete, or bituminous surface is applied. During fiscal 1978, ten projects were let to contract at a cost of $1,743,414 of which $581,135 is safety related.

Mnm Nonmotorized Vehicle Facility - This program funds facilities for exclusive pedestrian and bicycle usage. The conflict between vehicles, bicycles, and pedestrians has been the subject of concern for several years. Three projects let to contract during fiscal 1979 cost a total of $533,335. One of the projects was on the interstate system and cost $154,400. The projects provided paved shoulders or separate pathways for nonmotorized vehicles.

Msh Shoulder Edge Treatment - This program provides a minimum 3-foot bitminous edge strip along the right-hand side of state highways. It is aimed at preventing the formation of an edge drop between the pavement and adjacent shoulder material. An edgeline is provided to delineate the driving lanes and prevent regular usage of the added width. During fiscal 1979, there were 26 projects involving 335.5 miles at a cost of $5,023,803 or $14,973 per mile.

High Accident Skid Test Program

The department continues to conduct an annual surveillance review of statewide accident locations (listed in 0.2 mile sections) to determine the percentage of wet accidents occurring above a predetermined level. As in previous years, the district average wet percentage is used as the norm to isolate locations warranting further investigation. Skid tests are then obtained at those locations which exhibit a disproportionate wet surface accident experience. Those locations displaying accident patterns which are normally considered susceptible to correction (rear-end or sideswipe type) and also have low wet sliding friction (WSF) coefficients are recommended for treatment. Anticipated safety benefits are forecasted in a similar manner as spot safety improvement projects to determine the expected project amortization or time-of-return.

The accident surface friction model, developed by the Testing and Research Division, which has the ability to prioritize candidate locations (intersections only) based on the predicted accident reduction using skid number, weather, and traffic volume data is also being used to develop a priority listing of candidate projects. Through continued use of the model, it is expected that a comprehensive anti-skid/accident reduction program can be developed. Those locations not suitable for analysis by the model (nonintersection or freeway sections) are being identified and analyzed through the annual surveillance review. The coordination of the overall program which includes the actual implementation of the skid-accident model is still being developed.

Yellow Book Program

The Michigan Department of Transportation is currently engaged in a program of implementing safety improvements to reduce hazards in the roadside environment. Typically this program consists of culvert extensions, modernization of guardrails, resloping to eliminate guardrails, replacing or retrofitting inadequate bridge rails, concrete median barriers and glare screen installations, impact attenuation, installing traffic signs on breakaway supports or bridge mounts, and freeway lighting alterations.

Plans preparation for yellow book upgrading have been based on the 1967 and 1974 editions of the AASHTO publications of Highway Design and Operational Practices Related to Highway Safety commonly referred to as the Yellow Book. More recently, AASHTO's 1977 Guide for Selecting, Locating and Designing Traffic Barriers has also been used as a guideline for designing roadside safety improvements.

Progress in actual completion of yellow book interstate safety improvements has been slow until the past three years. Initially, work authorizations were issued starting in 1971 to have the work performed by contract counties and state forces as their schedules permitted. The work at that time consisted mainly of guardrail improvements, culvert extensions, and minor grading.

As time went on, however, only a small amount of work was completed. The contract counties and state forces did not have enough time or manpower requirements (with a few exceptions) to complete the work as initially anticipated.

In 1975 we began to let yellow book interstate safety projects to private contract. The conversion to private contract allowed the scope of the work to be expanded to include bridge railing replacements, crash cushion installations, concrete median barrier and glare screens, and freeway lighting upgrading.

Yellow Book projects are blanket-type projects which include complete roadside safety improvements for longer segments of highway such as an entire control section. Yellow Book safety improvements are often classified as interstate safety projects but are separated for this report.

Interstate safety projects may also include superelevation corrections, modification of interchange ramp termini to avert wrong-way maneuvers, widening lanes or structures to separate turning movements, or provide for left-turns and freeway on- and off-ramp roadway alignment signalization, and other types of spot improvements to improve safety.

Interstate Freeways - Yellow Book Status

Yellow book upgrading continues on the 1,100 miles of interstate routes open to traffic with 935 miles of upgrading approved by the FHWA. The remaining 165 miles are in accordance with present day standards with the exception of a limited number of buried end section guardrails and a few minor items which will ultimately be brought up to current standards.

Of the 935 miles:

1. 69 percent (647 miles) has been completed or are presently under contract.

2. 30 percent (280 miles) are programmed and in the design stage.

3. 1 percent (8 miles) are either unprogrammed or not in the design stage.

In 1978-79 Michigan obligated yellow book projects that total $7,569,340 and encompassed 44 miles of freeways.

Michigan has recognized that it will be necessary to review each yellow book project that has been completed since standards and guidelines for safety improvements have changed over the years. For instance, freeway mainline improvements were the main issue for some of the earlier projects. Some interchange and crossroad work, including guardrail modernizations and bridge railing replacements for structures over freeways was not accomplished. Also, it was quite common to retain Type A guardrail (12'6" post spacing and not blocked out) for some of the older projects if it was structurally sound, of appropriate height, and did not show evidence of being struck. Current practice includes complete roadside upgrading, including ramps and crossroads, replacement of all obsolete bridge rails for freeway mainline or crossroad structures over freeways.

Interstate safety projects are similar to those categorized as yellow book safety improvements and include installation and/or removal of traffic

barriers and endings; installation of impact attenuators; lengthening culverts and modifying end sections; minor grading of slopes; installation, modification, and/or relocation of signs and markings; overpass screening; and glare screening. Generally, interstate safety projects are spot improvements.

Noninterstate Freeways - Yellow Book Status

Of the 560 miles of noninterstate freeways open to traffic, it will be necessary to perform yellow book safety upgrading on 500 miles. The remaining 60 miles is up to current safety standards.

Of the 500 miles:

1. 39 percent (193 miles) has been completed or are presently under contract.

2. Programmed or in design - 33 percent (166 miles).

3. The remaining 141 miles have been prioritized based upon accident rates over a five-year period.

The 5-mile project which was obligated since last year's report was financed with ROS funds. Also there were other spot roadside safety projects obligated in the category of ROS, HHO, and HES and the costs are included on page VII.

Free Access State Trunklines - Yellow Book Status

Realizing that complete yellow book upgrading on the free access state trunkline system will require several hundred million dollars to complete. Michigan has elected to complete this work in three stages defined as Task 1, Task 2, and Task 3.

Task 1 includes the installation of buffered end sections to eliminate straight guardrail endings and the potential hazard of penetration into passenger compartments. This work began on a limited basis and three counties were completed during the winter of 1974-75 and was financed with 100 percent state funds. In the fall of 1976 the remaining work was authorized in the amount of $1,455,000 and financed with Transitional Quarter funds as a Roadside Obstacle Safety (ROS) project with the FHWA participating in 90 percent of the total cost. Due to cost increases since authorization, the amount required to complete all Task 1 work has risen to $1,600,000.

During fiscal 1978-79 $401,265 was expended and the project is estimated 88 percent complete.

Task 2 includes upgrading guardrails proximate to bridges and replacing or retrofitting guardrails to the existing railing system. This type of work is currently being included with road and bridge reconstruction or resurfacing projects as available manpower and funding allows. Most of this work is being financed with 100 percent state funds.

The costs for this Task 2 work are included in the category of Other State Funded Projects on page 18.

Task 3 includes improvement of the roadside to current yellow book standards. Due to lack of funds, specific Task 3 programs have not been initiated. However, guardrail modernization work is currently being included with road and bridge reconstruction or resurfacing projects as resources allow. The costs for this Task 3 work are included in the category of Other State Funded Projects on page 18. A computer program to prioritize Task 3 improvements based on frequency, rate, and severity of fixed-object accidents is currently being developed by Michigan's Department of Transportation.

Impact Attenuators

The Michigan Department of Transportation has 171 existing impact attenuators installed on the state highway system. One hundred and six are Hi-Dro Cell attenuators, 28 are "GREAT" (Guardrail Energy Absorption Terminal) attenuators, 27 are sand barrel attenuators, one Hi-Dri Cell attenuator, and the remaining nine are Cell Cluster attenuators. The cost for installing the 13 attenuators during fiscal 1979 was $271,269. We also have approximately 40 attenuators in the design stage. The total estimated installation cost for these attenuators is $1,137,350.

Personnel from the Traffic and Safety Division conducted a field inspection of all of the existing attenuators on our trunkline system. An inventory of the attenuator locations has been forwarded to the Maintenance Division for their use.

Traffic Engineering Services

The Michigan Department of Transportation continues to provide traffic engineering services to local governmental agencies through the Community Assistance and Operational Inventories Programs. These services are intended primarily for those agencies that lack sufficient resources or expertise to plan, design, and develop appropriate countermeasures to alleviate traffic engineering and traffic safety problems. The need for this program was recognized after the Michigan Department of Transportation reviewed the state's ability, including that of its political subdivisions, to provide an adequate program of traffic engineering to reduce the number and severity of traffic accidents occurring on the streets and roads of Michigan. This review was conducted as a result of Highway Safety Program Standard 13 of the 1966 Highway Safety Act, which encouraged each state in cooperation with local political subdivisions to develop programs for the reduction of traffic accidents. To address this need, the Michigan Department of Transportation requested and received, through the Michigan Office of Highway Safety Planning, a federal grant to fund the staff required to provide the needed services.

The Community Assistance Program provides the necessary expertise for identifying, analyzing, and correcting problem accident locations. When implemented, these recommendations for operational and geometric improvements will reduce the number of accidents and their severity. The Operational Inventories Program provides assistance to local governmental agencies for the inventory of the traffic control devices on the local road

system. As part of the inventory process, recommendations are made for the erection, replacement, relocation, and removal of traffic control devices to conform with the Michigan Manual of Uniform Traffic Control Devices. Department personnel conduct inventories for the smaller agencies and train local personnel to conduct their own inventories in larger agencies.

Participation in both services is initiated through a request by the local agency to the department's Local Government or Traffic and Safety Divisions. Both programs are federally funded through a grant from the Office of Highway Safety Planning using Section 402 funds thus enabling these services to be provided at no cost to the local agencies.

These programs have proven so successful that a considerable backlog of community requests has developed. To help decrease this backlog, we are contracting with private consultants to perform some of this work. If the limited pilot program is successful in terms of the quality and cost effectiveness of the results, a program of greater magnitude will follow. We anticipate that it will be necessary to supplement the traffic engineering services provided by the department in the future due to the substantial completion of the Michigan Accident Location Index (MALI) project, which identifies high crash locations on both state and local roads.

In fiscal 1978-79, the Community Assistance Program provided traffic engineering services to 33 different local jurisdictions for the analysis of 89 spot locations. Recommendations included traffic signal installations and modernizations, intersection reconstructions, signing modifications, pavement resurfacing and marking, rural road realignments, and plans for urban parking. $3,059,035 in Federal Highway Safety funds was programmed to assist local agencies in implementing these recommendations.

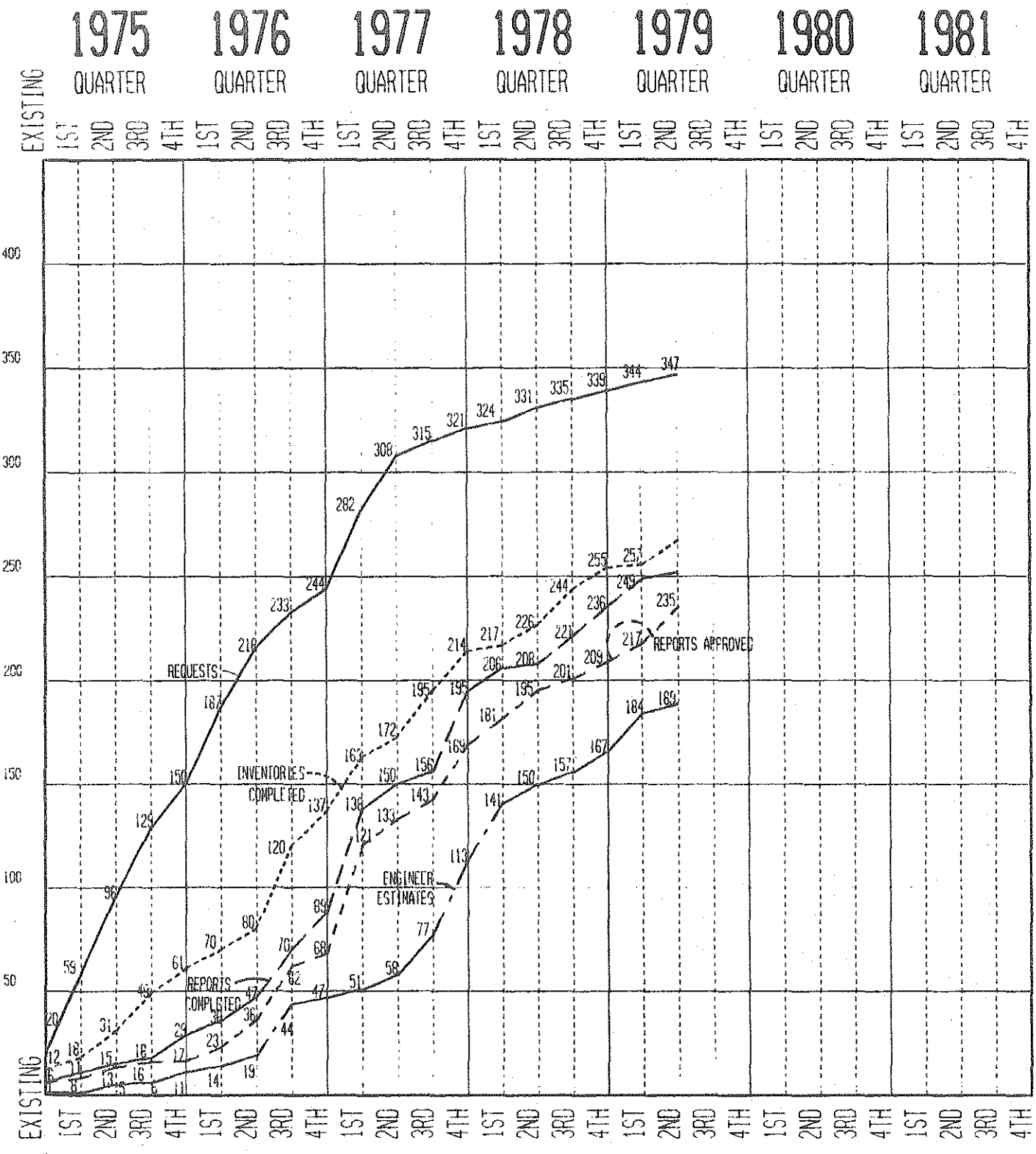
Inventories of traffic control devices have been completed on 18,102 miles of villages. These amounts represent approximately 40 percent of the total statewide nontrunkline mileage of 107,218 miles. The accomplishments by fiscal year from 1969 to the present are as follows.

MANUAL INVENTORIES

Fiscal	County				City or Village		FY Totals	
	Primary/FAS		Local		On and Off System Routes			
Year	No.	Miles	No.	Miles	No.	Miles	No.	Miles
69-70	1	277.26	-	-	-	-	1	277.26
70-71	7	2,670.96	-	-	-	-	7	2,670.96
71-72	24	6,198.30	-	-	-	-	24	6,198.30
72-73	6	2,345.97	-	-	-	-	6	2,345.97
73-74	3	1,140.53	-	-	1	18.80	4	1,159.33
74-75	1	357.00	1	748.07	10	170.63	12	1,275.70
75-76	3	1,162.69	5	4,468.65	19	473.41	27	6,104.75
Trans. Quarter	5	1,375.80	2	1,600.70	13	198.98	20	3,175.48
76-77	1	331.55	3	1,987.25	55	706.23	59	3,025.03
77-78	3	1,061.58	3	1,753.59	40	674.40	46	3,489.57
78-79 (6-30-79)-Sub		0.31	-	-	32	527.86	32	588.17
Total	54	16,921.95	14	10,558.26	170	2,770.31	238	30,250.52

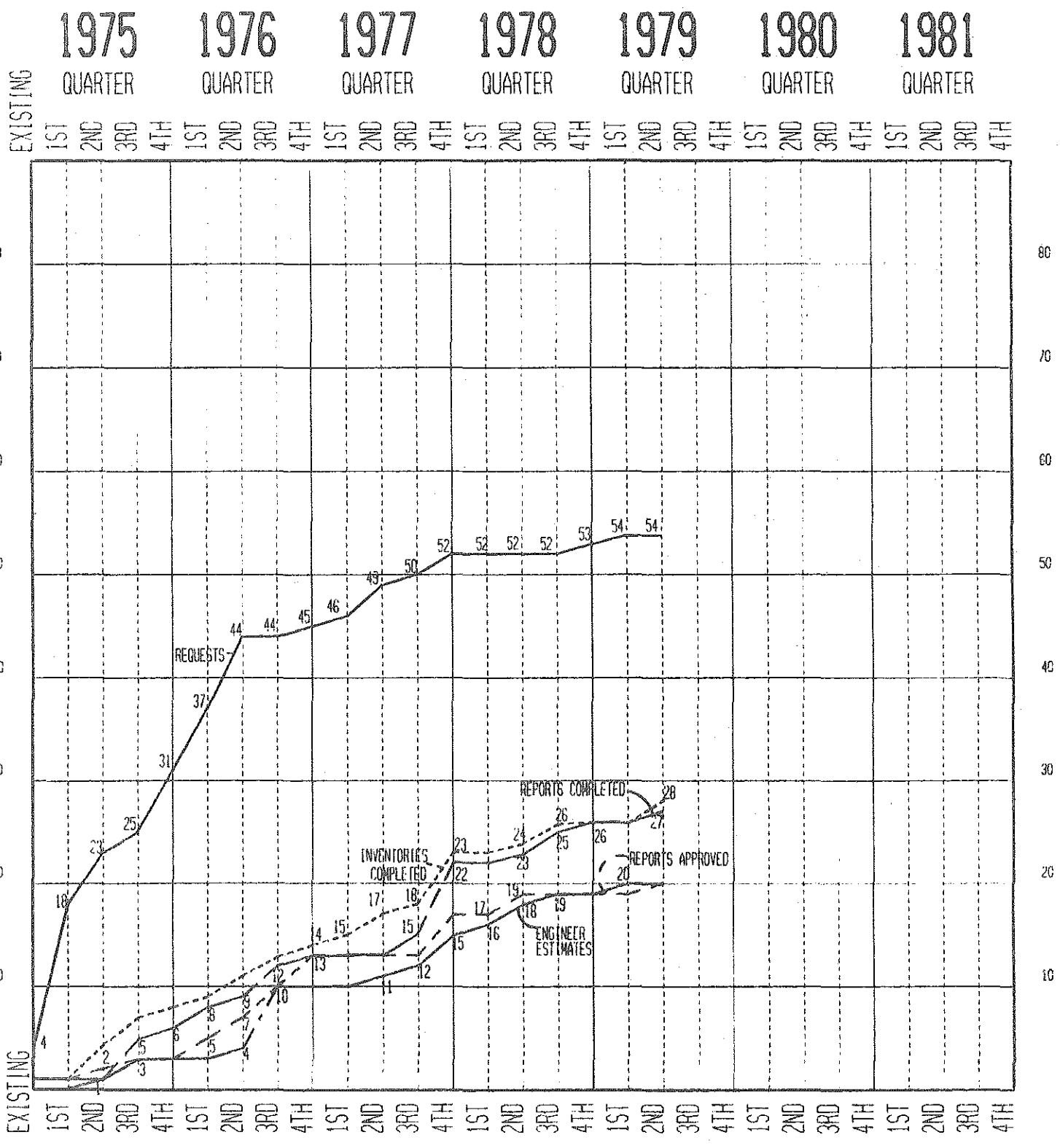
STATEWIDE STATUS
INVENTORY AND ANALYSIS OF TRAFFIC CONTROL DEVICES FOR CITIES AND VILLAGES

TOTAL NUMBER OF REQUESTS	347
NUMBER OF INVENTORIES COMPLETED	269
NUMBER OF REPORTS COMPLETED (PRELIMINARY & FINAL)	252
NUMBER OF REPORTS APPROVED	235
NUMBER OF ESTIMATES	189



STATEWIDE STATUS
INVENTORY AND ANALYSIS OF TRAFFIC CONTROL DEVICES
FOR COUNTIES

TOTAL NUMBER OF REQUESTS	54
NUMBER OF INVENTORIES COMPLETED	28
NUMBER OF REPORTS COMPLETED (PRELIMINARY & FINAL)	27
NUMBER OF REPORTS APPROVED	20
NUMBER OF ESTIMATES	20



In addition to Michigan Department of Transportation inventory activities, three counties and 65 local agencies have been inventoried by consultants using the photolog procedure resulting in computerized printout inventories involving 12,335 miles of nontrunkline roadways.

Department personnel continue to provide technical assistance to local governmental agencies in their preparation of the documentation necessary for obtaining federal funding for projects. During the first nine months of fiscal 78-79, 32 sign upgrading projects were initiated involving approximately $735,300 of federal program funds. Ninety-five additional projects, with an estimated funding of $1.3 million, are anticipated for next year.

Michigan Accident Location Index (MALI)

The Michigan Department of Transportation and the Michigan Department of State Police, in cooperation with the Michigan Office of Highway Safety Planning, have developed a computerized crash location reference and analysis system referred to as the Michigan Accident Location Index (MALI). The MALI system is designed to generate a computerized description of traffic crash locations directly from the information reported by the police officer. The computer system generates and maintains the crash location information on the MALI street index for later retrieval and analysis. The MALI street index is a map of the street network stored in the computer. The street index is composed of distances between intersections, alternate street names, and accurate city and township boundaries.

The primary functions of the MALI system are to expand the state's crash locating capability to all roads and streets, eliminate the manual locating of crashes, and provide crash analysis information to state and local users. The MALI system will enable the user to identify hazardous locations on all roads and streets, forming the basis for establishing priorities for safety improvement projects, selected enforcement areas, and other activities that have an impact on the state's accident experience.

The MALI project is currently operational on the state trunkline system and the local road system in all 83 counties. Thus, the MALI system is locating current crash data (1979 data) on all roads and streets in the state.

The MALI system is currently being enhanced by the addition of all public railroad crossings to each county index. Railroad crossings were treated as intersections using the federal, railroad, identification number and railroad name. Currently, railroad crossings have been added to 53 county indexes. Even though this activity will be completed later this year, crashes will not be coded directly to specific railroad crossings until 1980.

SECTION 4

NEW DEVELOPMENTS IN

HIGHWAY SAFETY

Interchange Priority Study Phase 2

The Michigan Department of Transportation is engaged in Phase 2 of the interchange priority study which was undertaken to comply with federal guidelines concerning justification for safety improvement projects. Phase 2 of the study outlines the procedures to be followed in the analyzation/ prioritization process and addresses alternate solutions, estimated costs and benefits, and cost-effectiveness.

Since the writing of last year's annual report, the department has completed two interchange studies and moved to step 4 in the prioritization process. The various steps involved in the prioritization process can be outlined as follows:

1. Perform interchange data analysis
2. Determine alternate countermeasures or solutions
3. Obtain cost estimate and calculate benefits
4. Determine cost-effectiveness of each alternative
5. Implement and evaluate

In addition, the department has received FHWA approval to annually update the statewide interchange criticality ranking and use an updated process that concentrates on those interchanges that continue to reappear in critical groupings. These reappearing interchanges are given the strongest consideration for project development.

The analyzation/prioritization process must be continually updated. The need is rather apparent since recent or impending construction, operational changes, ongoing studies, or lack of concentration of actual accident patterns can alter the uppermost ranking of critical interchanges.

Not only has the department updated its ranking of statewide interchanges and the analyzation/prioritization process, but it has made provision for the establishment of a full-time subunit to work on these critical interchanges. This new subunit (interchange improvement) is scheduled to become operational with the beginning of the new fiscal year.

MIDAS

The department is currently developing a crash surveillance and analysis system known as the Michigan Dimensional Accident Surveillance model (MIDAS). The system being designed will provide a statistical anlaysis of abnormal crash patterns and an analysis of all feasible corrective treatments.

The goal of the department is to develop further and implement the MIDAS model which, in conjunction with the MALI index, will provide Michigan with a coordinated traffic record and analytic system.

The model is composed of three stages. The first stage involves a computerized data bank containing information such as laneage, alignment, lane and shoulder widths, auxiliary lanes, traffic controls, and land usage. It is possible to classify the information into discreet units, with each unit

containing accident data for sites with nearly identical characteristics. The numerous variables are explained by four basic dimensions; geometry, environment, cross section, and accident characteristics. At the present time this stage of the model is operational within the constraints of existing accident data and program limitations.

The second stage of the computer model will calculate the cost effectiveness of each potential accident countermeasure.

The third stage will involve objective optimization using mathematical optimizing processes.

During the development of the model, deficiencies have been discovered, for the most part involving a lack of needed data, insufficient precision of existing data, and/or file incompatibilities. Thus we requested and have received two Highway Safety Grants ($900,000 each over three years) for model improvements and advancement. A major component of the proposed projects consists of the integration of parallel data sources, such as the Secretary of State driver and vehicle records, weather bureau information, and environmental data with the existing data base for the MIDAS model. These types of data will allow the MIDAS model to relate the driver, the vehicle, and the roadway to available crash characteristics.

Because the modeling techniques are continuously being improved as we gain greater insight, MIDAS will be developed in a series of generations. MIDAS-I is the present state of the art. MIDAS-II is anticipated to be completed in 1980 and will consist of a variable length analysis, improved rationale for merging data files, and improved data on horizontal alignment. MIDAS-III is anticipated for completion in 1981 and will be our first attempts for integrating and modeling data on the driver and vehicle. MIDAS-IV is scheduled for completion in 1982 and will have more precise data on highway geometry and more advanced mathematical algorithms for alternative analysis and optimization of objectives.

The following histogram is a sample output of the MIDAS model which is a graphical representation of the accident frequency distribution.

The accident codes used in this sample include total accidents, right angle, rear end, left turn, and wet surface accident rankings at 139 2-lane two-way signalized trunkline intersections. These histograms determine families based on like geometrics, traffic control, and ADT. Those intersections that are within a family norm are indicated by X's to the right of the number of accidents that occurred. Intersections having more accidents than what has been determined as the upper confidence limit are indicated by zeros to the right of the number of accidents that occurred. These intersections are called outliers which are identified in English and reviewed for possible corrective treatment.

2 LANE 2 WAY SIGNALIZED INT. 78 TOTAL ACCIDENTS

AVERAGE ADT= 12411 NUMBER OF LOCATIONS= 139

ACC. CODE	AVG.	ACCIDENT TYPE
1	10.532	TOTAL ACCIDENTS
2	2.381	RIGHT ANGLE
3	2.978	REAR END
4	2.029	LEFT TURN
5	0.317	RIGHT TURN
6	0.129	HEAD-ON
7	0.396	RAN OFF ROAD
8	0.007	RAN OFF ROAD-HIT GUARDRAIL
9	0.058	RAN OFF ROAD-HIT SIGN
10	0.122	RAN OFF ROAD-HIT POLE
11	0.058	RAN OFF ROAD-HIT CULVERT OR DITCH
12	0.000	RAN OFF ROAD-HIT ABUTMENT
13	0.014	RAN OFF ROAD-HIT TREE
14	0.835	PARKING
15	0.151	PEDESTRIAN
16	6.424	DRY SURFACE
17	2.439	WET SURFACE
18	1.669	ICY SURFACE
19	7.129	LIGHT
20	3.403	NON-LIGHT

2 LANE 2 WAY SIGNALIZED INT. 78 TOTAL ACCIDENTS

TOTAL ACCIDENTS

NUMBER OF LOCATIONS

```
                1         2         3         4         5         6
ACC*12345678901234567890123456789012345678901234567890123456789012345678901234
  0*XXXXXXX
  1*XXXXXXXXXX
  2*XXXXXXXXX
  3*XXXXX
  4*XXXX
  5*XXXXXXXXXXX
  6*XXXXXX
  7*XXXXXX
  8*XXXXXXXXXXXXX
  9*XXXX
 10*XXXXXXXXX
 11*XXXXXXXXXX
 12*XXXXXX
 13*XXX
 14*00
 15*00000
 16*0000
 17*0
 18*0
 19*000
 20*0
 21*
 22*0000
 23*0
 24*
 25*00
 26*
 27*
 28*0
 29*0
 30*0
 31*
 32*00
 33*00
 34*
 35*0
 36*
 37*
 38*
 39*
 40*
 41*
 42*
 43*
 44*
 45*0
 46*
 47*
 48*
 49*
 50*
 51*
 52*
 53*
 54*
 55*
 56*
```

59*0
ACCIDENT TYPE = 1
LOCATIONS = 139
AVE 24HR VOLUME= 12411
AVE ACCIDENTS =10.532
UPPER LIMIT =13.778

HIGH HAZZARD LOCATIONS-- 35

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T COUNTY
13032	0.97	14	M-66	AT GARRISON STREET	BATTLE CREEKCALHOUN C
13032	1.80	18	M-66	AT EMMET STREET	BATTLE CREEKCALHOUN C
14011	9.91	14	M51,M62	AT COMMERCIAL STREET	DOWAGIAC CITCASS COUN
14011	10.02	25	M51,M62	AT E JCT M62,DIVISION	DOWAGIAC CITCASS COUN
25061	2.78	28	M-121	AT VAN SLYKE ROAD	FLINT TWP. GENESEE C
25061	3.80	32	M-121	AT ALLEY	FLINT TWP. GENESEE C
27011	0.52	15	US-2 BR	AT LOWELL ST	IRONWOOD GOGEBIC
27011	0.61	19	US-2 BR	AT SUFFOLK ST	IRONWOOD GOGEBIC
30041	0.00	19	M-99	AT BROAD ST	HILLSDALE HILLSDALE
38072	1.22	33	M-50,US127BR	AT GANSON ST.	JACKSON CTY JACKSON C
38072	1.73	33	M-50,US127BR	AT JCT I-94BL	JACKSON CTY JACKSON C
38082	0.65	15	I-94BL	AT WILDWOOD SRD.	BLACKMAN TWPJACKSON C
39082	2.59	20	M43-M89	RURAL MIDBLOCK IN	KLMAZOO CITYKALAMAZOO
39082	3.51	23	M43-M89	AT SPRINKLE ROAD	COMSTOCK TWPKALAMAZOO
41051	1.81	16	M-44	AT LAKE DR	GRAND RAPIDSKENT CO
41051	3.51	22	M-44	AT FULTON ST	GRAND RAPIDSKENT CO
44042	13.20	14	M-21	AT M-53/CEDAR&VANDYKE	IMLAY CITY CLAPEER CO
46041	17.54	15	M-34	AT MADISON ST	DOVER TWP LENAWEE
46062	13.02	16	US-223	AT LANE STREET	BLISSFIELD CLENAWEE C
50022	4.03	22	M-59	AT S. GARFIELD ROAD	MAC./CLINT TMACOMB CO
50022	4.91	45	M-59	AT ROMEO PLANK ROAD	MAC./CLINT TMACOMB CO
50022	7.97	29	M-59	AT M-97/GROESBECK HY.	MAC./CLINT TMACOMB CO
52081	5.87	22	M-28BR	AT WATER ST/US-41	NEGAUNEE CTYMARQUETTE
58042	8.01	16	M-50	AT S. REESSLER ST.	MONROE CTY MONROE CO
58052	7.60	19	US-24	AT DUNBAR RD.	LASALLE TWP MONROE CO
58052	10.65	32	US-24	AT STEWART RD.	FRENCHTOWN TMONROE CO
58111	0.16	15	M-50	AT TREMONT/MACOMB AVE	MONROE CTY MONROE CO
63071	1.03	22	M-15	AT WASHINGTON STREET	CLARKSTON CYOAKLAND C
77052	8.54	15	M-29	AT CLINTON STREET	ST.CLAIR CY.STCLAIR C
77132	0.39	25	M-25	AT KRAFFT ROAD	FT.GRATIOT TSTCLAIR C
78042	1.00	16	M-60,M-66	AT JCT.M-86,US-131BR	FABIUS TWP STJOSEPH
82081	2.96	17	M-153	AT CANTON-CENTER ROAD	CANTON TWP. WAYNE CO.
82101	4.18	59	M-14	AT MAIN STREET	PLYMOUTH C. WAYNE CO.
82101	5.45	35	M-14	AT HAGGERTY ROAD	PLYMOUTH T. WAYNE CO.
82101	7.28	30	M-14	AT NEWBURG ROAD	LIVONIA CY. WAYNE CO.

2 LANE 2 WAY SIGNALIZED INT. 78 TOTAL ACCIDENTS

RIGHT ANGLE

```
                    NUMBER OF LOCATIONS
              1         2         3         4         5         6
ACC*123456789012345678901234567890123456789012345678901234567890123
  0*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  1*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  2*XXXXXXXXXXXXXXXXXXXXXXXX
  3*XXXXXXXXXXXXXXXXXX
  4*000000000
  5*00000
  6*00000
  7*000
  8*0000
  9*00
 10*0
 11*0
 12*0
ACCIDENT TYPE   = 2
LOCATIONS       =   139
AVE 24HR VOLUME= 12411
AVE ACCIDENTS   = 2.381
UPPER LIMIT     = 3.924
```

HIGH HAZZARD LOCATIONS-- 31

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T	COUNTY
4032	0.08	7	US 23	AT SECOND AVE	ALPENA CITY	ALPENA
11052	0.06	4	US31,33	URBAN MIDBLOCK IN	ST JOSEPH CI	BERRIEN C
11091	0.06	5	M-51	AT SYCAMORE STREET	NILES CITY	BERRIEN C
13032	0.97	4	M-66	AT GARRISON STREET	BATTLE CREEK	CALHOUN C
13061	9.23	4	I-94	AT RAYMOND STREET	EMMETT TWP	CALHOUN C
14011	10.02	4	M51,M62	AT E JCT M62,DIVISION	DOWAGIAC CIT	CASS COUN
22011	2.04	4	M-95	AT H STREET	IRONMOUNTAIN	DICKINSON
25011	2.43	4	M-13,M-21	AT JCT. M-21,M-56	CLAYTON TWP.	GENESEE C
25033	1.75	4	US-23 BR	AT ADELAIDE STREET	FENTON CITY	GENESEE C
27011	0.52	5	US-2 BR	AT LOWELL ST	IRONWOOD	GOGEBIC
30041	0.00	5	M-99	AT BROAD ST	HILLSDALE	HILLSDALE
38072	1.22	8	M-50,US127BR	AT GANSON ST.	JACKSON CTY	JACKSON C
38072	1.73	9	M-50,US127BR	AT JCT I-94BL	JACKSON CTY	JACKSON C
38082	0.65	6	I-94BL	AT WILDWOOD SRD.	BLACKMAN TWP	JACKSON C
39082	3.51	8	M43-M89	AT SPRINKLE ROAD	COMSTOCK TWP	KALAMAZOO
41051	3.51	9	M-44	AT FULTON ST	GRAND RAPIDS	KENT CO
41081	5.41	6	M-45	AT LEXINGTON AVE	GRAND RAPIDS	KENT CO
44042	13.20	4	M-21	AT M-53/CEDAR&VANDYKE	IMLAY CITY	CLAPEER CO
47121	0.06	6	M-155	AT SIBLEY ST	HOWELL	LIVINGSTO
50022	4.91	8	M-59	AT ROMEO PLANK ROAD	MAC./CLINT TWP	MACOMB CO
50022	7.97	5	M-59	AT M-97/GROESBECK HY.	MAC./CLINT TWP	MACOMB CO
58052	7.60	6	US-24	AT DUNBAR RD.	LASALLE TWP	MONROE CO
58052	10.65	10	US-24	AT STEWART RD.	FRENCHTOWN TWP	MONROE CO
58111	0.16	7	M-50	AT TREMONT/MACOMB AVE	MONROE CTY	MONROE CO
73121	0.73	6	M-83	AT OLD US-10	BIRCH RUN TP	SAGINAW C
73131	8.00	4	M-54,M-83	AT GENESEE STREET	FRANKENMUTH	SAGINAW C
77132	0.39	8	M-25	AT KRAFFT ROAD	FT.GRATIOT TS	TCLAIR C
78042	1.00	5	M-60,M-66	AT JCT.M-86,US-131BR	FABIUS TWP	STJOSEPH
82081	2.96	7	M-153	AT CANTON-CENTER ROAD	CANTON TWP,	WAYNE CO,
82101	4.18	11	M-14	AT MAIN STREET	PLYMOUTH C,	WAYNE CO,
82101	7.28	12	M-14	AT NEWBURG ROAD	LIVONIA CY,	WAYNE CO,

2 LANE 2 WAY SIGNALIZED INT. 78 TOTAL ACCIDENTS

REAR END

NUMBER OF LOCATIONS

```
                1         2         3         4         5         6
ACC*123456789012345678901234567890123456789012345678901234567890123
  0*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  1*XXXXXXXXXXXXXXXXXXXXXXX
  2*XXXXXXXXXXXXXXXXXXXXXXXXXX
  3*XXXXXXXXXXXXXXXX
  4*XXXXXXXXXXXX
  5*0000
  6*0000000
  7*0000
  8*000
  9*00
 10*00
 11*000
 12*0
 13*
 14*00
 15*0
```

ACCIDENT TYPE = 3
LOCATIONS = 139
AVE 24HR VOLUME= 12411
AVE ACCIDENTS = 2.978
UPPER LIMIT = 4.704

HIGH HAZZARD LOCATIONS-- 30

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T COUNTY
9051	0.15	5	M-84	AT GARFIELD AVENUE	BAY CITY BAY COUNT
13032	1.80	7	M-66	AT EMMET STREET	BATTLE CREEKCALHOUN C
14011	9.82	5	M51,M62	AT FRONT STREET	DOWAGIAC CITCASS COUN
14011	9.91	6	M51,M62	AT COMMERCIAL STREET	DOWAGIAC CITCASS COUN
14011	10.02	9	M51,M62	AT E JCT M62,DIVISION	DOWAGIAC CITCASS COUN
22011	2.04	5	M-95	AT H STREET	IRONMOUNTAINDICKINSON
25061	2.78	8	M-121	AT VAN SLYKE ROAD	FLINT TWP. GENESEE C
25061	3.80	11	M-121	AT ALLEY	FLINT TWP. GENESEE C
28012	0.00	6	US31/M37	AT S JCT M37	BLAIR TWP GR TRAVER
29031	3.28	6	US-27BR	AT LINCOLN/WRIGHT ST	PINE RIVER TGRATIOT
38072	1.22	15	M-50,US127BR	AT GANSON ST.	JACKSON CTY JACKSON C
38072	1.53	7	M-50,US127BR	AT ALLEY/WILDWOOD AVE	JACKSON CTY JACKSON C
38072	1.73	10	M-50,US127BR	AT JCT I-94BL	JACKSON CTY JACKSON C
39082	2.59	11	M43-M89	RURAL MIDBLOCK IN	KLMAZOO CITYKALAMAZOO
41051	1.81	8	M-44	AT LAKE DR	GRAND RAPIDSKENT CO
41051	3.51	7	M-44	AT FULTON ST	GRAND RAPIDSKENT CO
50022	4.03	14	M-59	AT S. GARFIELD ROAD	MAC./CLINT TMACOMB CO
50022	4.91	12	M-59	AT ROMEO PLANK ROAD	MAC./CLINT TMACOMB CO
50022	7.97	10	M-59	AT M-97/GROESBECK HY.	MAC./CLINT TMACOMB CO
50092	1.82	5	M-19	AT GRATIOT AVENUE	NEW HAVEN C MACOMB CO
52081	5.87	14	M-28BR	AT WATER ST/US-41	NEGAUNEE CTYMARQUETTE
58042	8.01	6	M-50	AT S. REESSLER ST.	MONROE CTY MONROE CO
58052	7.60	6	US-24	AT DUNBAR RD.	LASALLE TWP MONROE CO
58052	10.65	6	US-24	AT STEWART RD.	FRENCHTOWN TMONROE CO
77052	8.54	5	M-29	AT CLINTON STREET	ST.CLAIR CY.STCLAIR C
77132	0.39	7	M-25	AT KRAFFT ROAD	FT.GRATIOT TSTCLAIR C
79061	16.35	6	M-81	AT LINCOLN STREET	CARO CITY TUSCOLA C
82101	4.18	11	M-14	AT MAIN STREET	PLYMOUTH C. WAYNE CO.
82101	5.45	9	M-14	AT HAGGERTY ROAD	PLYMOUTH T. WAYNE CO.
82101	7.28	8	M-14	AT NEWBURG ROAD	LIVONIA CY. WAYNE CO.

2 LANE 2 WAY SIGNALIZED INT. 78 TOTAL ACCIDENTS

LEFT TURN

NUMBER OF LOCATIONS

```
          1         2         3         4         5         6
ACC*12345678901234567890123456789012345678901234567890123456789012345678901234
  0*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  1*XXXXXXXXXXXXXXXXXXXXXXXXX
  2*XXXXXXXXXXXXXXXXXXXXX
  3*XXXXXXXXXXXXXX
  4*00000
  5*00
  6*0
  7*00
  8*00
  9*00
 10*0
 11*0
 12*
 13*
 14*
 15*
 16*
 17*0
 18*0
 19*
 20*
 21*
 22*
 23*
 24*
 25*
 26*
 27*0
```

ACCIDENT TYPE = 4
LOCATIONS = 139
AVE 24HR VOLUME= 12411
AVE ACCIDENTS = 2.029
UPPER LIMIT = 3.453

HIGH HAZZARD LOCATIONS== 19

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T COUNTY
8032	9.28	6	M-37	AT MAIN STREET	MIDDLEVILLE BARRY CO.
13032	0.97	5	M-66	AT GARRISON STREET	BATTLE CREEKCALHOUN C
13061	9.23	4	I-94	AT RAYMOND STREET	EMMETT TWP CALHOUN C
25061	2.78	11	M-121	AT VAN SLYKE ROAD	FLINT TWP. GENESEE C
25061	3.80	8	M-121	AT ALLEY	FLINT TWP. GENESEE C
28012	0.00	4	US31/M37	AT S JCT M37	BLAIR TWP GR TRAVER
38072	1.73	10	M-50,US127BR	AT JCT I-94BL	JACKSON CTY JACKSON C
39082	3.51	9	M43-M89	AT SPRINKLE ROAD	COMSTOCK TWPKALAMAZOO
41051	3.07	7	M-44	AT CASCADE RD M-45	GRAND RAPIDSKENT CO
50022	4.91	17	M-59	AT ROMEO PLANK ROAD	MAC./CLINT TMACOMB CO
50022	7.97	7	M-59	AT M-97/GROESBECK HY.	MAC./CLINT TMACOMB CO
58042	8.01	5	M-50	AT S. REESSLER ST.	MONROE CTY MONROE CO
58052	7.60	4	US-24	AT DUNBAR RD.	LASALLE TWP MONROE CO
58052	10.65	8	US-24	AT STEWART RD.	FRENCHTOWN TMONROE CO
82081	2.96	4	M-153	AT CANTON-CENTER ROAD	CANTON TWP. WAYNE CO.
82101	4.18	27	M-14	AT MAIN STREET	PLYMOUTH C. WAYNE CO.
82101	5.45	18	M-14	AT HAGGERTY ROAD	PLYMOUTH T. WAYNE CO.
82101	7.01	4	M-14	AT ANN ARBOR TRAIL	LIVONIA CY WAYNE CO

82101 7.28 9 M-14 AT NEWBURG ROAD LIVONIA CY. WAYNE CO.

WET SURFACE

NUMBER OF LOCATIONS

```
                1         2         3         4         5         6
ACC*12345678901234567890123456789012345678901234567890123456789012345678901234
  0*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  1*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  2*XXXXXXXXXXXXXXXXXXX
  3*XXXXXXXXXXXXXXXXXXXX
  4*XXXXXXXXXXX
  5*000000000
  6*0
  7*000
  8*000
  9*0
 10*0
 11*0
 12*00
 13*0
ACCIDENT TYPE  =17
LOCATIONS      =   139
AVE 24HR VOLUME= 12411
AVE ACCIDENTS  = 2.439
UPPER LIMIT    = 4.001
```

HIGH HAZZARD LOCATIONS-- 22

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T COUNTY
14011	10.02	8	M51,M62	AT E JCT M62,DIVISION	DOWAGIAC CITCASS COUN
25061	2.78	7	M-121	AT VAN SLYKE ROAD	FLINT TWP. GENESEE C
25061	3.80	5	M-121	AT ALLEY	FLINT TWP. GENESEE C
28012	0.00	5	US31/M37	AT S JCT M37	BLAIR TWP GR TRAVEF
30041	0.00	5	M-99	AT BROAD ST	HILLSDALE HILLSDALE
38072	1.22	10	M-50,US127BR	AT GANSON ST.	JACKSON CTY JACKSON C
38072	1.73	7	M-50,US127BR	AT JCT I-94BL	JACKSON CTY JACKSON C
38082	0.65	5	I-94BL	AT WILDWOOD SRD.	BLACKMAN TWPJACKSON C
39082	2.59	12	M43-M89	RURAL MIDBLOCK IN	KLMAZOO CITYKALAMAZOC
39082	3.51	9	M43-M89	AT SPRINKLE ROAD	COMSTOCK TWPKALAMAZOC
41051	3.51	5	M-44	AT FULTON ST	GRAND RAPIDSKENT CO
41081	5.41	5	M-45	AT LEXINGTON AVE	GRAND RAPIDSKENT CO
47121	0.06	5	M-155	AT SIBLEY ST	HOWELL LIVINGSTC
50022	4.91	8	M-59	AT ROMEO PLANK ROAD	MAC./CLINT TMACOMB CC
50022	7.97	7	M-59	AT M-97/GROESBECK HY.	MAC./CLINT TMACOMB CC
50052	10.65	6	US-24	AT STEWART RD.	FRENCHTOWN TMONROE CC
77132	0.39	12	M-25	AT KRAFFT ROAD	FT.GRATIOT TSTCLAIR C
78042	1.00	5	M-60,M-66	AT JCT.M-86,US-131BR	FABIUS TWP STJOSEPH
82081	2.96	5	M-153	AT CANTON-CENTER ROAD	CANTON TWP. WAYNE CO.
82101	4.18	13	M-14	AT MAIN STREET	PLYMOUTH C. WAYNE CO.
82101	5.45	11	M-14	AT HAGGERTY ROAD	PLYMOUTH T. WAYNE CO.
82101	7.28	8	M-14	AT NEWBURG ROAD	LIVONIA CY. WAYNE CO.

Positive Guidance Demonstration Project

In 1978 Michigan was awarded a FHWA contract to participate in a Positive Guidance Demonstration Project. 100 percent federally funded, the project employs Positive Guidance methodology to improve the safety and operational features of a problem location. The project site selected for Michigan is the eastbound I-96 freeway split at M-37 (Alpine Avenue) near the city of Grand Rapids.

The Positive Guidance approach integrates the traffic engineering and human factor technologies to produce an information system matched to driver performance capabilities under varying traffic operational facilities and conditions. It is designed to provide high-payoff, short-range solutions to safety and operational problems at relatively low cost. Positive Guidance is based on the premise that a driver can be given sufficient information to avoid accidents.

Highway system failures range from simple delays through traffic conflicts to actual accidents. Many of these are the result of failures by drivers to select appropriate speeds and paths. Positive Guidance helps eliminate these system failures by providing information that increases the probability that drivers will select the proper speed and path for the operating conditions of the highway.

The Positive Guidance methodology consists of the following six steps:

1. Data Collection at Problem Locations
2. Specification of Problems
3. Definition of Driver Performance Factors
4. Definition of Information Requirements
5. Determination of Positive Guidance Information
6. Evaluation

To date, the proposed positive guidance plan as developed in Step 5 has been reviewed and approved by the FHWA. The plan involves the use of diagrammatic signing. It is anticipated that the signing contract will be awarded in September 1979 with installation completed the following spring. Evaluation of the project (Step 6) will be conducted during the summer of 1980. In addition, the principles of this project are being applied at other problem locations throughout the state, since they have proven to be an appropriate aid in solving the myriad safety and operational problems that our maturing road system now faces.

Project BEAR Update

The state's CB motorist aid system officially became operational on October 1, 1978. This joint effort by the MDOT and the MSP provides motorists on I-96 between Grand Rapids and Detroit a means of communication with the State Police to obtain assistance in emergencies.

The project is now in a twelve month evaluation phase. During this time all calls are being coded into the MDOT computer to aid in the technical and operational evaluation of the system.

To date over 3,500 calls have been taken on the system. The 24-hour average is about 12 calls. The assistance rendered has ranged from a couple of gallons of gas to life saving medical service for heart attack and accident victims.

Most operational problems were corrected early and there has only been one minor equipment failure. The biggest problem has been achieving 100 percent roadway coverage. Several modifications have already been made to close the transmitting gaps and another will be made shortly to fill in the receiver gaps.

An advisory sign modification has also been made in an attempt to get callers to give their location when they first call. This enables the State Police operator to use the tower closest to the caller when they respond.

At the conclusion of the evaluation period a recommendation will be made on whether or not to continue the project and if continued whether expansion should be considered.

Network Simulation (NETSIM) Model

In last year's annual report, the NETSIM Model was briefly described. During the past year, the NETSIM modeling process has been utilized on four different occasions for locations on the local road system.

NETSIM analysis was applied at the Oakland-Milham signalized intersection in the city of Portage. As a partial result of the analysis, a signal modernization project was recommended complete with pedestrian signals, signal phasing, center left-turn lanes, pavement markings, and drainage.

The model was also used in analyzing a signal system modernization project along Columbia Avenue near the city of Battle Creek. The project called for installing two new signals, interconnection of the 5-signal system, intersection widenings to increase capacity, and signal phasing.

An alternative analysis of a proposed street network for a new housing development was conducted for Ingham County. The study showed the network statistics of three possible street alternatives. Such traffic flow parameters as travel time, travel distance, vehicular delay, fuel consumption, and vehicular emissions were evaluated with respect to accessibility, safety, environmental quality, and other concerns of the community.

At present, another alternative study is being conducted for the Okemos Road - Grand River Avenue - Hamilton Road - Marsh Road network in Ingham County. This analysis involves 27 different alternatives involving signal patterns, street widenings, and traffic control strategies. By simulating the various strategies, it is hoped that the most feasible implementation plan can be developed for the area.

It is anticipated that the NETSIM model will continue to be, in conjunction with our MALI and MIDAS programs, an integral working tool in the development of safety projects.

SECTION 5

SPECIAL STUDIES

Operation Lifesaver Public Information Program - The railroad grade crossing accident phenomenon continues to be one of Governor Milliken's primary concerns relative to transportation safety. While the annual number of train-car accident fatalities in Michigan has been reduced significantly over the past decade, about 30 to 40 people are still being killed every year. In 1978, 534 railroad grade crossing accidents occurred, resulting in 33 deaths and 310 injuries.

In order to reduce the number and severity of railroad grade crossing accidents in Michigan, the public information program called "Operation Lifesaver" is being developed by the Michigan State Safety Commission in cooperation with Michigan railroads. The program utilizes principles long recognized as effective in improving highway safety - Education, Engineering, and Enforcement. We anticipate significant reductions in fatalities comparable to that experienced in other states as a result of implementation of "Operation Lifesaver."

Although the law requires motorists to yield the right-of-way to trains at railroad crossings, impatience or carelessness causes some drivers to speed through in front of passing trains. Therefore, the primary target behavior of the project will be driver carelessness at railroad grade crossings. Appeals will be made to the general driving population to exercise care and caution at railroad grade crossings. By revealing the consequences that can occur, it is hoped that motorists will heed the warning devices that exist at grade crossings. The main theme of the project will be "Trains Can't Stop." By instilling into motorists the inherent dangers that exist at grade crossings, motorists are likely to use more caution when negotiating railroad grade crossings.

The major media appeal will be made through public service announcements on radio and television. Newspaper coverage of the campaign will also help to promote the project. Also, posters will be placed in schools, rest areas, and other public facilities and pamphlets will be distributed at various local and regional safety meetings.

An evaluation of train-vehicle accident experience will be made after a 1-year period to determine the impact of Operation Lifesaver. A decision will be made at that time to determine whether the project should be continued.

Pedestrian, School Crossing, and Bicycle Safety

The pedestrian accident problem, which affects all age groups of our society, is of serious proportions. This is particularly true as it relates to children and to certain older persons. While the problem is both urban and rural in scope, it is more serious in urban areas where 60 percent of the nationwide pedestrian fatalities take place.

During the past five years, a total of 1,682 pedestrians have been killed in Michigan for an average of 336 per year. A little over 15 percent of all traffic fatalities in the state involved a pedestrian. In addition, for each pedestrian killed, about 16 pedestrians are injured.

Closely related to the pedestrian safety problem is the problem involving bicycle safety. In 1977 there were 43 bicyclists killed and 3,567 injured in 4,073 total reported crashes involving bicycles and motor vehicles. It is expected, due to the energy shortage and the growing popularity of recreational riding, that bicycle usage will increase in the next five to ten years resulting in a proportional increase in fatalities and injuries.

There is a need for a coordinated effort to develop and implement a program designed to improve pedestrian and nonmotorized vehicular safety. The major emphasis on this program will focus on the need to recognize pedestrian safety as an integral element of highway safety and community planning and to ensure a continuing program to improve pedestrian safety on all roads in the state. Safe pedestrian environments are not chance occurrences. Safety is created by design through the constant attention and effort of responsible agencies and individuals. Unfortunately, pedestrian safety efforts have been haphazard or uncoordinated. There is a need for rational program development and solution implementation.

The initial program will be designed to define the extent of the safety problem relating to pedestrians, school crossings, and bicycles. Based on the results of this initial study, programs can be developed to address specific problems. Some of these programs will include the identification of pedestrian and bicycle crash problem locations and the subsequent recommendations for improvements that will result from an in-depth analysis of these locations. Special emphasis will be directed at school crossings, which will be inventoried, where uniform criteria for traffic controls will be developed and applied consistently statewide. In addition, laws relating to pedestrians, school crossings, and bicycles will be reviewed and proposals developed to achieve greater compliance with the uniform vehicle code.

Critical Accident Program

A newly expanded aspect of the department's safety activities will provide for the investigation of certain fatal and other critical accidents occurring on the state trunkline system. Reports will be documented in order to provide a better knowledge of the performance of our safety programs. Field data will be gathered by district traffic and safety engineers with certain selected data forwarded to the Lansing central office. A review of the investigative material will be undertaken on a continuing basis to determine if any highway-related crash factors are identified that can be utilized to correct or improve our highways with respect to present or future safety or construction projects.

Right Turn on Red (RTOR)

The Traffic and Safety Division recently coordinated the preparation of a report for the American Association of State Highway and Transportation Officials (AASHTO) to determine the safety and delay impacts of right turns on red. Although the study has not as yet been approved by the Executive Committee of AASHTO and the report itself cannot be released, the results of this nationwide study are pertinent to those individuals who are responsible for safety program planning and implementation.

The purpose of the RTOR study was to investigate the practice of allowing these turns with respect to safety, operational efficiency, and the regulation of RTOR with traffic control devices. The main objective of the study was to provide those responsible for roadway operations with insight for the judicious use of RTOR.

To conduct the study specific information on signalized intersections was requested from each state, its largest city, and every city over 500,000 population. This information included geographical data, signal operational data, intersection geometry, crash data, number of intersections with RTOR prohibition, location of no turn on red signs, and the type of overhead mountings used. In addition, specific data related to motorist delay was requested to provide insight on the operational effectiveness of the RTOR maneuver.

The results of the study showed that the total crashes at an average signalized intersection decreased from 12.6 crashes to 11.9 crashes per year after the conversion to allowing RTOR. This reduction in total crashes was statistically significant as were the individual reductions in rear-end crashes and other crashes which include angle, sideswipe, ran-off-road, etc. Some types of crashes such as those involving right turns and left turns did increase. However, their increase did not offset the decrease of the other types of crashes.

It was further found that the average motorist saves six seconds for every RTOR. Computerized simulation for one hour at an intersection with two approach lanes, including a right-turn lane, and an arrival rate of 700 vehicles per hour, showed a savings of approximately 1/5 of a gallon of gas when right turns are allowed on red. Overall the results of the study concluded that RTOR has been beneficial not only in vehicle delays, fuel consumption, and vehicle emissions, but also in the reduction of accidents.

The task group recommended, in the report, that each agency review those locations where RTOR is now prohibited and reevaluate the need for the prohibition. It was also recommended that those states that do not now allow left turns on red seriously consider doing so.

APPENDIX I

Table 1 Instructions and Codes

Procedural and Status Information
HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1979

Highway Location Reference System

Column (1) - Percent of miles covered by location reference system.

Column (2) - If column (1) is less than 100%, show date it is expected 100% of highway mileage will be covered by reference method. (Year)

Traffic Records System

Column (3) - Percent of reported accidents for which accident data is correlated with volume data.

Column (4) - Is it currently possible to correlate accident data with highway inventory data through automated data processing? (Y-Yes, N-No, U-Under development)

For columns (5), (6), (7), (8), (9), and (11) use the specified codes to list in order of their importance the major factors taken into account in developing projects for the various types of improvements.

Hazardous Locations

Column (5) - Criteria used to identify high hazard locations for further study.

CODES (more than one may apply)

A Number of accidents

E Economic loss/accident cost

L A specific number of locations (e.g. top 100)

CODES (continued)

R Accident rate, including rate-quality control

S Accident severity

Y Other (Describe on separate sheet)

Z Under development

Column (6) - Factors taken into account in establishing hazardous location project priorities.

CODES (more than one may apply)

C Criteria indicated in column (5)

E Cost-benefit analysis

I On-site inspection

P Project cost

R Accident and/or severity reduction expected from project

Y Other (describe on separate sheet)

Z Under development

Elimination of Roadside Obstacles

Column (7) - Factors analyzed in establishing project priorities for correction of roadside obstacle hazards.

CODES (more than one may apply)

A Accident data

E Cost-benefit analysis

H Highway system or type

I Type of obstacle/type of improvement

O Obstacle survey data

R Accident and/or severity reduction expected from project

CODES (continued)

S Traffic speed or speed limit

V ADT

Y Other (describe on separate sheet)

Z Under development

Skid Improvement Projects

Column (8) - Factors analyzed in determining priorities for correcting hazardous skid prone location.

CODES (more than one may apply)

A Total accidents

E Cost-benefit analysis

G Roadway geometrics

I On-site inspection other than skid testing

P Pavement texture or other pavement characteristics besides skid number

R Accident and/or severity reduction expected from project

S Skid number

V ADT

W Wet pavement accidents

Y Other (describe on separate sheet)

Z Under development

Hazardous Bridges

Column (9) - Factors analyzed to determine priorities for correcting operationaly hazardous conditions associated with bridges.

CODES (more than one may apply)

A Accident history

B Bridge width

CODES (continued)

E Cost-benefit analysis

G Condition of approach guardrail

R Accident and/or severity reduction expected from project

S Posted speed limit

V ADT

W Bridge width in relation to approach width

Y Other (describe on separate sheet)

Z Under development

Rail-Highway Grade Crossings

Column (10) - Method used to update crossing inventory

CODES (more than one may apply)

N National Railroad-Highway Crossing Inventory Update Manual

S State inventory

Y Other (describe on separate sheet)

Column (11) - Factors taken into account in establishing project priorities

CODES (more than one may apply)

A Accident history

C Physical characteristics of the crossing

E Cost/benefit analysis

H Hazard index formula (show formula on separate sheet and define all terms)

I On-site inspection

M Hazardous materials factor

P People factor (buses, passenger trains, etc.)

T Characteristics of train traffic

CODES (continued)

V Characteristics of highway traffic

W Existing warning devices

Y Other (describe on separate sheet)

Column (12) - Number of crossings at which crossbucks, advance warning signs, and/or pavement markings were upgraded to MUTCD standards during the period July 1, 1973, to June 30, 1979* without regard to funding source. This information has not previously been available from PR 37 data.

Column (13) - Number of public crossings that do not comply with minimum MUTCD standards as of June 30, 1979.

Column (14) - Percentage of public crossings that do not comply with minimum MUTCD standards as of June 30, 1979.

Column (15) - Target date for full compliance with MUTCD (Year).

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*If this information was reported last year for the period July 1, 1973, to June 30, 1978, report only for the period July 1, 1978, to June 30, 1979.

APPENDIX II

Table 2 Instructions

EVALUATION DATA FOR COMPLETED IMPROVEMENTS
HIGHWAY SAFETY IMPROVEMENT PROGRAM
AND PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1979

General

- Provide information only for improvements with at least 1 year "before" and 1 year "after" accident data.
- Data on more than one project may be combined as long as the source of funds (column 1), safety classification code (column 2), before and after periods (columns 6 and 11), and evaluation status (column 16) are the same. Otherwise, data for each project should be shown separately.
- Information for columns (1) through (16) is required.
- Information for columns (17) through (22) is optional.

Column (1) - Indicate source of funds for the safety improvement.

Code:

HH - High Hazard Location Projects

RO - Elimination of Roadside Obstacles

SR - Safer Roads Demonstration

PM - Pavement Marking Demonstration Program

RR - Rail-Highway Crossings

SO - Safer Off-System Roads Program

IS - Interstate Safety Improvements

FA - Other safety improvements made with Federal-aid funds

SL - Safety improvements funded with State and local funds only

Column (2) - Indicate the type of safety improvement as classified by Safety Classification Codes in FHWA Administrative Manual, Volume 22, Chapter V, Paragraph 23.

Column (3) - For the improvement(s) included on each line enter the total cost(s) in thousands of dollars to one decimal place.

Column (4) - Based on classification code used in column (2), enter the total quantity of improvements included on each line according to the codes below:

Safety Codes	Quantity of Improvements	Unit Code
10-19	Number of intersections	X
20-24, 27, 29, 67	Number of miles (0.1)	M
25, 26	Either of the above as appropriate	X or M
30-39, 66	Number of structures	S
50-59	Number of crossings	R
64	Highway miles of centerline marked	C
	Highway miles of edgeline marked	E
	Highway miles of both center and edgeline marked	B
	Number of intersections marked (cross walks, stop bars, etc.)	X
	Number of railroad grade crossings marked	R
	Other markings	As appropriate
68	Number of locations	L
All others	Any of the above as appropriate	As appropriate
Any	Unknown	N

Column (5) - Indicate the appropriate units code for quantity shown in column (4). If quantity of improvements is not available use "N" in column (5).

Columns (6) and (11) - Indicate the number of months included in the "before" and "after" periods, respectively.

Columns (7) and (12) - Enter the number of fatal accidents that occurred in the "before" and "after" periods, respectively.

Columns (8) and (13) - Nonfatal injury accidents.

Columns (9) and (14) - Property damage only accidents.

Columns (10) and (15) - Total accidents

Column (16) - For each line of data in the table:

- Enter "P" if this is preliminary data and more evaluation data will be submitted on the project
- Enter "F" if this is the final evaluation data that will be submitted on the project(s).

Columns (17) and (18) - For each line entry, based on the classification codes used in column (2), enter the appropriate exposure data for the "before" and "after" periods in million vehicles or million vehicle-miles to two decimal places.

$$\text{Million vehicles} = \frac{(\text{ADT} \times 30 \times \text{number of months})}{(10)^6}$$

$$\text{Million vehicle miles} = \frac{(\text{ADT} \times 30 \times \text{no. of months} \times \text{no. of miles})}{(10)^6}$$

Safety Codes	Exposure	Units Code
10-19 30-39 50-59 66, 68	Million vehicles	V
20-24, 27, 29, 67	Million vehicle miles	M
All Others	Either of the above as appropriate	V or M

Column (19) - Indicate the appropriate units code for the exposure data shown in columns (17) and (18).

Column (20) - Enter "R" if projects are in a rural area. Enter "U" if projects are in an urban area.

Column (21) - Enter number of lanes. For divided highways indicate the total number of lanes in both directions. For intersection projects enter the number of lanes on the major street.

Column (22) - Enter "U" if roadway is undivided. Enter "D" if roadway is divided.

For intersection projects indicate if the major street is divided or undivided.