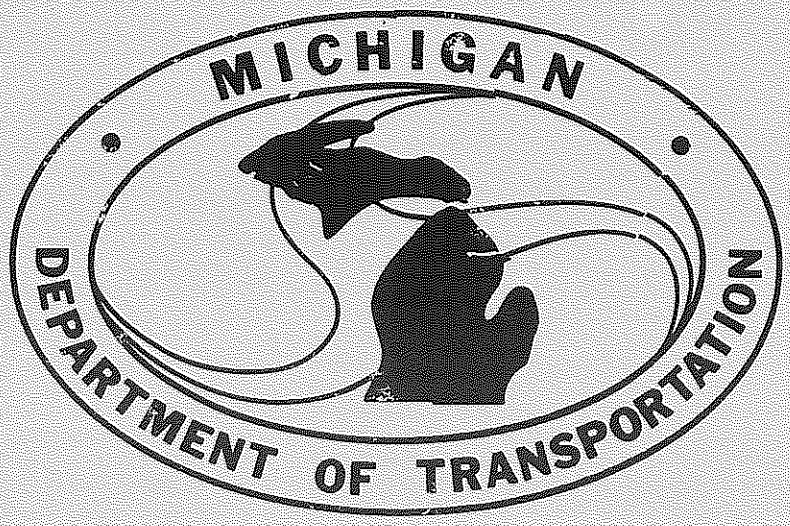
TWELFTH ANNUAL REPORT
OF
MICHIGAN'S OVERALL HIGHWAY SAFETY IMPROVEMENT PROGRAM

July 1, 1984 - June 30, 1985



August 31, 1985

This report was prepared by the Traffic and Safety Division. The opinions, findings, and conclusions expressed in this publication are those of the Traffic and Safety Division and not necessarily those of the Federal Highway Administration.

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Introduction

This is the Twelfth Annual Report of Michigan's Highway Safety Improvement Program. The report covers the period July 1, 1984 through June 30, 1985.

The Highway Safety Program summary is found on page 3. In general, all of the categorical projects were identified and selected following the Highway Safety Improvement Process, outlined in the Appendix of this report. Over $82 million of safety projects were identified in this years report. This is significiantly greater then in recent years, reflecting the greater availability of funds at the federal and state level.

In addition to implementing safety justified projects, the department continues to emphasize the 3R/4R type construction program. These projects are all reviewed to insure that appropriate "safety enhancements" are included with particular attention to the roadside environment and to locations experiencing documented concentrations of accidents.

This report includes evaluation of the HES program. The evaluation incorporates statistical controls which account for accident trends and "expected" changes in before-and-after accidents.

Also in this report is a revised Highway Safety Improvement Process (HSIP). The major revision of the HSIP is inclusion of guidelines for federal funding of safety projects on the nontrunkline system. These guidelines were prepared by the Department's Local Services Division and approved by the FHWA.

Highway Safety in Michigan - The Year in Review

For the first time since 1978, Michigan experienced an increase in highway fatalities in 1984. There were 1,556 deaths statewide, 16.9 percent more than reported in 1983, and the most since 1981 (1,589). Total accidents and injuries were also up in 1984 to 335,200 (300,800 in 1983) and 150,800 (135,800 in 1983) respectively. On the positive side, the death total was 15.8 percent below the 1,849 killed in 1979 and 37.4 percent below the 2,487 fatalities recorded in the record year of 1969. We are also encouraged by 1985 accident data, through July. While vehicle miles traveled continue to increase, fatalities, through September, were about 4 percent below the same period in 1984.

The 1984 fatality rate was 2.4 per 100 million vehicle miles, a 14.3 percent increase over the 1983 rate of 2.1, but still below the national rate of 2.7. Travel increased by over three percent between 1983 and 1984 from 63.6 to 65.7 billion vehicle miles traveled.

Enactment of a mandatory front seat safety belt law culminated long term efforts of Michigan's safety community. The law took effect on July 1, 1985, and results appear promising. Preliminary data indicates that 134 roadway fatalities occurred between July 1, and September 31, 1985 compared to 484 killed during the same 1984 period. Pre-law publicity apparently resulted in a seat belt usage increase to 23 percent in 1984 among accident victims, compared to 18 percent in 1983. Observation studies conducted subsequent to enactment of the law indicates that seat belt use has increased to about 60 percent. Statistical analyses of the law's effects will be conducted by the University of Michigan's Transportation Research Institue under contract to the Michigan Office of Highway Safety Planning.

Child restraint use also continues to increase and safety benefits are being documented as a result of Michigan's child restraint law. Casualties involving children covered by the law have decreased by about 25 percent since enactment of this legislation.

Continued enforcement of Michigan's drunk driving laws is indicated by arrests for drinking drivers which increased 22 percent from 65,451 in 1982 to 79,812 in 1984. The involvement rate of drinking drivers in fatal accidents dropped about three percent (53.3 to 50.6 percent) during the same time period. However, public controversy and debate have, at least temporarily, stalled initiatives to implement a statewide sobriety check lane program.

Compliance with the 55 mph speed limit remains a major concern. Federal transportation funds are threatened by the slow but steady escalation of speeds in Michigan and in other states. Federal law provides for a penalty of up to 10 percent of funds allocated for primary, secondary, and urban systems highways if more than half of a state's motorists exceed the 55 mph speed limit. Adjusted survey data for 1984 shows 50.3 percent of Michigan drivers within the limit, compared to 51.5 percent in 1983. In response to this trend the Michigan Department of State Police increased enforcement efforts in August, 1985, including use of aerial surveillance units.

Obviously, the accident/casualty increase in 1984 is cause for concern. However, we are confident that the setback is temporary, even though reasons for the increase are not clear. With continued federal support for improved highway facilities, agressive law enforcement and education efforts and increased safety belt use, we anticipate an improved record in 1985 and beyond.

Highway Safety Program Summary (Obligated)
July 1, 1984 - June 30, 1985

Federal Categorical	
Hazard Elimination Safety	6,431,756
Rail/Highway Crossings	5,906,588
Pavement Marking	125,989
Other Federal Funds	
Interstate	29,340,000
Primary	20,485,130
Seconday	714,275
Urban	7,618,000
State Funded	
	1,321,478
State/Local Match	
	10,593,260
TOTAL	82,536,476

Federal Funding of Highway Safety Improvements in Michigan

As of June 30, 1985, Michigan had obligated 129.8 million or 94.4 percent of its total since 1974 apportioned combined federal aid safety construction funds available. That total includes obligations from the various categorical programs as follows:

Program	Obligated (Millions)	Percent of Apportionment
Rail Highway Combined		
On System	$57.5	93%
Off System	7.3	99%
HES	40.0	91%
HH, ROS	9.6	100%
Pavement Marking	15.4	100%

From July 1, 1984 to June 30, 1985, $12,464,333 was obligated from the various categorical funds (not including the special bridge replacement program on the state and local systems). Hazard Elimination obligations totaled $6,431,756 Rail/Highway obligations $5,906,588, and Pavement Marking program obligations $125,989. In addition to the Pavement Marking Program funds obligated during this past fiscal year, the department allocated approximately $3.5 million for retracing pavement markings on our state trunkline system.

As noted on the "Highway Safety Program Summary" $29.3 million of Interstate and $28.8 million of Federal Aid Primary, Secondary, and Urban funds were obligated for projects primarily justified based on safety.

Evaluation of the Hazard Elimination program and a several other federal/state funded projects are also included in this report. Due to discontinuation of PMS program funding, Tables 3 and 4 relative to that program are not included. Following is Table 1 (Procedural and Status Information) which summarizes the department's location referencing, traffic records, and rail-highway grade crossing systems.

TABLE 1

STATE: Michigan | M | I | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1985
PROCEDURAL AND STATUS INFORMATION

Line	Highway System	HIGHWAY LOCATION REFERENCE SYSTEMS: Miles Covered (Percent) (1)	Expected Completion (Year) (2)	Type of Location Reference Method (3)	TRAFFIC RECORDS SYSTEM: Types of Data Collected and Maintained (4)	Automated Correlation of Accident and Highway Data (Percent) (5)	Automated Correlation of Accident and Volume Data (Percent) (6)
101	Interstate	100	N/A	M	AMT	100	0
102	State - F.A.	100	N/A	D-II	AMT	100	100
103	State - Non-F.A.	100	N/A	D-II	AMT	100	100
104	Local - F.A.	100	N/A	D-II	AT	0	0
105	Local - Non-F.A.	100	N/A	D-II	AT	0	0

Line	Highway System	HAZARD ELIMINATIONS: Criteria for Identifying Hazardous Locations, Sections and Elements *(7)	Criteria for Setting Project Priorities *(8)	RAILROAD-HIGHWAY GRADE CROSSINGS: Inventory Update *(9)	Project Priority Selection *(10)	Compliance With MMUCD: Crossings Upgraded **7/1/73-6/30/82 (11)	Not Complying: Number (12)	% (13)	Compliance Target Date (14)
201	Interstate	AEHLRS	CEIPTV						
202	State - F.A.	AEHRS	CEIPTV	B	AHIMPTVW	N/A	0	0	N/A
203	State - Non-F.A.	AEHRS	CEIPTV	B	AHIMPTVW	N/A	0	0	N/A
204	Local - F.A.	AEHRS	CHIPTV	B	AHIMPTVW	N/A	0	0	N/A
205	Local - Non-F.A.	AEHRS	CHIPTV	B	AHIMPTVW	N/A	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.

Indicate reporting period:
7/1/73-6/30/85 ____
7/1/81-6/30/85 ____

HES Program Evaluation Data

Thirty-two completed federally funded safety improvement projects were evaluated in this year's annual safety report. Project types include lane widenings, realignments, signal installations and upgradings, pavement friction improvements, and various other types of roadside and roadway improvements.

Accident data was collected before-and-after each project for one to three year periods and is summarized below. The average before/after period evaluated was 2.44 years. The 32 projects experienced a total of 1802 accidents in the before period with nine fatalities and 914 injuries. After accidents totalled 1,483 with six fatalities and 657 injures. The 32 projects cost a total of $6,724,600. An annual accident savings of 1.24 million resulted in a project time-of-return (T.O.R.) of 5.43 years which is much better than the 10 year TOR goal outlined in the Highway Safety Improvement Process.

Time-of-Return (T.O.R.) Evaluation of HES Safety Projects

Before				After			
Fatal	Injury	PD	Total	Fatal	Injury	PD	Total
8 (9)	578 (914)	1,216	1,802	4(6)	420 (657)	1,059	1,483

Before Accidents costs $11.15 million. After accident costs $8.13 million. Savings $3.02 million. Annual savings $1.24 million based on 2.44 years.

In addition, a statistical evaluation of the 32 HES projects was undertaken which used "control" samples to account for statewide accident trends. The statistical tests reflect evaluation techniques endorsed by the FHWA in "Evaluation of Highway Safety Projects" (January 1979). Specifically, the poisson technique, 95 percent level of confidence was used. "Before" and "After" accident data for like periods were compared, usually one to three years. The expected "After" period accident frequency (E_f) was calculated using the following formula:

$$E_f = B_{pf} \times \frac{A_{cf}}{B_{cf}}$$

B_{pf} = Before Period Accident Frequency

A_{pf} = After Period Accident Frequency

A_{cf}/B_{cf} = After Control Group Accident Frequency/Before Control Group Accident Frequency

E_f = After Expected Accident Frequency

That analysis indicates that total accidents at the 32 project sites decreased 13.4 percent greater than "expected".

The HES projects were further analyzed by project type. Three categories were evaluated; lane widenings (20 projects) friction improvements (3 projects) widenings and shoulders (6 projects) and miscellaneous (3 projects). Appropriate control groups were utilized to establish trends for each project type. Both "lane widenings" and "miscellaneous" projects evidenced statistically significant accidents reductions of 18.6 and 16.4 percent greater than "expected". "Friction improvements" and "widening and shoulder" project types did not evidence accident reductions as great as "expected". The statistical evaluation table follows.

Statistical Evaluation of HES Safety Projects

Project Type	Bpf	Apf	Acf/Bcf	E_f	%Reduc.	Significant
All Projects (32)	1802	483	0.951	1713	13.4	Yes
1A 1D 1G 3B Lane Widening (20 Projects)	843	655	0.955	805	18.6	Yes
1D 3F Friction Improvement (3 Projects)	71	74	0.925	66	0.0	No
3A 3B 3D 3E 3R Widening & Shoulders (6 Projects)	249	244	0.925	233	0.00	No
1C 1F 1G Miscellaneous (3 Projects)	639	510	0.955	610	16.4	Yes

Other Federal/State Funded Project Evaluation Data

Twenty-two completed noncategorical federal/state funded safety projects were also evaluated for this years annual safety report. Project types are similar to those in the HES program evaluation.

Accident data for each project was collected and is summarized below. The average before/after period evaluated was 2.4 years. The 22 projects cost a total of $3,185,400. An annual accident savings of $2.32 million resulted in a project time-of-return (T.O.R.) of 1.4 years, which is considerably better than the desired 10-year T.O.R. goal for safety projects.

Time-of-Return (T.O.R.) Evaluation of Other Federal/State Safety Projects

Before				After			
Fatal	Injury	PD	Total	Fatal	Injury	PD	Total
13 (14)	1020 (1596)	1885	2918	3 (3)	783 (1255)	1596	2382

Before accident costs $18.83 million After accident costs $13.25 million
Savings $5.57 million
Annual savings $2.32 million based on 2.4 years.

A statistical evaluation of the "Other" Federal/State Safety projects was also completed. It is similar to the previously discussed HES statistical evaluation. The following table documents that all 22 projects witnessed a reduction of accidents 14.2 percent greater than expected. Lane widenings (12 projects) and friction improvements (4 projects) reflected statistically significant reductions. The "miscellaneous" project category type witnessed an accident reduction, though it was not statistically significant.

Statistical Evaluation of Other Federal/State Safety Projects

Project Type	B_{pf}	A_{pf}	A_{cf}/B_{cf}	E_f	%Reduc.	Significant
All Projects (22)	2918	2382	0.951	2775	14.2	Yes
1A, 1G, 3B Lane Widening (12 Projects)	522	276	0.955	499	44.5	Yes
3F Friction Improvement (4 Projects)	447	322	0.925	413	22.0	Yes
3A, 3B, 3D 3E, 3K, 3R Miscellaneous (6 Projects)	1949	1785	0.925	1803	1.0	No

Following are completed FHWA "Table 2's" for all of the 54 projects. 10-11-85

TABLE 2

Michigan | M | 1 | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
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 Before Mos. (6)	Before Fat. (7)	Before Inj. (8)	Before PDO* (9)	Before Tot. (10)	After Mos. (11)	After Fat. (12)	After Inj. (13)	After PDO* (14)	After Tot. (15)	Evaluation Status (16)	Exposure Information Before AADT (17)	Exposure Information After AADT (18)	(19)	Rural or Urban (20)	Number of Lanes (21)	Divided or
01		HE	1A3B3E	295.8	1	X	36	0	4 (4)	11	15	36	0	3 (6)	11	14	F				U	4	U
02		HE	1A3B	45.8	1	X	24	0	2 (5)	4	6	24	0	0	3	3	F				U	2	U
03		HE	1A3B	290.5	1	X	26	0	19 (27)	41	60	26	0	9 (20)	28	37	F				R	4	U
04		HE	1A3B	92.5	1	X	24	0	29 (54)	74	103	24	0	36 (48)	57	93	F				U	5	U
05		HE	1A3B	117.7	1	X	17	0	9 (15)	10	19	17	1 (1)	7 (12)	11	19	P				U	4	U
06		HE	1A3B	87.4	1	X	17	0	8 (10)	10	18	17	0	4 (7)	10	14	P				R	2	U
07		HE	1A3B	392.8	1	X	32	0	11 (23)	31	42	32	0	16 (25)	41	57	F				U	4	U
08		HE	1A3B	83.1	2	X	25	0	4 (5)	19	23	25	0	7 (17)	17	24	F				U	2	U
09		HE	1A3B	195.8	1	X	24	0	5 (5)	21	26	24	0	3 (3)	9	12	F				U	2	U
10		HE	1A3B	666.7	1	X	36	1 (2)	23 (39)	39	63	36	0	10 (14)	17	27	F				R	4	U
11		HE	1A3B	168.0	1	X	30	0	31 (54)	56	87	30	0	22 (40)	58	80	F				R	4	U
12		HE	1A3B	159.5	1	X	24	0	52 (87)	63	115	24	0	36 (71)	93	129	F				R	5	U
13																							
14		TOTAL	1A3B	2595.6			26.25	1 (2)	197 355	379	577		1 (1)	153 263	355	509							
15																							

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.) $200.00

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Michigan | M | 1 | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
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 Before Mos. (6)	Before Fat. (7)	Before Inj. (8)	Before PDO* (9)	Before Tot. (10)	After Mos. (11)	After Fat. (12)	After Inj. (13)	After PDO* (14)	After Tot. (15)	Evaluation Status (16)	Exposure Information Before AADT (17)	Exposure Information After AADT (18)	(19)	Rural or Urban (20)	Number of Lanes (21)	Divided or
01	HE	1A1D1G3B	491.4	2	X	24	0	11 (19)	20	39	24	0	5 (5)	45	50	F				U	4	U
02	HE	1A1D1G3G	106.0	1	X	12	0	1 (1)	3	4	12	0	3 (4)	4	7	P				U	2	U
03	HE	1A1D1G3B	305.3	2	X	24	0	16 (24)	44	60	24	0	5 (8)	21	26	F				U	2	U
04	HE	1A1D1G3B	63.9	1	X	24	0	19 (29)	24	43	24	0	6 (6)	19	25	F				R	2	U
05	HE	1A1G3B	212.7	1	X	27	0	34 (52)	49	83	27	0	10 (11)	33	43	F				R	4	U
06	HE	1A1G3B	88.1	1	X	23	0	11 (17)	18	29	23	0		16	20	P				R	2	U
07						268							4 (6)									
08	TOTAL	1ADG3B	1172.0			22.3	0	92 (142)	166	258		0	33 (40)	108	141							
09				8									88									
10	HE	1C	817.6		M	24	2(2)	136 175	441	579	24	0	126 183	349	475							
11																						
12	HE	1D3F	268.6		M	36	0	6(7)	15	21	36	0	5 (7)	4	9	F				R	4	U
13	HE	1D3F	231.2	1	X	26	0	6(9)	2	8	26	0	0	0	0	F				R	2	U
14	HE	3F	67.0	3	X	12	0	15 (22)	27	42	12	0	16 (24)	49	65	P				U	4	U
15	TOTAL	1D3F	566.8			74 24 67		27 (38)	44	71			21 (31)	53	74							

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.)_____

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TABLE 2

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Michigan | M | 1 | FIPS CODE (Alpha)

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 Information			Rural or Urban (20)	Number of Lanes (21)	Divided or (2
							Before					After						Before AADT (17)	After AADT (18)	(19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO* (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO* (14)	Tot. (15)							
01		HE	1F	77.5	1	X	15	1 (1)	13 (23)	20	34	15	0	9 (15	9	18	P				U	5	U
02		HE	1G	25.2	2	X	24	0	8 (9)	18	26	24	0	7 (8)	10	17	F				U	2	U
03							39																
04			TOTAL 1FG	102.7	3		19.5	1 (1)	21 (32)	38	60		0	16 (23	19	35							
05																							
06		HE	3A	236.7	1	X	24	0	1 (7)	0	1	24	0	3 (10)	1	4							
07		HE	3A3E	147.5	0.6	M	23	0	3 (5)	2	5	23		2 (2)	0	2							
08							47																
09			TOTAL 3AE	384.2			23.5	0	4 (12)	2	6		0	5 (12)	1	6							
10																							
11		HE	3B	49.3	1	X	29	0	1 (1)	2	3	29	0	0	1	1	F				R	2	U
12		HE	3B5J	111.8	1	X	24	0	2 (5)	3	5	24	0	0	4	4	F				U	2	U
13							53																
14			TOTAL 3B	116.1			26.5	0	3 (6)	5	8		0	0	5	5							
15																							

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.)

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Michigan — FIPS CODE (Alpha): M 1

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
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 Information			Rural or Urban (20)	Number of Lanes (21)	Divided or (2
							Before					After						Before AADT (17)	After AADT (18)	(19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO* (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO* (14)	Tot. (15)							
01		HE	3D3E	264.9	0.25	M	15	0	12 (19)	4	16	15	0	6(8)	10	16	P				R	2	U
02		HE	3D3R	447.8	8.6	M	36	3 (3)	43 (65)	54	100	36	5 (5)	42(67)	86	131	F				R	2	U
03		HE	3E	41.1	1	X	29	1 (1)	2 (4)	1	4	29	0	2(7)	1	3	F				R	2	U
04		HE	3E	170.8	3	X	36	0	41 (66)	82	123	36	0	16(23)	72	88	F				U	5	U
05							116																
06			TOTAL 3DER	924.6			29	4 (4)	98(154)	141	243		3 (5)	66(105	169	238							
07																							
08		32	TOTAL ALL	6724.6				8 (9)	578 914	1216	1802		4 (6)	420 657	1059	1483							
09																							
10																							
11																							
12																							
13																							
14																							
15																							

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.)_____

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Michigan — M I — FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
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 Before Mos. (6)	Before Fat. (7)	Before Inj. (8)	Before PDO* (9)	Before Tot. (10)	After Mos. (11)	After Fat. (12)	After Inj. (13)	After PDO* (14)	After Tot. (15)	Evaluation Status (16)	Exposure Information Before AADT (17)	Exposure Information After AADT (18)	(19)	Rural or Urban (20)	Number of Lanes (21)	Divided or (2
01	SL	1A	25.6	5	X	16	0	13 (22)	5	18	16	0	18 (32	1	19	P				U	6	D
02	SL	1A	23.9	1	X	17	0	7 (11)	11	18	17	0	7 (9)	25	32	P				U	4	U
03	SL	1A	13.9	1	X	25	0	6 (12)	24	30	25	0	1(1)	7	8	F				U	5	U
04																						
05		TOTAL 1A	63.4				0	26 (45)	40	66		0	26 (42	33	59							
06																						
07	SL	1A3B	142.8	1	X	28	0	12 (18)	8	20	28	0	8 (12	13	21	F				R	2	U
08	SL	1A3B	53.4	1	X	27	0	10 (12)	36	46	27	0		15	20	F				U	4	U
09	SL	1A3B	10.5	1	X	27	0	2 (3)	16	18	27	0	5 (10	30	35	F				U	4	U
10	SL	1A3B	141.5	1	X	29	0	17 (32)	27	44	29	1 (1)	10 (23	4	15	F				U	4	D
11	SL	1A3B	153.9	1	X	30	2 (2)	15 (21)	31	48	30	0	10 (16	14	24	F				U	4	D
12	SL	1A3B	88.9	1	X	24	0	5 (9)	11	16	24	0	6 (10	7	13	F				R	4	U
13	SL	1A3B	40.8	1	X	30	0	22 (28)	28	50	30	0	4 (5)	29	33	F				U	6	D
14																						
15		TOTAL 1A3B	631.8				2 (2)	83(123)	157	242		1 (1)	48 (83)	112	161							

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.) $200.00

TABLE 2

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Michigan — FIPS CODE (Alpha): M I

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
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 Information			Rural or Urban (20)	Number of Lanes (21)	Divided or
							Before					After						Before AADT (17)	After AADT (18)	(19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO* (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO* (14)	Tot. (15)							
01		SL	1A1G3B	542.9	0.48	M	36	0	99(186)	89	188	36	0	19(32)	30	49	F				U	4	D
02		SL	1D 3F	207.0	1	M	36	0	15(28)	11	26	36	0	3(3)	4	7	F				R	2	U
03																							
04			TOTAL 1ADG	749.9				0	114(214)	100	214		0	22(35)	34	56	F						
05																							
06		SL	3F	332.5	1	M	36	1(1)	48(76)	87	136	36	0	35(53)	51	86	F				R	2	U
07		SL	3F	57.9	1	X	36	1(1)	25(36)	118	144	36	0	24(36)	98	122	F				U	4	U
08		SL	3F	23.4	0.3	M	36	0	17(19)	28	45	36	0	3(5)	21	24	F				R	2	U
09		SL	3F	76.1	1	X	36	1(1)	14(24)	107	122	36	0	18(35)	72	90	F				U	4	U
10																							
11			TOTAL 3F	489.9				3(3)	104/155	340	447			80/129	242	322							
12																							
13		SL	3A	606.4	0.87	M	36	0	42/61	97	139	36	0	32/60	73	105	F				R	2	U
14		SL	3B	302.2	1.47	M	25	2(3)	13(22)	45	60	25	0	13(20)	54	67	F				R	2	U
15		SL	3D	101.0	2.8	M	24	1(1)	4(14)	22	27	24	0	8(29)	30	38	F				R	5	U

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.) $200

TABLE 2

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 198
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Michigan | M | I | FIPS CODE (Alpha)

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 Before Mos. (6)	Before Fat. (7)	Before Inj. (8)	Before PDO* (9)	Before Tot. (10)	After Mos. (11)	After Fat. (12)	After Inj. (13)	After PDO* (14)	After Tot. (15)	Evaluation Status (16)	Exposure Information Before AADT (17)	Exposure Information After AADT (18)	Exposure Information (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or
01	SL	3E3R	152.2	1	X	30	1(1)	17(28)	40	58	30	0	3(4)	4	7	F				R	2	U
02																						
03		TOTAL 3ABDE	1161.8				4(5)	76 125	204			0	56(113)	161	217							
04																						
05	SL	3K	60.0	3.7	M	24	4(4)	616 933	1037	1657	24	2(2)	551 853	1014	1567	F				U	4	D
06	SL	3K	28.6	2.2	M	28	0	1(1)	7	8	28	0	0	0	0	F				U	4	U
07																						
08		TOTAL 3K	88.6				4(4)	617 934	1044	1665		2(2)	551 853	1014	1567							
09																						
10	22	TOTAL ALL	3,185.4				13(14)	1020 1596	1885	2918		3(3)	783 1255	1596	2382							
11																						
12																						
13																						
14																						
15																						

*Threshold for reporting PDO accidents that are included in this Table (i.e., minimum dollar value, towaway, etc.) $200

Safety Program Activities

A Safety Improvement process was first outlined in our Eighth Annual Report in 1981 and revised last year. This years report includes a further revision of the Safety Improvement Process, located in the Appendix. Major changes include a process for developing and implementing non state trunkline HES projects.

As outlined in last years report, engineering evaluation and analysis on the state trunkline system continues to be the primary responsibility of the Traffic and Safety Division's Safety Program's Unit. Major activities of the Safety Program Unit are discussed below.

Crash Analysis/Roadside Safety Program

The Crash Analysis/Roadside Safety group evaluates approximately 2,000 trunkline locations which exceed predetermined threshold numbers of total accidents or accident types (including ran-off-road), in a two-year period. A more detailed discussion of the data analysis/evaluation/project selection process is included in the appendix "Safety Improvement Process."

In addition, in response to a Federal Highway Administration mandate that a safety analysis on all 3R/4R type projects be completed, last year approximately 150 accident analyses were conducted for road and bridge projects.

TOPICS Program

The Traffic Operations Program to Increase Capacity and Safety (TOPICS) is the traffic engineering element of the department's Transportation System Management (TSM) process.

The program encompasses both state trunklines and local streets in 32 cities with populations greater than 10,000 to assure a comprehensive, integrated effort to indentify and solve traffic engineering problems. The local street review is accomplished by our Community Assistance group funded by Federal Section 402 funds distributed through the Office of Highway Safety Planning. The TOPICS reviews are closely coordinated with the Metropolitan Planning Organization (MPO) in 15 larger urbanized areas and with appropriate local officials in the smaller communities.

During the past year, we completed TOPICS studies in Adrian, Owosso, Monroe, Traverse City, Niles, and Flint (Genesee County). The six studies involved review of 204 locations experiencing concentrations of accidents or congestion. Fifty-four percent of the locations were on the state trunkline system and 46 percent were on local street systems. Corrective recommendations totaled 291 and consisted of 249 low-cost operational actions and 42 capital outlay (construction) projects. Based on a conservative five percent expected reduction in total accidents for each of the operational recommendations and a $2,000 average implementation cost, the time of return (TOR) for the operational improvements is estimated to be less than one year.

Construction projects ranged from pavement friction improvements to intersection and corridor widenings. Thirty-four of the 42 projects potentially qualified for HES funding. Additional considerations, such as capacity, were involved in recommending the eight other projects. The average cost of the 34 safety justified construction improvements was estimated to be $123,000 and the average annual benefit was estimated at $30,000, providing an average TOR of

about four years. By December 1984, 50 percent of all 1984 calendar year recommendations had already been implemented. A minimum 90 percent final implementation recorded is anticipated.

Community Assistance Program

The Community Assistance Program assists in the identification, analysis, and correction of locations experiencing accident concentrations. The program is funded by a Section 402 grant administered by the Michigan Office of Highway Safety Planning.

We continue to emphasize integration of the Community Assistance Program with our TOPICS program as discussed previously. This results in a much higher level of activity and, we believe, a more efficient, cost-effective use of personnel. The Community Assistance Program does, however, continue to respond to any local agency requesting its services.

During fiscal 1984-85, the Community Assistance Program analyzed 108 locations. Ninety-four were included as part of TOPICS reviews and 14 were completed on a special request basis.

APPENDIX I
SAFETY IMPROVEMENT PROCESS

Table of Contents

I. Planning

A. Data Collection

1. Accident Data

The Michigan Department of Transportation utilizes a computerized crash location reference and analysis system referred to as the Michigan Accident Location Index (MALI). The MALI system generates computerized descriptions of traffic crash locations directly from the information reported by the police officer. The system uses a street index composed of distances between intersections, alternate street names, and accurate city and township boundaries.

The MALI system enables the user to identify locations on all roads and streets with concentrations of correctable accident types.

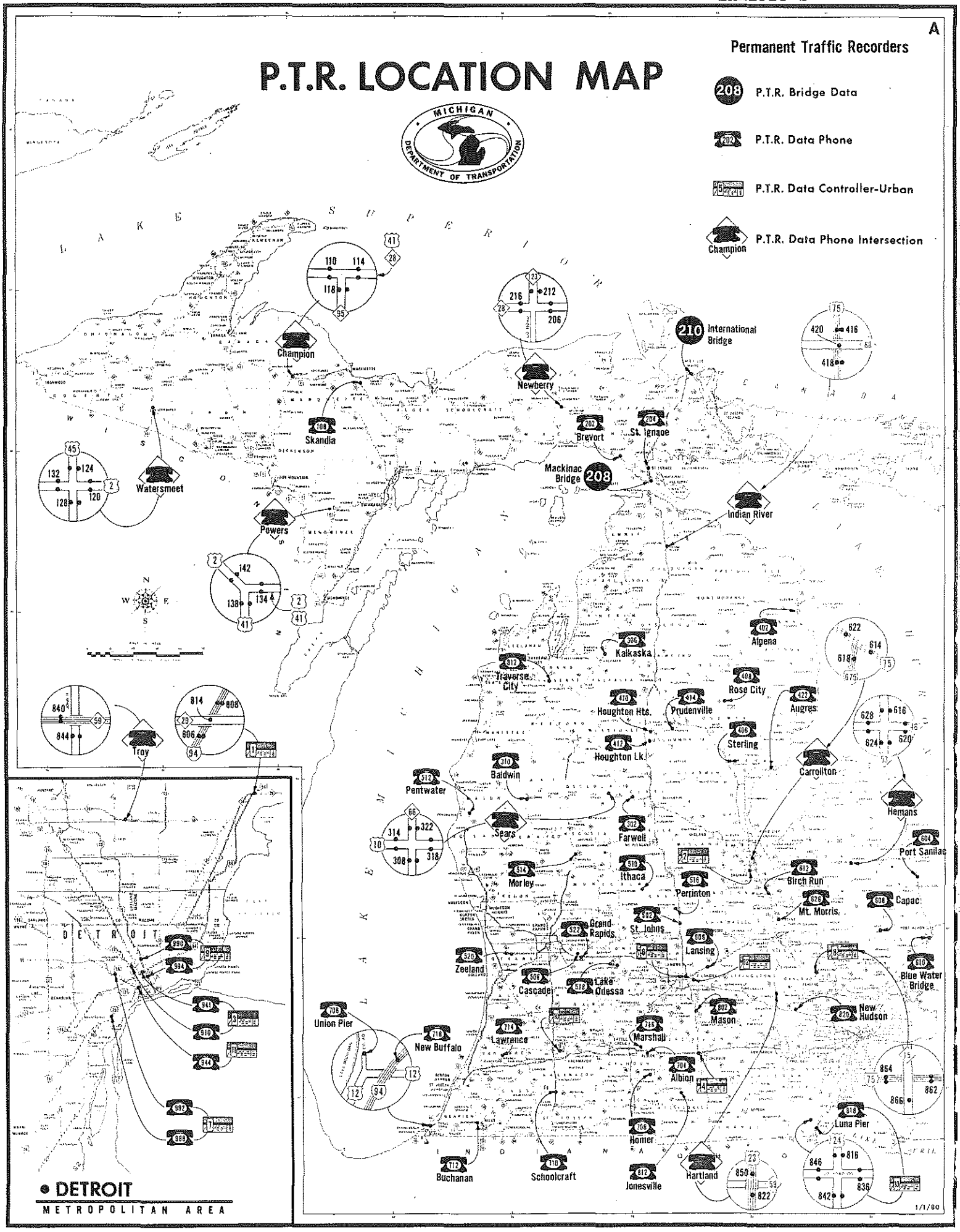
2. Traffic Volume Data

The department utilizes Permanent (automatic) Traffic Recorders (PTR), portable traffic recorders, and manual recording techniques to collect traffic volume data on the trunkline system. The counting network consists of 110 PTR's 393 portable traffic recorder "A: stations, and 2858 portable traffic recorder "C" stations. ATR data is used to establish seasonal and annual volume trends (refer to Exhibit I). "A" stations are counted for one week, three times a year and are used to determine where patterns change. "C" stations (short counts) are counted once a year for 48 to 96 hours and are used to identify volume changes.

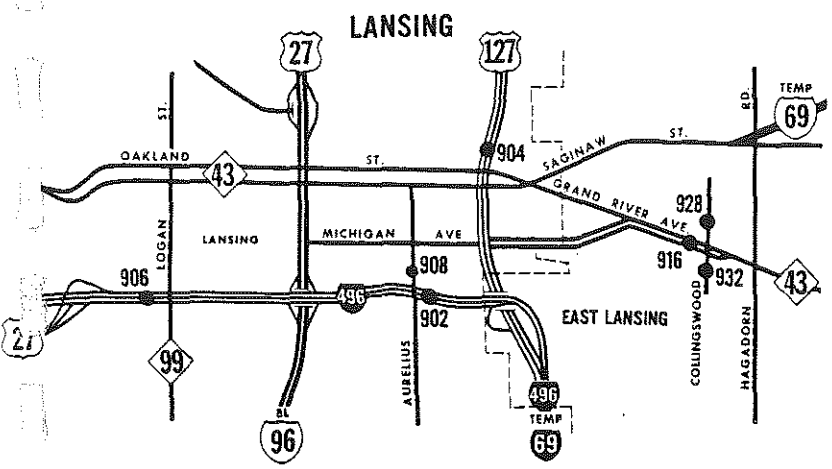
Vehicle classification surveys are conducted year-round at all the permanent traffic count stations by manual observation for 8- and 16-hour periods. This data is used to determine the mix of commercial traffic on the trunkline system.

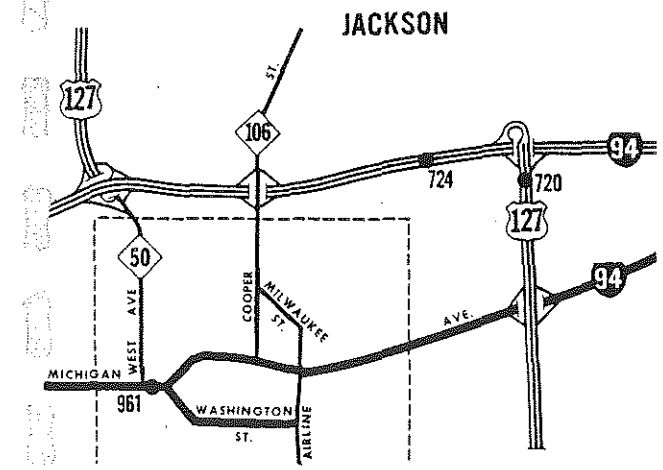
Special intersection traffic surveys are conducted on a "request basis" primarily for traffic engineering analyses. These surveys usually include 8-hour manual turning movement counts and 24-hour machine counts. Backup, gap-and-delay studies and pedestrian volumes are included, when appropriate.

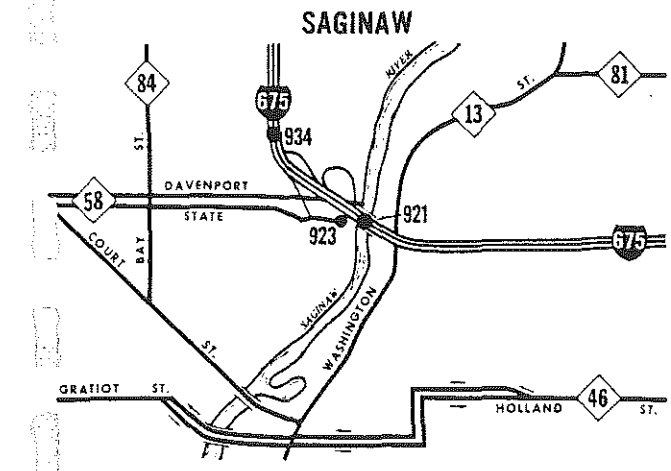
All traffic volume data is stored on magnetic tape in the department's central computer. This information is used to estimate present and future traffic on the state trunkline system, analyze traffic flow at specific locations, and monitor annual and seasonal traffic trends.

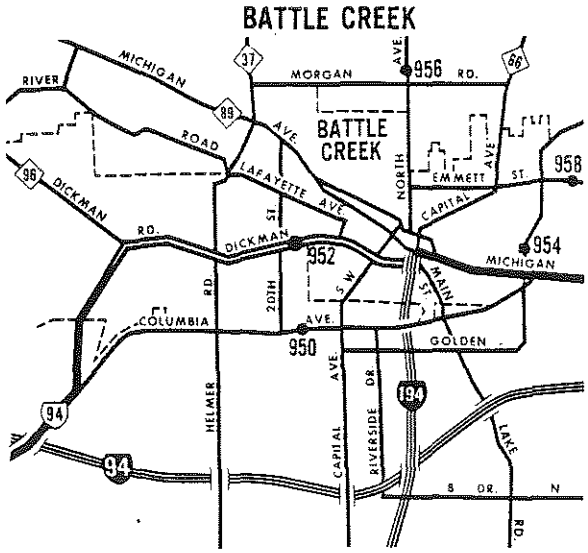

A
Permanent Traffic Recorders
P.T.R. LOCATION MAP
MICHIGAN DEPARTMENT OF TRANSPORTATION
208 P.T.R. Bridge Data
202 P.T.R. Data Phone
5 P.T.R. Data Controller-Urban
Champion P.T.R. Data Phone Intersection
L A K E S U P E R I O R
L A K E M I C H I G A N
C A N A D A
I N D I A N A
O H I O
216 International Bridge
Champion
Newberry
Skandia
Brevort
St. Ignace
Mackinac Bridge 208
Watersmeet
Powers
Indian River
Alpena
Kalkaska
Traverse City
Houghton Hts.
Prudenville
Rose City
Augres
Houghton Lk.
Sterling
Carrollton
Baldwin
Pentwater
Sears
Farwell
Hemans
Port Sanilac
Morley
Ithaca
Perrinton
Birch Run
Mt. Morris
Capac
Grand Rapids
St. Johns
Lansing
Zeeland
Cascade
Lake Odessa
Blue Water Bridge
Union Pier
New Buffalo
Lawrence
Marshall
Mason
New Hudson
Albion
Homer
Luna Pier
Buchanan
Schoolcraft
Jonesville
Hartland
Troy
DETROIT
DETROIT METROPOLITAN AREA
1/1/80

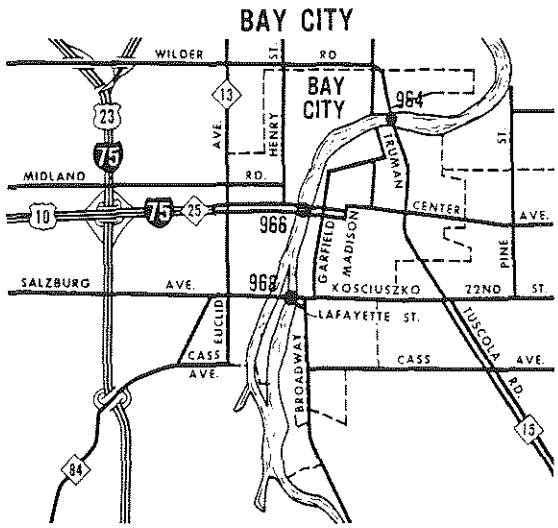
P.T.R.
URBAN
LOCATION MAP











Data from the PTR stations are published in a monthly report (MDOT #65) which is available to the public. A magnetic tape of this information is also transmitted to the FHWA in Washington, D.C., to assist in identifying national traffic trends.

As a result of the Surface Transportation Act, vehicle speed data is also collected statewide. This information is collected using automatic equipment from 44 stations (see Exhibit II) and is reported on a quarterly and annual basis (MDOT #66). The data is sent to the FHWA in Washington D.C. on a quarterly and annual basis as part of Michigan's Annual Certification. This certification is accomplished in cooperation with the Department of State Police and the Office of Highway Safety Planning.

The department also conducts spot speed surveys, primarily to evaluate the need for new or modified speed limits. This data is maintained in a computerized file, tabulations of which are available in the Traffic and Safety Division.

3. Highway Data

Many different inventories are maintained which include highway data. These files can be generally characterized as length or point highway data. Length data includes roadway features and roadway alignment. Examples of roadway features include facility type, tyoe of parking, surface type, and roadside type. Roadway alignment data is not generally available from a single source and is usually collected and stored in response to specific needs.

Point highway data includes traffic control devices (signs and signals), guardrail, interchange configuration, intersection geometry, structure, and bridge data, railroad crossing information, (see d below), and utility placement.

The computerization of the department's highway related data is the subject of continuing review. The task force, which was formed last year, has developed several recommendations to improve the integration and accessibility of our highway data systems.

These highway data systems warrant special mention:

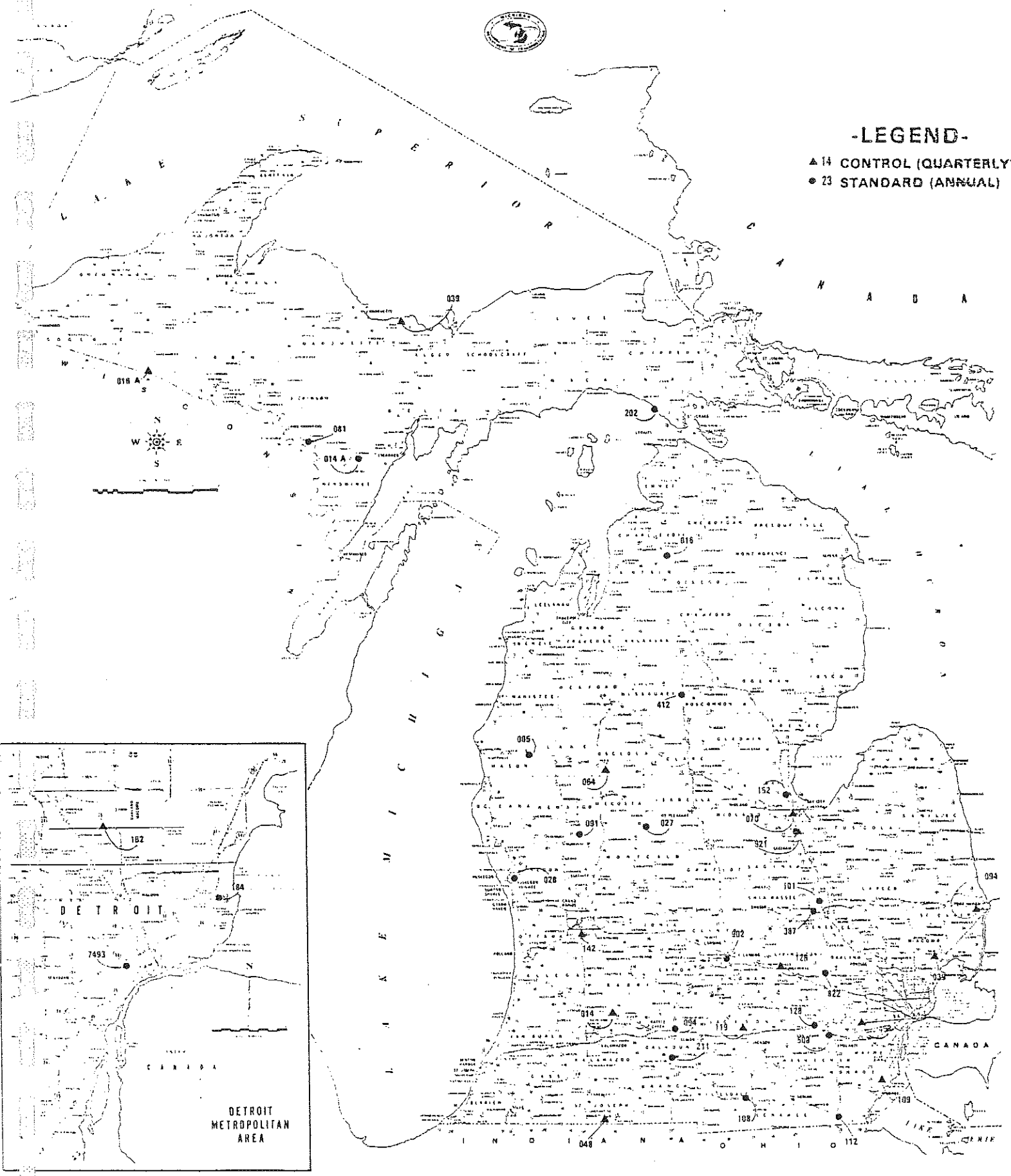
Photolog

The department maintains a photolog system which provides a 35mm sequential film library of all state trunkline roadways and federal forest highways. The system includes a control section-milepoint reference system which is coordinated with the MALI system.

The photolog and viewing equipment are located in the department's Traffic and Safety Division.

55 M.P.H. SPEED MONITORING PROGRAM

Station Location Map



6/1/81

The system is used to document and evaluate roadway geometrics traffic control devices and is updated periodically.

b) Sufficiency Rating

MDOT uses a "Sufficiency Rating" system to rank highway segments on the basis of deficiencies in several areas, including safety, surface and base condition, capacity, drainage, and alignment. A completely adequate road would be rated 100. A lower score would reflect deficiencies, according to specific formulae and procedures.

The Safety element of the Sufficiency Rating has been completely revised, more accurately reflecting the area's accident characteristics. Under the new system, the highway network is divided into five roadway types, which are further sub-divided as rural and urban. Each roadway segment's safety rating is generated based on comparison of the segments accident rate with all segments in the same highway type category. A segment with no accidents is assigned the maximum of 30 points; a segment with an average accident rate is assigned 12 points. Segments with less than two rating points are considered in the first priority for improvement.

The Highway Sufficiency Rating Report is published biennially. A copy of a typical page is shown in Exhibit III.

c) Pavement Management System

The department is also developing a pavement management system (PMS) which rates the pavement surface, based on objective assessment of its quality. PMS is a uniform system which allows Districts to define the condition status of pavements; identify boundaries of potential rehabilitation projects; identify the most cost effective type of rehabilitation projects; establish accurate "lifecycle" rehabilitation cost estimates; forecast future pavement condition status and funding requirements. The system provides the information needed to identify where and how improvements can be made in the design, construction, and maintenance of pavements.

d) Railroad Crossing Inventory

The Michigan Department of Transportation, Railroad Safety and Tariffs Division maintains a highway-railroad crossing inventory. Information for the inventory is obtained through site inspections and contacts with the various agencies involved and is recorded on grade crossing inspection report. The inventory data is computerized to provide flexibility in use, analysis, and updating.

B. Data Analysis

Prior to 1981-1982, data analysis was done using the MIDAS statistical Some outlier, peer group comparison system. Since the geometric

72.2 TOTAL PAVED MI.
68.9 TOTAL T.L. MI.
50.1 1ST PRIOR IMP MI

REG
FAE

STARTING MILE POST																					
LENGTH																					
YR. OF LATEST IMPROV.																					
URBAN OR RURAL																					
PREDOMINANT WIDTH																					
PARKING																					
30th HIGH HOUR IN 10's																					
A.D.T. IN 100's																					
% COMMERCIAL VEH.																					
% SIGHT RESTRICTION																					
ACC. PER 10^8 VEH. MI.																					
CAPACITY RATING																					
SURFACE RATING																					
BASE RATING																					
SAFETY RATING																					
SUFFICIENCY RATING																					
REC. 5-YR. PERIOD																					

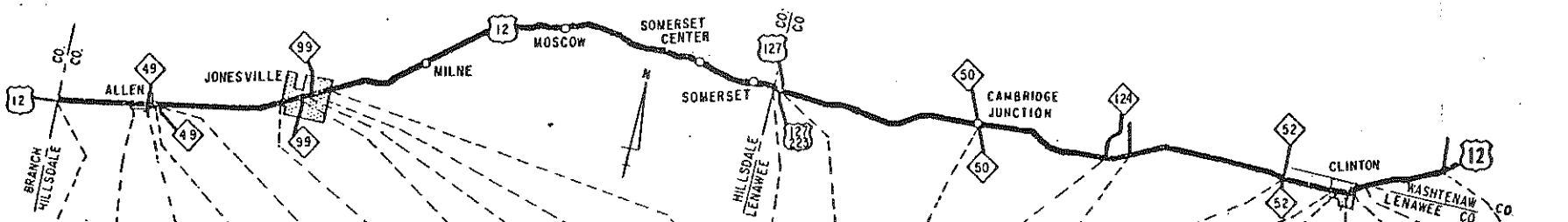


Exhibit III

STARTING MILE POST	0.0	2.5	3.0	3.4	3.5	7.7	8.5	8.7	0.0	0.6	0.0	0.2	7.6	11.8	12.6	18.7	20.3	20.5	21.2	21.4	0.0
LENGTH	2.5	0.5	0.4	0.1	4.2	0.8	0.2	0.1	0.6	16.4	0.2	7.4	4.2	0.8	6.1	1.8	0.2	0.7	0.2	0.3	2.5
YR OF LATEST IMPROV.	72	72	72	72	72	72	74	74	74	74	72	71	67	67	69	69	63	63	69	69	76
URBAN OR RURAL	R	U	U	R	R	U	U	U	U	R	R	R	R	R	R	R	U	U	U	R	R
PREDOMINANT WIDTH	24	+38	38	+24	24	+24	+44	70	+22	+24	+24	+24	+24	24	+24	+24	24	+48	24	24	24
PARKING	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0
30th HIGH HOUR IN 10's	52	52	55	55	51	66	130	130	79	54	71	71	77	94	96	105	106	107	109	101	90
A.D.T. IN 100's	40	40	42	42	43	52	110	110	65	45	43	31	49	54	50	83	99	102	105	98	86
% COMMERCIAL VEH.	27	27	26	26	26	28	15	15	22	29	20	23	13	11	12	8	7	7	7	7	11
% SIGHT RESTRICTION	24	0	0	0	21	0	0	0	0	42	0	49	76	63	52	25	0	0	0	67	48
ACC. PER 10^8 VEH. MI.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAPACITY RATING	37	40	40	40	38	21	18	40	11	29	40	21	15	13	14	15	***7**	31	***7**	12	18
SURFACE RATING	7	7	7	7	7	5	6	13	6	8	8	8	***2**	***2**	***3**	***3**	***2**	***2**	***4**	***3**	10
BASE RATING	8	6	***2**	6	6	6	6	6	***1**	6	8	6	***3**	***3**	***3**	***3**	***2**	***2**	***2**	***1**	5
SAFETY RATING	22	18	18	26	14	10	22	18	18	***6**	22	10	***6**	14	***6**	14	18	14	22	18	22
SUFFICIENCY RATING	72	71	67	75	65	42	52	77	36	49	76	43	26	32	26	35	29	49	35	34	55
REC 5 YR PERIOD	2	2	1	2	2	2	2	2	1	1	2	85P2	85P1	85P1	85P1	1	1	1	1	1	2
SUBAREA SECTION	30061								30062		46101										81031 CONT.

* INDICATES CAPACITY RATING CONTROL DUE TO EXISTING PARKING.

*** ** DENOTES 1ST. PRIORITY FOR IMPROVEMENT

\+ = WIDER BY 9' OR MORE

P = PROGRAMMED

features and traffic control devices weere not updated, the "peer group" analysis has been suspended temporarily.

High accident locations are identified based on a minimum threshold table (Exhibit IV). Those thresholds are used to generate lists of locations which warrant further engineering review. (Exhibit V). This list identifies each location of which the number of accidents or type of accident exceeded its threshold value. The thresholds can, at the analyst's option, be predetermined or calculated through statistical analysis techniques. There are threshold values for the total accidents and for 24 accident types. The threshold table lists each of those "outliers" and shows the number of accidents for each accident type for which the threshold was exceeded. Work continues to improve the system and to integrate statistical analysis techniques to assure that efforts are focused only on locations that with abnormal numbers or patterns of accidents.

During the past year, a computerized system was developed which allows roadway and traffic accident data to be generated for all freeway interchanges. In addition to summarizing traffic and roadway accident data, rankings can be generated by type of freeway interchange and by similar elements (such as ramp type) within interchange areas. The system is accessible through any terminal connected to the MDOT computer and offers information in three different report formats. Currently the system offers accident data for the years 1982 through 1984.

The department is continuing its efforts to develop and enhance the MIDAS model. The system being designed will ultimately provide a statistical analysis of abnormal crash patterns and an analysis of alternative corrective treatments. Integration of the MIDAS and minimum threshold techniques is also being pursued.

In-depth analyses of locations utilizes various MIDAS printouts (Exhibit VI). This package includes a summary of accidents by approach; a one line printout of each accident; accident distribution by hour (with volume distribution), day, month, and year. The reports, in most cases, eliminate the need for collision diagrams. MIDAS also provides before-and-after accident information, which is helpful in the evaluation of safety improvements.

Accident information is available for the previous nine years and for a part of the current year.

Since it is crucial that the roadway geometrics and operational characteristics be correctly described in the files, an updated traffic control device/geometrics file, is being developed through review of the department's photolog.

C. Engineering Studies

Primary responsibility for accident surveillance on the state trunkline system is assigned to the Spot Safety Improvement Program, managed by the Traffic and Safety Division's Safety Programs Unit.

Exhibit IV

SAFETY PROGRAM ANNUAL REVIEW DOCUMENTATION

Accident Data Used - 1981 and 1982 Combined
1982 Seperate

Thresholds for Intersections 1981-1982	Thresholds for Intersection 1982 (Only)
Total - 20	14
Injury - 15	10
Fatal - 2	2
Wet - 12	8
Icy - 12	8
Dark - 15	10
Overturned - 3	2
Train - 2	2
Parked Vehicle - 10	7
Multi Vehicle Other - 8	5
Pedestrian - 3	2
Fixed Object - 6	4
On Road Object - 3	2
Animal - 8	5
Bicycle - 3	2
Single Vehicle Other - 10	7
Head-On - 3	2
Side Swipe Meet - 4	3
Side Swipe Pass - 4	3
Right Angle - 10	7
Left Turn - 10	7
Right Turn - 4	3
Rear end - 14	9
Backing - 6	4
Parking - 10	7

Exhibit V

1981-1982 INTERSECTION THRESHOLD LISTING PAGE 189

DISTRICT 9

ACC TYPE	# ACC	THRESHOLD NUMBER

82062 00.70 US-12 NOWLIN STREET DEARBORN CY. 20 TOTAL ACCIDENTS
8 Lane Divided/Tangent Urban/Signal 12 ft. Lane/Curb

Total	20	000020

REMARKS:

82062 01.11 US-12 MILITARY STREET DEARBORN CY. 39 TOTAL ACCIDENTS
5 Lane-2 Way/Tangent Urban/Signal 12 ft. Lane/Curb

Total	39	000020
Injury	16	000015
Wet	16	000012
Right Angle	10	000010

REMARKS:

82062 01.29 US-12 HOWARD STREET DEARBORN CY. 34 TOTAL ACCIDENTS
5 Lane-2 Way/Tangent Urban/Signal 12 ft. Lane/Curb

Total	34	000020
Rear-End	22	000014

REMARKS:

82062 01.38 US-12 MASON STREET DEARBORN CY. 65 TOTAL ACCIDENTS
5 Lane-2 Way/Tangent Urban/Signal 12 ft. Lane/Curb

Total	65	000020
Injury	27	000015
Wet	18	000012
Right Turn	4	000004
Rear-End	42	000014

REMARKS:

82062 01.50 US-12 MONROE STREET DEARBORN CY. 58 TOTAL ACCIDENTS
5 Lane-2 Way/Tangent Urban/Signal 12 ft. Lane/Curb

Total	58	000020
Injury	24	000015
Wet	17	000012
Pedestrian	3	000003
Rear-End	38	000014

REMARKS:

82062 01.56 US-12 OAKWOOD BLVD. DEARBORN CY. 54 TOTAL ACCIDENTS
5 Lane-2 Way/Tangent Urban/Signal 10 ft. Lane/Curb

Total	54	000020
Right Angle	16	000010
Rear-End	22	000014

REMARKS:

INTERSECTION PROFILE

LOCATION: M-100 AT GRAND RIVER AVE

CITY/VILLAGE/TOWNSHIP: EAGLE TWP

COUNTY: CLINTON COUNTY

INTERSECTION TYPE: 4 LEGS - CROSS - FLASHER

DISTRICT	CONTROL SECTION	MILEPOINT MALI	MILEPOINT PHOTOLOG
5	19011	1.92	1.90

DATE REQUESTED: JANUARY 1, 1979 THRU DECEMBER 31, 1983 (5 YEARS, 0 MONTHS, 0 DAYS)

REPORT RUN BY: J. SALLER

REASON FOR RUN: M-100 AT GRAND RIVER AVE.

AUGUST 08, 1984

Exhibit VIa

INTERSECTION PROFILE

DIST 5 CS 19011 MP 1.82 (MALI), 1.90 (PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY

INTERSECTION GEOMETRICS

APPROACH DIRECTION	SPEED (MPH)	DAILY VOLUME	LANEAGE BASIC	LANEAGE LEFT	LANEAGE RIGHT	LEFT TURNS PROHIBITED	LEFT TURNS PHASE	DIST	CS	INFLUENCE ZONE MALI MP	INFLUENCE ZONE LENGTH
NORTH BOUND	55	2,430	1			NO	NONE	5	19011	1.45- 2.00	0.55MI 2904FT
SOUTH BOUND	55	2,430	1			NO	NONE	5	19011	0.00- 0.00	0.00MI 0FT
EAST BOUND						NO	NONE	5	19011		
WEST BOUND						NO	NONE	5	19011		
OTHER						NO	NONE	5	19011		

INTERSECTION ACCIDENTS: 1- 1-79 THRU 12-31-83 (5.00 YEARS)

APPROACH DIRECTION	INJ ACC	FAT. ACC	TOTL ACC	NUMBER OF ACCIDENTS BY TYPE: HEAD ON	SS PASS	SS MEET	ANGL	LEFT TURN	RIGHT TURN	REAR END	BACK UP	PARK	OTHER	PERCENT: WET	ICY	DARK	ACC PER MILLION VEHICLES
NORTH BOUND	2	0	6	0	0	0	2	1	1	2	0	0	0	33.3	33.3	33.3	1.35
SOUTH BOUND	5	0	9	0	0	0	1	6	0	0	0	0	2	22.2	11.1	22.2	2.03
EAST BOUND	9	0	12	0	0	0	9	1	0	1	0	0	1	16.7	33.3	25.0	0.00
WEST BOUND	6	0	12	0	0	0	8	0	0	1	0	0	3	25.0	25.0	16.7	0.00
OTHER	1	0	1	0	0	0	1	0	0	0	0	0	0	0.0	0.0	0.0	0.00
5.00 YEAR TOTAL	23	0	40	0	0	0	21	8	1	4	0	0	6				
AVERAGE PER YEAR	4.6	0.0	8.0	0.0	0.0	0.0	4.2	1.6	0.2	0.8	0.0	0.0	1.2				
PERCENT OF TOTAL	57.5	0.0	100.0	0.0	0.0	0.0	52.5	20.0	2.5	10.0	0.0	0.0	15.0	22.5	25.0	22.5	
EXPECTED ACC.	2.2	0.0	3.5	0.1	0.0	0.2	2.0	0.8	0.3	0.8	0.1	0.3	0.5	2.5	1.4	1.6	
DIFF IN ACCIDNT	2.4	-0.0	4.5	-0.1	-0.0	-0.2	2.2	0.8	-0.1	-0.0	-0.1	-0.3	0.7	-0.7	0.6	0.2	

Exhibit VIb

?????

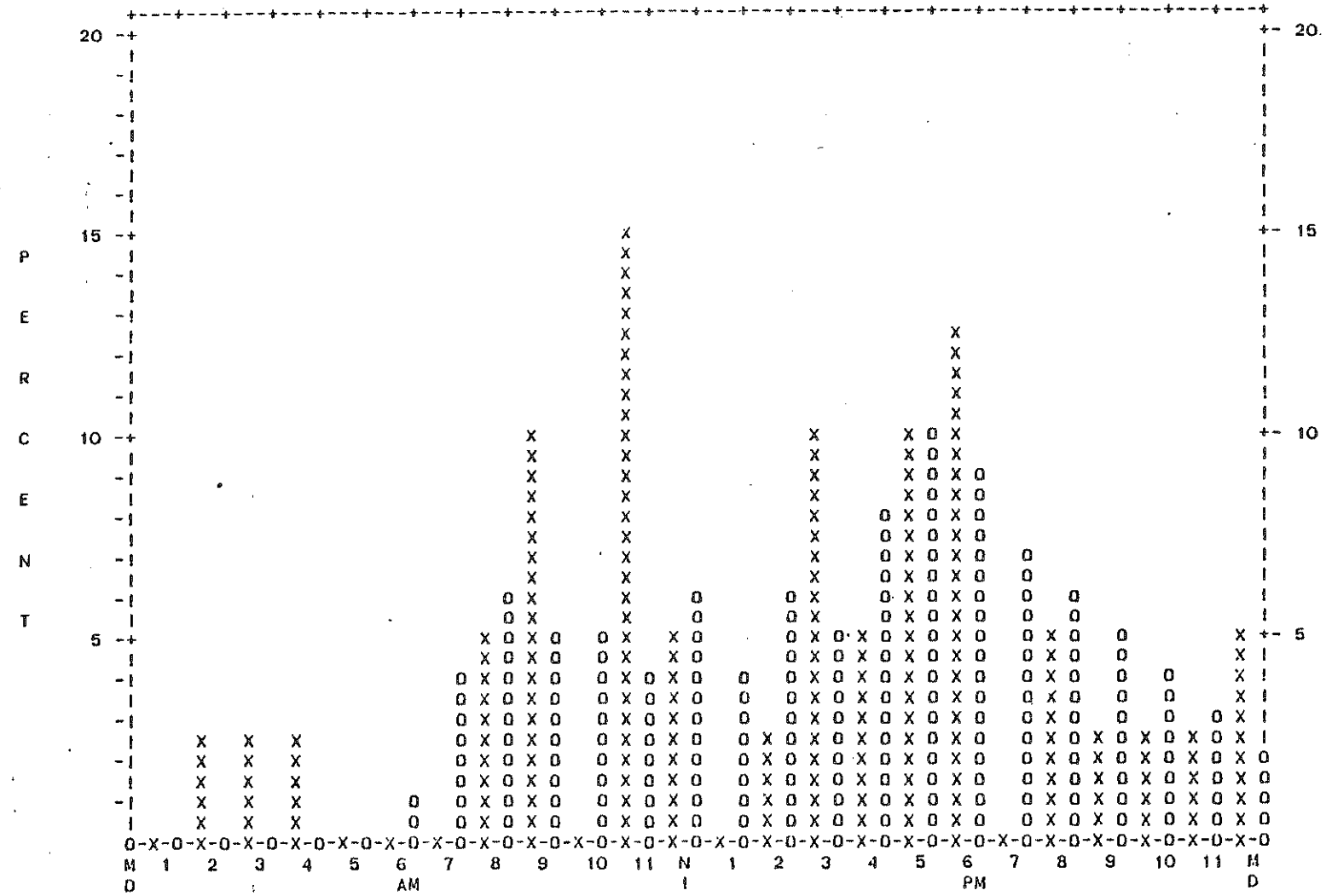
MICHIGAN DEPARTMENT OF TRANSPORTATION
TRAFFIC AND SAFETY DIVISION
MICHIGAN DIMENSIONALIZED ACCIDENT SURVEILANCE SYSTEM (MIDAS)

08/08/84 PAGE 4

INTERSECTION PROFILE-HISTOGRAM

DIST CS 19011 MP 1.92(MALI) 1.90(PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY

DISTRIBUTION BY HOUR OF DAY



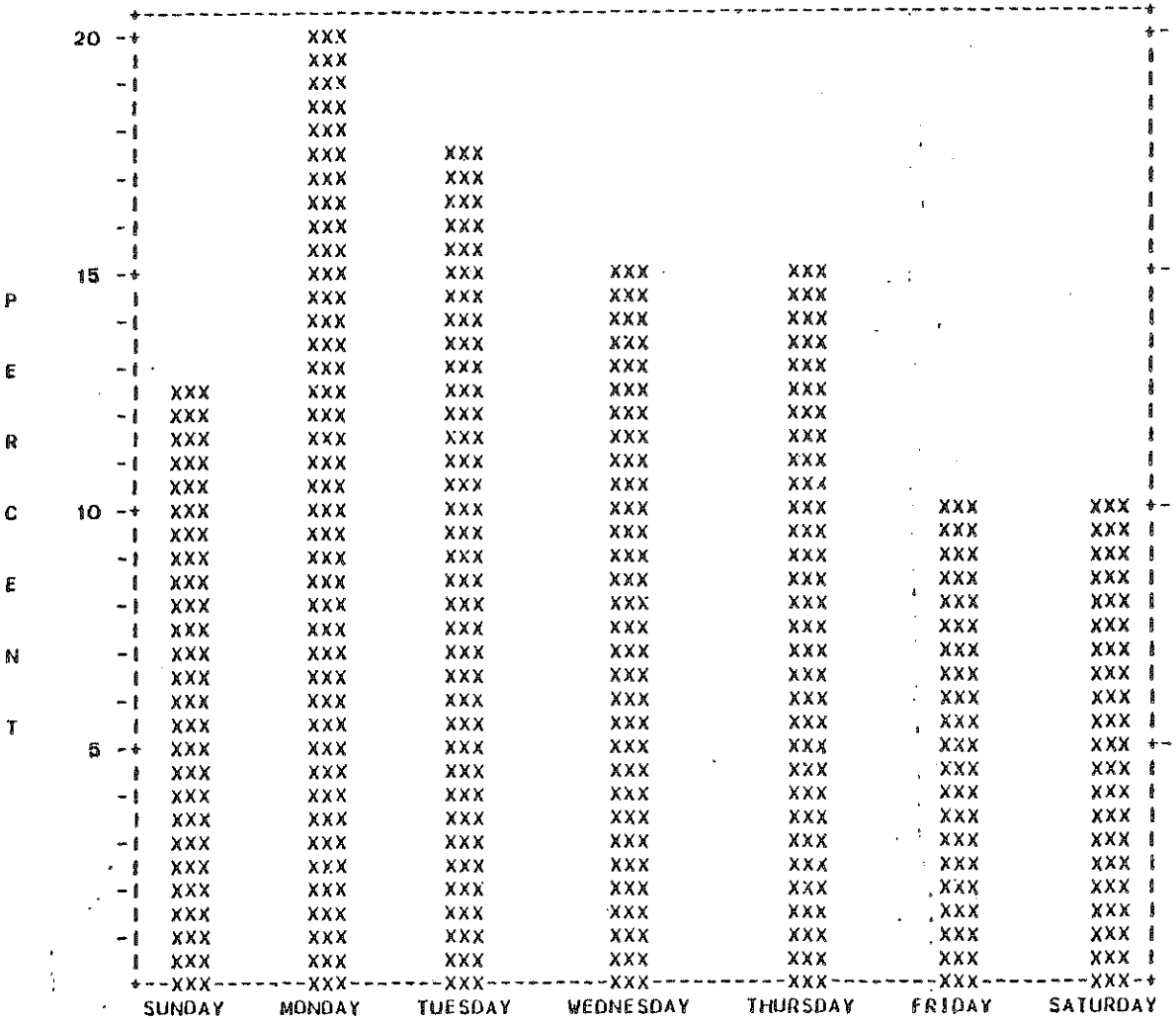
X = ACCIDENT DISTRIBUTION (JANUARY 01, 1979 THRU DECEMBER 31, 1983)
O = VOLUME DISTRIBUTION

Exhibit VIc

INTERSECTION PROFILE-HISTOGRAM

DIST CS 19011 MP 1.92(MALI) 1.90(PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY

DISTRIBUTION BY DAY OF WEEK



X = ACCIDENT DISTRIBUTION (JANUARY 01, 1979 THRU DECEMBER 31, 1983)

Exhibit VIb

I N T E R S E C T I O N P R O F I L E - H I S T O G R A M

DIST CS 19011 MP 1.92(MALI) 1.90(PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY

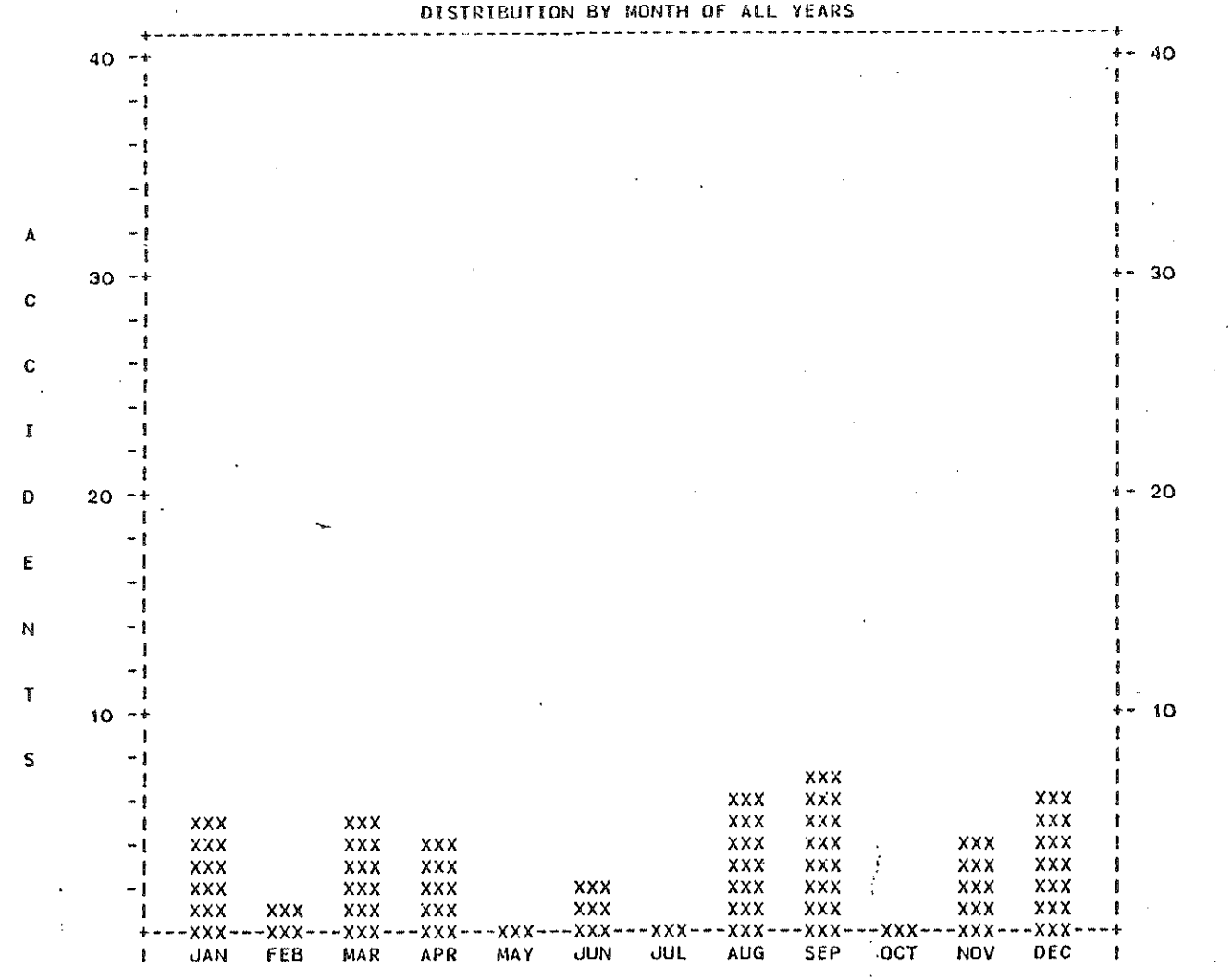


Exhibit VIe

MICHIGAN DEPARTMENT OF TRANSPORTATION
TRAFFIC AND SAFETY DIVISION

08/08/84 MICHIGAN DIMENSIONALIZED ACCIDENT SURVEILLANCE SYSTEM (MIDAS) PAGE 7

INTERSECTION PROFILE - HISTOGRAM

DIST CS 19011 MP 1.92(MALI) 1.90(PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY

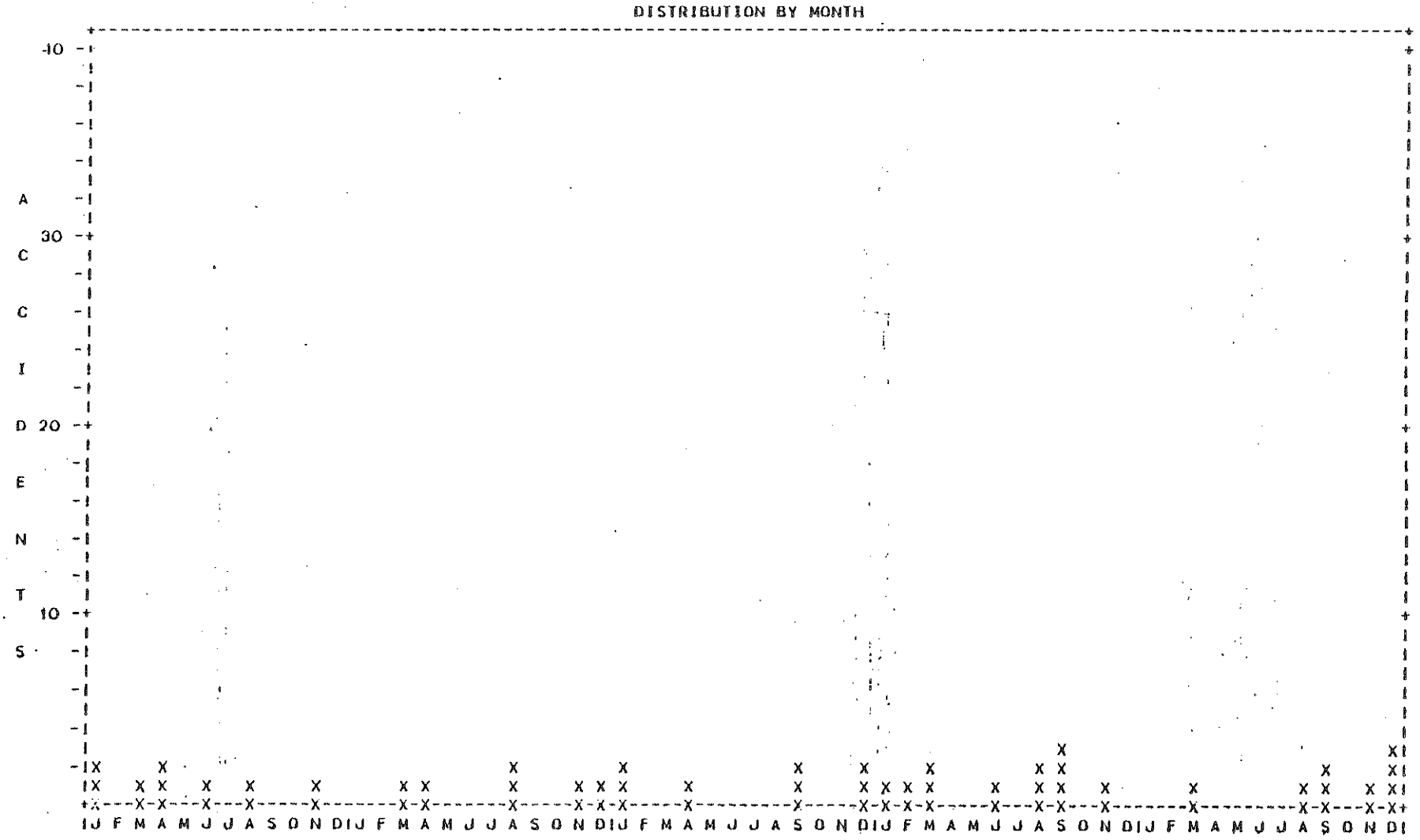


Exhibit VIf

I N T E R S E C T I O N A C C I D E N T P R O F I L E

INTERSECTION TYPE : 2 LANE 2-WAY FLASHER

LOCATION : M-100 AT GRAND RIVER AVE EAGLE TWP . CLINTON COUNTY

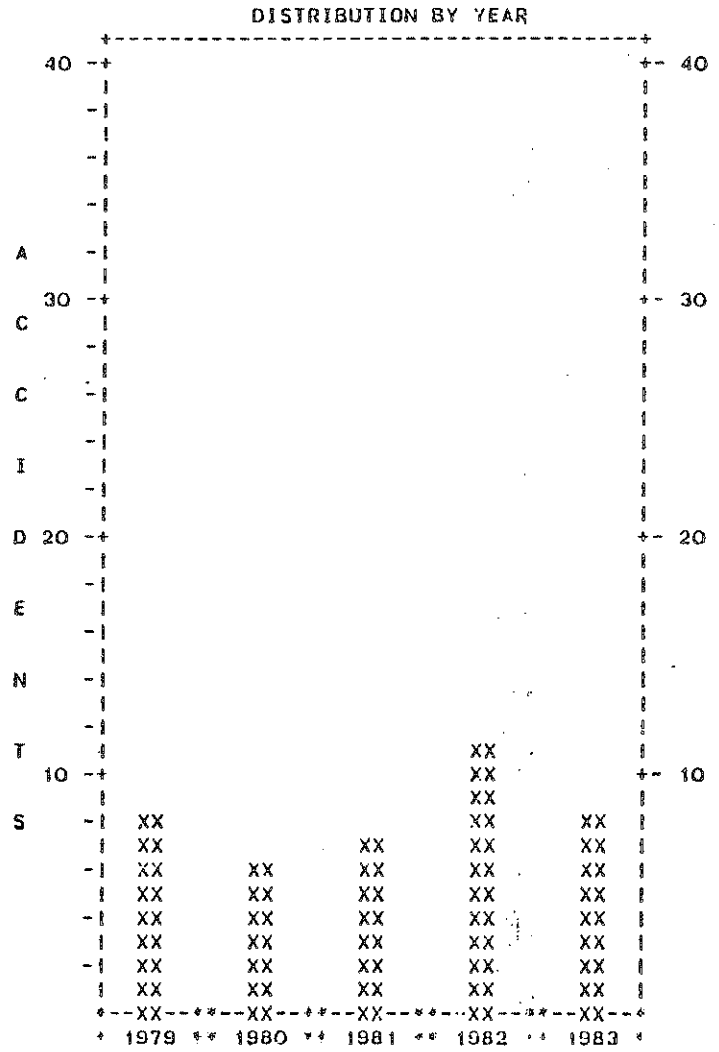
DISTRICT 5 CONTROL SECTION 19011 MILEPOINT 1.92

DIST FROM ISCN	ACCIDENT TYPE	VIOLATOR (OR VEH 1) DR	INTENT	IMPACT	HAZRD ACT'N	SECOND VEHICLE DR	INTENT	IMPACT	HAZRD ACT'N	SRF WEATH	CND	LIGHT	VEH/ CIRCUM	NUMBER OF INJURIES F	A	B	C	O	PRP DMG	DATE OF ACCIDENT		ACCDNT REPORT NUMBER
									NORTHBOUND APPROACH													
1.92	2-VEH ANGLE N	R-TURN	FRNT-L	CLOSE	W	GO STR	SIDE-L	NONE		CLEAR	ICY	DUSK	1/SKID	0	0	0	0	2	X	FRI 1/ 5/79	5PM	9543
1.92	2-VEH ANGLE N	R-TURN	FRNT-L	FAST	W	GO STR	SIDE-L	NONE		CLEAR	ICY	DAY		0	0	0	0	2	X	THU 1/ 4/79	8AM	5234
1.92	2-VEH L-TRN N	L-TURN	FRNT-L	TURN	S	GO STR	FRNT-L	NONE		CLEAR	DRY	DAY		0	0	1	0	1		TUE 8/26/80	10AM	156325
1.92	2-VEH R-TRN N	GO STR	SIDE-R	NONE	N	R-TURN	SIDE-R	NONE		RAIN	WET	DARK		0	0	0	0	4	X	THU 9/ 3/81	9PM	178718
1.92	2-VEH R-END N	GO STR	FRONT	CLOSE	N	L-TURN	REAR	NONE		CLEAR	DRY	DAY		0	0	0	3	4		SAT 9/24/83	10AM	167156
1.96	2-VEH R-END N	GO STR	REAR-L	NONE	N	GO STR	FRNT-R	NONE		RAIN	WET	DARK		0	0	0	0	3	X	TUE 4/24/79	7PM	98032
									SOUTHBOUND APPROACH													
1.89	1-VEH FX OB S	AV VEH	FRNT-R	NONE		DITCH				CLEAR	WET	DAY		0	0	0	0	2	X	MON 12/ 5/83	5PM	234460
1.92	2-VEH L-TRN S	L-TURN	REAR-R	TURN	N	GO STR	FRNT-R	NONE		CLEAR	DRY	DARK		0	1	0	1	2		FRI 11/16/79	11PM	261711
1.92	1-VEH ROLL S	L-TURN	OTHER	TURN						CLEAR	DRY	DARK	1/RECK	0	0	1	0	1		SAT 8/11/79	2AM	191301
1.92	2-VEH L-TRN S	L-TURN	SIDE-R	TURN	N	GO STR	FRONT	NONE		CLEAR	DRY	DAY		0	0	0	2	1		WED 4/30/80	2PM	80954
1.92	2-VEH ANGLE S	GO STR	SIDE-R	NONE	E	GO STR	FRNT-L	NONE		CLEAR	DRY	DAY		0	0	0	0	4	X	SUN 9/12/82	1PM	214775
1.92	2-VEH L-TRN S	L-TURN	FRONT	TURN	N	GO STR	FRNT-L	NONE		CLEAR	DRY	DAY		0	0	0	1	2		MON 8/30/82	10AM	170973
1.92	3-VEH L-TRN S	L-TURN	FRNT-R	F YLD	N	GO STR	FRNT-R	NONE		CLEAR	WET	DAY		0	0	1	0	3		SAT 1/30/82	2PM	26311
1.92	2-VEH L-TRN S	L-TURN	SIDE-R	F YLD	N	GO STR	FRNT-R	NONE		SNOW	ICY	DUSK		0	0	0	0	2	X	TUE 12/ 6/83	5PM	234457
1.92	2-VEH L-TRN S	L-TURN	SIDE-R	TURN	N	GO STR	FRONT	NONE		CLEAR	DRY	DAY		0	0	0	0	4	X	SUN 8/ 7/83	11AM	158006
									EASTBOUND APPROACH													
1.92	2-VEH ANGLE E	GO STR	FRONT	F YLD	N	GO STR	SIDE-L	NONE		CLEAR	DRY	DAY	1/OB V	0	3	0	2	1		MON 6/18/79	5PM	139429
1.92	2-VEH ANGLE E	GO STR	SIDE-R	F YLD	N	GO STR	FRONT	NONE		SNOW	WET	DAY		0	0	1	0	1		MON 3/31/80	11AM	53547
1.92	2-VEH R-END E	GO STR	FRONT	FAST	E	STOPPD	REAR	NONE		CLEAR	ICY	DAY		0	0	0	5	1		WED 12/16/81	4PM	250146
1.92	1-VEH FX OB E	GO STR	FRNT-L	CLOSE		SIGN				CLEAR	ICY	DARK	1/SKID	0	0	0	0	1	X	WED 12/16/81	11PM	261718
1.92	2-VEH ANGLE E	GO STR	FRNT-R	F YLD	N	GO STR	FRONT	NONE		CLEAR	DRY	DAY		0	1	0	0	2		SUN 9/12/82	3PM	173014
1.92	2-VEH ANGLE E	GO STR	REAR-L	F YLD	S	GO STR	FRONT	NONE		CLEAR	DRY	DAY		0	0	1	0	2		THU 8/ 5/82	10AM	152413
1.92	2-VEH ANGLE E	GO STR	FRNT-L	CLOSE	S	GO STR	FRNT-R	NONE		CLEAR	ICY	DAY		0	0	0	0	3	X	WED 2/ 3/82	10AM	46280
1.92	3-VEH ANGLE E	GO STR	REAR-R	F YLD	N	GO STR	FRONT	NONE		CLEAR	WET	DAY		0	0	0	1	2		MON 12/ 5/83	4PM	234445
1.92	2-VEH L-TRN E	GO STR	FRNT-R	CLOSE	W	L-TURN	SIDE-R	NONE		CLEAR	DRY	DARK		0	0	0	0	2	X	TUE 9/27/83	10PM	169179
1.92	2-VEH ANGLE E	GO STR	SIDE-R	F YLD	N	GO STR	FRONT	NONE		CLEAR	DRY	DARK		0	0	1	0	1		THU 3/17/83	8PM	46714
1.97	2-VEH ANGLE E	GO STR	FRNT-L	F YLD	S	GO STR	FRNT-R	NONE		CLEAR	DRY	DAY		0	0	0	1	1		TUE 3/23/82	4PM	56163
1.98	2-VEH ANGLE E	GO STR	FRNT-L	F YLD	S	GO STR	FRONT	NONE		CLEAR	ICY	DAY		0	0	1	1	3		WED 12/24/80	2PM	244651
									WESTBOUND APPROACH													
1.92	2-VEH ANGLE W	L-TURN	FRONT	F YLD	N	GO STR	FRONT	NONE		CLEAR	WET	DAY		0	0	0	0	2	X	MON 4/30/79	8AM	98038
1.92	3-VEH R-END W	GO STR	FRONT	CLOSE	W	STOPPD	FRONT	NONE		CLEAR	ICY	DAY		0	0	0	0	3	X	TUE 3/ 6/79	7AM	72528
1.92	2-VEH ANGLE W	GO STR	FRNT-L	F YLD	S	L-TURN	REAR-L	NONE		CLEAR	DRY	DAY		0	0	0	0	2	X	MON 11/ 3/80	8AM	218815
1.92	2-VEH ANGLE W	L-TURN	FRNT-R	F YLD	N	GO STR	FRNT-R	NONE		CLEAR	DRY	DAY		0	0	0	1	5		FRI 4/10/81	10AM	77623

Exhibit VIb

I N T E R S E C T I O N P R O F I L E - H I S T O G R A M

DIST CS 19011 MP 1.92(MALI) 1.90(PHOTOLOG) M-100 AT GRAND RIVER AVE EAGLE TWP CLINTON COUNTY



X = ACCIDENT DISTRIBUTION (JANUARY 01, 1979 THRU DECEMBER 31, 1983)

Exhibit VIg

I N T E R S E C T I O N A C C I D E N T P R O F I L E

INTERSECTION TYPE : 2 LANE 2-WAY FLASHER

LOCATION : M-100 AT GRAND RIVER AVE EAGLE TWP , CLINTON COUNTY

DISTRICT 5 CONTROL SECTION 19011 MILEPOINT 1.92

DIST FROM ISCN	ACCIDENT TYPE	VIOLATOR (OR VEH 1) DR	INTENT	IMPACT	HAZRD ACT'N	SECOND VEHICLE DR	INTENT	IMPACT	HAZRD ACT'N	WEATH	SRF CND	LIGHT	VEH/ CIRCUM	NUMBER OF INJURIES INJURY CLASS F	A	B	C	O	PRP DMG		DATE OF ACCIDENT		ACCDNT REPORT NUMBER
1.92	1-VEH FX OB	W	GO STR	SIDE-L	CLOSE		ON RD			FOG	WET	DAY	1/SKID	0	0	0	1	0		MON	9/14/81	7AM	168677
1.92	2-VEH ANGLE	W	GO STR	FRONT	F YLD	S	L-TURN	SIDE-L	NONE	SNOW	ICY	DAY		0	0	0	0	2	X	THU	1/15/81	3PM	7620
1.92	1-VEH FX OB	W	GO STR	SIDE-R	FAST		SIGN			CLEAR	DRY	DARK		0	0	0	0	1	X	SAT	1/10/81	3AM	7730
1.92	2-VEH ANGLE	W	GO STR	FRNT-L	F YLD	N	AV VEH	FRNT-R	NONE	CLEAR	DRY	DAY		0	0	0	1	3		WED	9/ 1/82	2PM	173015
1.92	2-VEH ANGLE	N	GO STR	SIDE-R	NONE	W	GO STR	FRONT	UNKN	RAIN	WET	DARK		0	1	0	0	1		SUN	6/13/82	1AM	124175
1.92	2-VEH ANGLE	W	GO STR	FRNT-L	F YLD	N	GO STR	FRONT	NONE	CLEAR	DRY	DAY		0	1	0	2	2		THU	11/ 3/83	4PM	201928
1.94	2-VEH ANGLE	W	GO STR	FRONT	FAST	S	GO STR	FRNT-L	NONE	RAIN	ICY	DAY		0	5	0	1	1		SUN	11/28/82	8AM	226050
1.96	1-VEH PARKD	W	L-TURN	FRNT-R	CLOSE					CLEAR	DRY	DAY		0	0	0	0	1	X	TUE	3/23/82	5PM	56169
													OTHER										
1.92	2-VEH ANGLE	NW	GO STR	FRNT-R	F YLD	N	GO STR	SIDE-R	NONE	CLEAR	DRY	DAY		0	0	1	0	3		FRI	8/15/80	7PM	155297

Exhibit VII

This surveillance/analysis effort is accomplished annually using the most recent two years of accident data as a basis. The threshold tables described in (B) is the source of the location review list.

In addition, a TOPICS Program (Traffic Operations Program to Improve Capacity and Safety), managed by the Safety Programs Unit, is responsible for more intensive review on a 3-5 year cycle in 15 large urbanized areas and 17 smaller cities with population greater than 10,000. That effort includes coordinated identification and analysis of deficiencies on the local system by staff in the Safety Programs Unit funded by a Section 402 Community Assistance grant. The TOPICS studies are very comprehensive, including the identification of operational and capacity deficiencies. The program emphasizes lower cost corrective countermeasures such as improved signs, signals or pavement markings, parking prohibitions, traffic signal modifications, and minor construction projects.

The process followed by these two programs to carry out accident surveillance differs somewhat. The annual Spot Safety reviews are completed as follows:

1. Location Review List

   Computer listings of all locations exceeding minimum thresholds of accidents or exceeding a minimum threshold for any of 24 accident types. The listing can also be generated using statistical techniques. We are working to integrate the statistical and threshold generation of location.

   A second source of review locations are Traffic and Safety engineers, located in the department's district offices who are very familiar with all state trunkline highways in their area. They are aware of new and proposed development and other conditions which will impact safety. In addition, the department receivew from the public, police agencies, local governmental officials, and others calling attention to locations where accident concentrations are, or may be developing.

2. Preliminary Analysis

   Additional accident data developed in conjunction with the location review list is preliminarily reviewed in the office. That effort may include review of the photolog, traffic signal inventory, signal timing, intersection drawing, and other information included in Traffic and Safety Division files. The purpose of this preliminary review is to determine if the identified accident concentration is unusual and warrants further review of if action has been initiated which addresses the accident concentration.

   The entire list and those locations noted for further review are then sent to the district traffic and safety engineers and affected units in the Traffic and Safety Division for further review and comment.

3. Final Analysis and Identification of Corrective Countermeasures

After preliminary analysis, a field review may be scheduled including a Safety Programs Unit representative, the district traffic and safety engineer, and other affected Traffic and Safety Division staff and local interests. At that time any corrective countermeasures are identified. Final action is documented in correspondence prepared by the Safety Programs Unit.

If the proposed corrective countermeasure requires construction, the following process is followed:

a) The Geometrics Coordination Unit develops proposed alternate geometric schemes with cost estimates and transmits a recommended plan to the Safety Programs Unit.

b) Funding may be recommended by the Safety Programs Unit based on the projects anticipated cost-effectiveness. Candidate projects are generally recommended when the expected return in safety benefits is less than 10 years.

c) State and federal environmental requirements are fulfilled and any impact reviews of the proposed project are initiated.

d) The recommended functional layout is transmitted to the district for review and for discussion with local officials. The district traffic and safety engineer obtains unofficial written concurrence from local agencies required to participate in the project.

e) The Geometrics Coordination Unit makes necessary changes resulting from the district review and transmits the plan to the Design Division for completion and letting.

The TOPICS Program reviews follow basically the same procedures, except that it includes both the state trunkline and nontrunkline systems. The resultant review is more comprehensive and detailed, identifying significant accident concentrations and operational deficiencies. The TOPICS reviews are conducted within the framework of local Metro Planning Organizations (MPOs) responsible for managing and coordinating transportation activities in the urbanized areas. The final TOPICS reports are offered as the traffic engineering element of the TSM process. Local agencies may apply for non trunkline HES funding through the Local Services Division (See Appendix II).

D. Establishing Priorities

1. Time-of-Return Analysis.

The Department determines the time-of-return (T.O.R.) or the number of years to amortize safety projects. If the anticipated TOR is less than ten years, programming of the project may be requested.

The anticipated reduction in accidents at a given location is estimated using data collected from previous before-and-after accident studies. National Safety Council accident costs are used to establish economic benefits. Attached is a copy of a worksheet (Exhibit VII) used to evaluate accident costs, expected accident reductions, and to determine anticipated benefits.

The estimated cost of each improvement is compared to the anticipated yearly benefit, resulting in the T.O.R. Presently, most safety related projects programmed amortize costs in approximately five to eight years. In general, a TOR of less than ten years is sufficient to justify a safety improvement project.

2. Cost and Resources

The ability of the department to program the recommended safety projects is, or course, limited by their cost and by available funds. All designated categorical funds (HES and R.R. Safety) are earmarked for safety projects. Other state and federal aid funds are used for safety projects as described in "Implementation" (II).

3. Rail/Highway Grade Crossings Improvement Program

The Railroad Safety and Tariffs Division utilizes the Hazard Index Rating (HIR) described below to initiate grade inspections. Grade inspections can also be initiated by:

a. Complaints with regards to safety of the crossing.
b. Public or local agencies.
c. Railroad companies.
d. Private industries.

A diagnostic team is formed consisting of the inspector from the Railroad Safety Section as team leader and representatives of the railroad company, road authority, state, county, city or village, police, school, private industry and concerned citizens. The team reviews the safety conditions at the crossing and develops recommendations for improvements. The team leaders is responsible for completing the Grade Inspection Report form (Exhibit VIII).

The HIR is then utilized to determine the order in which improvement projects are submitted for programming. In addition, projects to upgrade or modernize signal devices to current standards, eliminate crossings, reduce the number of tracks in a crossing, research, and reconstruction of crossing surfaces, which are not recognized in the H.I.R., are submitted by the road authorities for programming. Further flexibility in the program is maintained by taking advantage of scheduled

COMPUTED BENEFITS DERIVED THROUGH ACCIDENT REDUCTION

Location _____ City/Twp. _____ County _____

The method of evaluating accident costs, used below, is given on page 67 of Roy Jorgensen's report of Highway Safety Improvement Criteria, 1966 edition. This same method is given in the Bureau of Public Roads IM21-3-67.

In the following analysis the costs provided by the National Safety Council are: 1983 values

Death - $210,000

Nonfatal Injury - $8,600 Costs to be updated periodically.

Property Damage Accident - $1,150

$$B = \frac{ADT_a}{ADT_b} \times (Q\ R_1 + 1150\ R_2)$$

where

B = Benefit in dollars

ADT_a = Average traffic volume after the improvement _____

ADT_b = Average traffic volume before the improvement _____

R_1 = Reduction in fatalities and injuries combined _____

R_2 = Reduction in property damage accidents _____

Q = 8,600 if no fatal accidents occurred, and

$$Q = \frac{210{,}000 + (I/F \times 8{,}600)}{1 + I/F} = 10{,}570 \text{ if at least 1 fatality occurred.}$$

where

I/F = Ratio of injuries to fatalities that occurred statewide during the year 1983

$$= \frac{135{,}996}{1{,}343} = 101.26$$

Time of Return (T.O.R.) based on _____ years of data.

B = _____[(8,600 or 10,570) _____ + (1,150) _____] ÷ _____yrs.

B = _____[(_____) + (_____)] ÷ _____yrs. = _____

Annual B = _____ dollars

C = Total cost of project

T.O.R. = $\frac{C}{B}$ = _____ = years

8-31-84
MAF:nkg(Form 3-219)-2
Safety Programs Unit

Exhibit VIII

1704 (N9/79)

GRADE CROSSING INSPECTION REPORT

File No. _____ N.I. No. _____ Inspector _____ Date _____

Railroad(s): _____ Road Authority _____

Location _____

Intersecting Roadway(s) Nearby _____

Direction of Roadway _____ Direction of Tracks _____ Angle _____

No. of Traffic Lanes _____ Roadway Width _____ Shoulder Width _____ Surface of Roadway _____

_____ Approaches _____ Electricity Nearby _____

No. of Tracks _____ Materials in Crossing _____ Crossing Length _____

Site Distances (Approx.)	NE Quadrant	NW Quadrant	SE Quadrant	SW Quadrant
100 Feet				
200 Feet				
300 Feet				

PHYSICAL CROSSING	CONDITION	RECOMMENDATIONS	QUADRANTS	LOCATION	RECOMMENDATIONS
1. Existing Crossing			8. Vegetation		
2. Proposed Crossing			9. Structures		
3. Trackage			10. Embankments		
4. Road Approaches			11. Vehicle Parking		
5. Devil Strip			12. RR Car Storage		
6. Drainage			13. Other		
7. Other					

STATIC SIGNING	REMARKS	RECOMMENDATIONS	AUTO. PROTECTION	REMARKS	RECOMMENDATIONS
14. Crossbucks			21. Flashing Lights		
15. Adv. Warning Signs			22. Side Lights		
16. Pavement Markings			23. Signals on Cants		
17. Overhead Lighting			24. Gates		
18. Stop Signs			25. Other		
19. Stop Ahead Signs					
20. Other					

RECOMM. CODES: 1 - Repair 3 - Extend 5 - Close 7 - Modernize 9 - Approve 11 - Restrict 13 - Add 15 -
2 - Rebuild 4 - Remove 6 - Relocate 8 - Install 10 - Deny 12 - Paint 14 - Adequate

PARTY RESPONSIBLE FOR WORK CODES: RR - Railroad RD - Road Authority Identify Other: _____

Traffic Count _____ Posted Speed Limit _____ No. School Buses Using Crossing _____

Accident Record _____

Train Movements: Thru _____ Switching _____

Speed _____ Main Tracks _____ Sidings/Spurs _____ Simultaneous Occupancy _____

Exposure Factor _____ Priority _____ Other _____

REMARKS _____

A. Existing situation adequate.

B. More information required.

C. Will draft supplemental report and mail to the involved parties at a later date.

D. Items _____ are considered seasonal and/or normal maintenance and should be accomplished within _____ days from this inspection and written confirmation provided to the Railroad Safety Section.

E. Items _____ are considered construction improvements, and a Commission Order will be issued. Objections to the recommendations must be received within 45 days from this inspection and must be based upon specific safety concerns.

REPORT PREPARED BY: _____

REPORT RECEIVED BY: Railroad Representative _____

Road Authority Representative _____

_____ Representative _____

Signature Title

highway improvements to improve a rail-highway crossing. The crossing improved by not be the highest priority; but significant savings are realized by combining the two projects.

Hazard Index Ratings (HIR)

(HIR) = Average Daily Traffic (A.D.T.) x Average 24-hour Train movements x Protection Factor.

Protection Factors

1.00 - Reflectorized Crossbuck Sign
0.30 - Flashing Light Signals
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0.05 - Flashing Light Signals with Cantilever Arms, Half-Roadway Gates, and Traffic Signal Interconnection

II. Implementation

The Department of Transportation schedules and implements safety projects through its Programming Section of the Bureau of Highways. The process is in accord with criteria outlined in the Federal-Aid Highway Program Manual, Volume 6, Chapter 3, Section 2, Subsection 2. The safety project identification/evaluation/selection process is described in Section I (Planning) of the Safety Improvement Process.

Hazard Elimination Funds are used to implement safety justified projects on all state roads, except Interstate. Approximately 50 percent of the HES funds are allocated to the state trunkline and 50 percent to the local system. State trunkline projects are primarily recommended by the Traffic and Safety Division and projects on local roads are administered by the Local Services Division. Guidelines for Federal funding of local road HES projects are included in Appendix II.

Rail Highway Crossing funds are selected based on the criteria outlined in I, D., 3 of the Safety Improvement Process. The projects are identified and selected based primarily on evaluation by the Railroad Safety Section. The Railroad Safety Section administers state trunkline projects and the Local Government Division those on the local system.

Section 144 of Title 23 of the United States Code provides financial assistance for replacing bridges over significant waterways or other topographical barriers which are unsafe because of structural deficiencies, physical deterioration, or functional obsolescence. The program in Michigan is administered by the department's Local Services 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.

Other highway safety projects are funded with Federal-Aid Urban, Primary, and Secondary funds. Interstate safety projects are funded with interstate funds.

Contracts for highway safety improvements are awarded in accord with criteria and requirements outlined in FHPM 6-4-1-14.

III. Evaluation and Reporting

Evaluation of highway safety improvements are done in accord with reporting requirements outlined in the Federal Aid Highway Program Manual, Volume 8, Chapter 2, Section 3, Paragraph 8. Results of these evaluations are included in Michigan's annual report to the Federal Highway Administration of its overall highway safety improvement program.

The basic element of the evaluation process is completion of the "Table 2" for the federal categorical Hazard Elimination Safety (H.E.S.) programs. In addition, that form has been, and is, used to tabulate before-and-after data for safety projects funded by other federal/state highway funds. Since Rail Highway Safety Program projects are not justified primarily by accident data, other "program" analysis methods are used (see C).

The "Table 2" includes the following information:

- Funding Source (Column 1)
- Improvement Type (Column 2)
- Cost (Column 3)
- Before-and-After Accident Data, Including Severity (Columns 7-15)
- Traffic Volume (Columns 17 and 18)

The data summarized in the "Table 2's" is assessed in different ways.

A. Time-of-Return

The time-of-return analysis computes before-and-after accident costs, utilizing National Safety Council cost data for fatalities, injuries, and property damage only crashes. Comparing the reduction of these costs (the "benefit") to project costs yields the time to recover the investment.

B. Statistical Analysis

Long term accident data is subject to increasing and decreasing trends, resulting from well known factors, such as safer vehicle designs, seat belt usage, the lower national speed limit, enforcement of drunk driving laws, and other less well understood factors which seem to affect crash and crash severity data. MDOt therefore utilizes statistically valid "control" groups to assess the expected impact of the "no build" alternative. This affords a more accurate assessment of the benefits of safety projects. "Controls" are usually groups of locations with characteristics similar to the project location. When entire safety programs are evaluated, statewide or system classification data may be used as a control.

C. Program Analysis

After several years of experience with one or more safety programs directed at specific road systems, or with similar types of projects or locations, a program analysis may be undertaken. Examples of such analyses included in previous annual safety reports are the Pavement Marking Demonstration Program (1981), the Rail/Highway Crossing Safety Program (1982), and the Roadside Safety Improvement Program on the Interstate System (1983). These types of analyses yield a broad perspective overview of the long term effect of safety programs on the targeted roadway systems.

D. Type of Improvement Analysis

MDOT regularly analyzes the impact of various types of roadside "hardware" and operational improvements. Examples include concrete median barrier walls, paved shoulders, traffic signal systems, 4-way stops in rural areas, and 2-way center left-turn lanes. These studies allow us to assess new "state of the art" traffic control devices and new or unique uses of existing devices.

The body of knowledge accumulated through these evaluations allows MDOT to assess the cost-effectiveness of specific safety programs, their impact on specific roadway classifications, and the impact of new or modified traffic control devices, highway appurtenance, or design techniques. This data assists us in future decisions as to what countermeasures will be most effective in alleviating accidents or reducing their severity.

Appendix II
Guideline for Federal Funding of Safety Projects
Local System

MICHIGAN DEPARTMENT

OF

TRANSPORTATION

Local Services Division

Guideline for Federal Funding

of

Safety Projects

May 1985

I. GUIDELINE - Local Highway Agency Projects

This document is the guideline for accepting safety related projects for Federal Safety Funding. It applies to MDOT Local Services Division and Local Highway Agencies throughout the State. The Federal Programs involved are HES and RRS.

II. GOAL:

The Goal of this program is to reduce highway related accidents through Federal funding of projects determined to be at hazardous locations. Improvements are aimed at specific locations rather than general roadway construction. Funds are not intended for the purpose of increasing roadway capacity, however, capacity can be the primary cause of accidents and these projects will be eligible.

III. PROJECT TYPES

This guideline shall apply to the following types of projects described herein.

1. General Time of Return (TOR) Projects.
2. Nationally Recognized Cost Effective Projects.
3. Small Safety Projects.

IV. DATA COLLECTION & ANALYSIS

It is the responsibility of the Local Highway Agency to set priorities, collect and analyze accident information and to select projects for Federal funding. Those chosen should be the most effective in accident reduction for the individual governmental jurisdictional area.

Accident information available from Michigan's MALI system should be used as the basis for Priority setting by the Local Agency.

Information gathered and analyzed shall be retained in the Local Agency file.

To assist smaller agencies, MDOT makes available a section of its Traffic and Safety Division (402 Federally funded) to develop projects for funding. The service is available upon request and on a limited basis.

The following reports are desirable to properly develop a safety project and should be retained by the Local Agency.

1. Accident Reports - (MALI) A 3 year period is desirable.
2. Collision Diagrams - Helpful in analyzing accident problems.
3. Sketch of Existing Conditions - Sketch should show relevent information such as street and lane widths, alignment, and cross-section.
4. Traffic Volumes - Actual counts are desirable, however, estimates will suffice on low volume roads. Actual counts will be necessary where traffic signals are involved.
5. Photographs - Before and after are helpful in evaluation.

V. EVALUATION PRIOR TO PROJECT CONSTRUCTION

Cost Benefit Evaluation Prediction

Evaluation of projects shall be accomplished using the estimated time of return (T.O.R.) Formula included herein, using current National Safety Council values for property damage accidents, injuries, and fatalities. Those projects exhibiting the lowest T.O.R. factors are deemed to be the most cost effective and are therefore given the highest priority in the programming process.

The T.O.R. of the project cost, due to accident reduction, shall be 15 years for Local Highway Agency Projects. This will allow greater coverage of Safety projects in local areas that do not have an intense accident problem.

The T.O.R. computation shall be based on the engineers estimate as submitted for programming and shall be re-evaluated at a later date if cost has increased excessively.

This policy will apply to all Safety Projects, except those indicated as "Small Safety Projects" listed herein, Nationally Recognized Safety Projects and Rail-Highway Safety Projects.

Environmental Assessment

Environmental Evaluation shall follow the currect Federal Aid Urban and Federal Aid Secondary Guidelines for assessment and classification. It is expected that a considerable number of Safety projects will be classed as categorical exclusions. This will aid in limiting the time required for the development of projects and insure obligation of Federal funds in a timely manner.

VI. NATIONALLY RECOGNIZED COST EFFECTIVE SAFETY PROJECTS

The MDOT Local Services Division will allow certain types of safety improvement projects which have been shown to be cost effective by previous nationwide studies to be implemented without individual T.O.R. prediction. These projects are:

1. Traffic Sign
2. Railroad Signs, Markings, Signals & Gates
3. Pavement Markings and/or Delineators
4. Upgraded and New Guard Rail

5. Bridge Approach Guard Rail
6. Railroad Crossing Alignment Improvement
7. Removal of Roadside Obstacles
8. Upgrade Bridge Rail

The above will be eligible for Federal Funding without ADT limitations as this criteria is not relative.

VII. SMALL SAFETY PROJECTS

The Goal of this Policy is to better dispense and balance distribution of Federal Safety funds on a state-wide basis, by insuring that all Local Agencies are eligible to receive Federal Safety Funds.

Past experience has shown that very few outstate Local Agencies have the intense hazard problems as associated with the Detroit Metro and large city areas of the State. Yet these outstate areas have a strong need for Safety funds for worthy projects.

To further the Goal of highway safety awareness on a state-wide basis, "SMALL SAFETY PROJECTS" will be accepted for Federal Funding without individual T.O.R. procedures. This policy may involve approximately 30% of the HES state-wide Local Services Allocation per year. Each project will be reviewed for its worthiness and its overall cost, so as to keep it in the realm of a "SMALL SAFETY PROJECT." Each project will be accepted on the basis of a known history of accidents and/or has the potential for such accidents as determined by the city/county engineer. Projects shall be chosen as the most cost effective in accident reduction for the individual governmental jurisdictional areas. Types of projects are:

1. Intersectional improvements
2. Roadside obstacle removals
3. Guard rail installation and slope flattening
4. Shoulder widening and paving
5. Signal installation and modernization
6. Vertical and horizontal alignments improvements
7. Adding lanes (channelizing and turning)
8. Installation of attenuators
9. Texturizing of roadway surfaces
10. Traffic Signals - Safety related

Project selection will not be limited to the above and on a limited basis may include other highway safety improvements as "SMALL SAFETY PROJECTS."

VIII. ADMINISTRATIVE DEVELOPMENT FOR FEDERAL FUNDS

To develop funding procedures, after safety evaluation and priority selection, the regular Urban and Secondary guidelines will apply, as appropriate.

IX. RAIL-HIGHWAY CROSSINGS

The Grade Crossing Improvement Program utilizes the Hazard Index Rating (H.I.R.) to initiate grade inspections by a diagnostic team. Inspectors from the Department's Railroad Safety Section are the team leaders and are responsible for completing the Grade Inspection Report ~~from (Exhibit VIII)~~.

The remarks section of the form would include data relative to people, factors, and hazardous materials. The H.I.R. is then again utilized to determine the order in which improvement projects are submitted with one exception: Flexibility in the program is maintained by being able to take advantage of a scheduled highway improvement to include an improvement in a rail-highway crossing. The crossing improved may not appear near the top of the project listing, but by incorporating the two projects a lower cost can be utilized.

a. Hazard Index from State Inventory Program

Hazard Index Rating (H.I.R.) = Average Daily Traffic (A.D.T.) x Average 24-hour Train Movements x Protection Factor

Protection Factors

1.00 - Reflectorized Crossbuck Sign
0.30 - Flashing Light Signals
0.27 - Flashing Light Signals with Cantilever Arms
0.24 - Flashing Light Signals with Cantilever Arms and Half-Roadway Gates
0.11 - Flashing Light with Half-Roadway Gates
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0.05 - Flashing Light Signals with Cantilever Arms, Half-Roadway Gates, and Traffic Signal Interconnection

NOTE: Railroad Safety does not account for interconnected traffic lights in their inventory data.

The MDOT Local Services Division may reserve certain portions of the annual RRS appropriation to fund worthy specialty projects such as, but not limited to, railroad consolidation projects. Evaluation and selection of these projects shall receive individual attention.

X. REPORTING EVALUATION OF COMPLETED HES PROJECTS

The Local Highway Agency shall be responsible for reporting to MDOT, evaluation of the Safety Project after construction and trial period. This may consist of the time of return comparison, before and after and/or a word report of the evaluation of the safety aspects of the project. The evaluation shall include as a minimum, a two year before/after accident comparison for the accident categories which the project was expected to address (shown on T&R analysis), and for overall accidents at that location. This report shall be submitted to the MDOT Local Services Division. Reporting before and after evaluations will not be required for "SMALL SAFETY PROJECTS" and "NATIONWIDE COST EFFECTIVE PROJECTS" as previously listed herein.