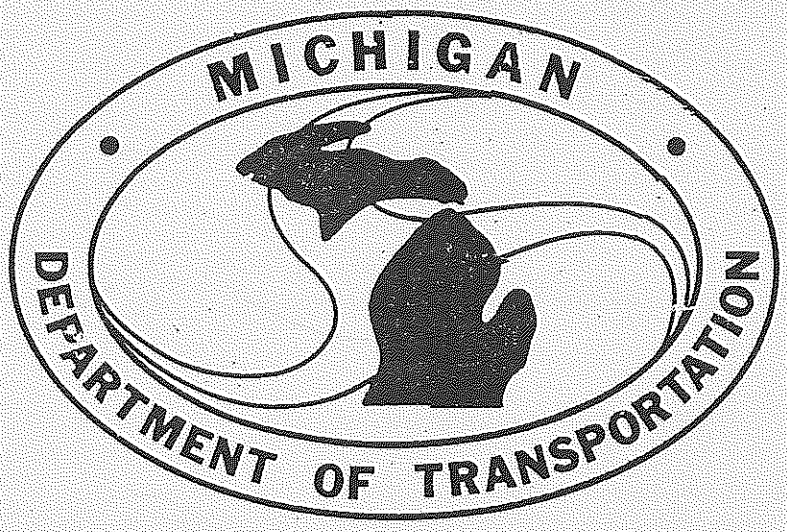
Fifteenth Annual Report of Michigan's Overall Highway Safety Improvement Program

July 1, 1987 - June 30, 1988



August 31, 1988

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 fifteenth Annual Report of Michigan's Highway Safety Improvement Program. The period covered in this report is July 1, 1987 through June 30, 1988.

The Highway Safety Program summary is found on page 2. Over $79 million of safety projects were identified in this years report. The Highway Safety Improvement Process (HSIP) was followed in the identification and selection of the HES and RR safety projects. The HSIP is not included in this report since it is basically unchanged, except for revision of the rail-highway program evaluation procedures which were approved by the FHWA.

This report includes evaluation of the HES and Rail/Crossing programs. Statewide accident trends are incorporated in a statistical analysis that determines expected accident frequencies for comparison with after accident data. That analysis indicates that the projects studied were responsible for a statistically significant accident reduction.

During 1987, 1632 persons died in traffic accidents on Michigan roads. This is the same total which was reported in 1986. Statewide travel increased, however, and the death rate was 2.2 per 100 million vehicle miles traveled, down 4.3 percent from the 1986 rate of 2.3. Total accidents during 1987 were 397,224, down 0.9 percent from the 400,694 in 1986 while total injuries decreased 1.1 percent from 158,032 to 156,318.

Highway Safety Program Summary (Obligated)
July 1, 1987 - June 30, 1988

Federal Categorical	
Hazard Elimination Safety	5,630,092
Rail/Highway Crossings	3,661,559
Other Federal Funds	
Interstate	42,012,500
Primary	9,348,448
Secondary	1,656,607
Urban	7,123.792
State Funded	1,475,399
State/Local Match	8,752,605
TOTAL	79,661,002

Federal Funding of Highway Safety Improvements in Michigan

As of June 30, 1988, Michigan had obligated $145.3 million or over 96 percent of its combined federal aid safety construction funds apportioned since 1974. That total includes obligations from the following active categorical programs:

Program	Obligated (Millions)	Percent of Apportionment
Rail-Highway Combined		
ON System	67.3	96
OFF System	16.7	96
HES	62.0	98

From July 1, 1987 to June 30, 1988 over 5.6 million of HES funds were obligated with 0.4 million being for Yellow Book type work and over 4.2 million used for intersection improvements. Signing, resurfacing, crossover construction and minor improvement accounted for the remaining 1.0 million. The Rail-Highway combined program included the following project types and cost:

Project Type	Obligated (Millions)
Crossing/Track Removal	0.20
Reconst. Crossing/Approach Work	1.71
New Signals/Crossing Surf/Track & Signal Removal	0.75
New Signals/reconst. Crossing/Approach Work	1.00
TOTAL	3.66

As noted on the "Highway Safety Program Summary" over $42 million of Interstate and $18.1 million of Federal Aid Primary, Secondary, and Urban funds were identified as being obligated for projects primarily justified based on safety.

TABLE 1

STATE MICHIGAN | M | I | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
PROCEDURAL AND STATUS INFORMATION

Line	Highway System	HIGHWAY LOCATION REFERENCE SYSTEMS			TRAFFIC RECORDS SYSTEM		
		Miles Covered (Percent) (1)	Expected Completion (Year) (2)	Type of Location Reference Method (3)	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	AHT	100	0
102	State - F.A.	100	N/A	D-II	AHT	100	100
103	State - Non-F.A.	100	N/A	D-II	AHT	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		RAILROAD-HIGHWAY GRADE CROSSINGS					
		Criteria for Identifying Hazardous Locations, Sections and Elements *(7)	Criteria for Setting Project Priorities *(8)	Inventory Update *(9)	Project Priority Selection *(10)	Compliance With MUTCD: Crossings Upgraded **7/1/73-6/30/83 (11)	Not Complying: Number (12)	Not Complying: % (13)	Compliance Target Date (14)
201	Interstate	AEHLRS	CEIPRTV						
202	State - F.A.	AEHRS	CEIPRTV	B	AHIMPTVW	N/A	0	0	N/A
203	State - Non-F.A.	AEHRS	CEIPRTV	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:
7/1/73-6/30/88 ____
7/1/86-6/30/88 ____

TABLE 2

STATE MICHIGAN — FIPS CODE (Alpha): M I

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line	Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1,000) (3)	Quantity of Improvements (4)	Date (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)	Volume Information: Before AADT (17)	Volume Information: After AADT (18)	Volume Information (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	HE	1A	28.7	1	X	36	0	16 23	41	57	36	0	23 36	38	61	F						
02	HE	1A3B	108	1	X	36	2 2	1 1	2	5	36	0	0	2	2	F						
03	HE	1A3B	11.7	1	X	36	1 1	22 49	25	48	36	2 2	10 17	23	35	F						
04	HE	1A3F	87.4	1	X	36	0	10 13	22	32	36	0	8 12	24	32	F						
05	HE	1A3F	95.4	1	X	36	0	2 2	5	7	36	0	8 13	12	20	F						
06	HE	1A3F	74.7	1	X	36	0	6 10	6	12	36	0	2 2	6	8	F						
07																						
08	SUBTOTAL–		511.9	6			3 3	57 98	101	161		2 2	51 80	105	158							
09																						
10	HE	1D1F3F	44.0	1	X	24	1 1	2 2	18	21	24	0	0	15	15	P						
11																						
12	HE	1F3F	241.7	1	X	24	0	18 28	30	48	24	0	5 6	28	33	P						
13	HE	1G3C	103.5	1	X	24	0	5 8	32	37	24	0	18 25	57	75	F						
14	HE	2E	35.9	1	S	36	0	0	1	1	36	0	0	0	0	F						
15																						

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

TABLE 2

STATE MICHIGAN — FIPS CODE (Alpha): M I

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
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)	Volume Information: Before AADT (17)	Volume Information: After AADT (18)	Volume Information: (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	HE	2E3R	548.1	30.76	M	36	0	1 2	2	3	36	0	0	4	4	F						
02	SUBTOTAL		973.2				1 1	26 38	83	110		0	23 31	104	127							
03	HE	3B	462.3	0.34	M	24	0	33 52	52	85	24	0	17 28	41	58	P						
04	HE	3B	195.8	0.40	M	36	0	31 46	48	79	36	0	22 30	50	72	F						
05																						
06	SUBTOTAL		658.1	0.74	M		0	64 98	100	164		0	39 58	91	130							
07																						
08																						
09																						
10	HE	3D3F3O	62.5	1	X	36	1 1	1 7	0	2	36	0	0	2	2	F						
11																						
12	HE	3F	339.4	0.16	M	24	0	5 5	10	15	24	0	1 3	5	6	P						
13	HE	3F	86.1	0.20	M	24	0	0	1	1	24	0	0	2	2	P						
14																						
15	SUBTOTAL		488.0	0.36	M		1 1	6 13	11	18		0	2 6	16	18							

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

TABLE 2

STATE MICHIGAN — FIPS CODE (Alpha): M I

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
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)	Volume Information: Before AADT (17)	Volume Information: After AADT (18)	Volume Information: (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	HE	3K3R	691.2	3.2	M	24	0	0	0	0	24	0	0	0	0	P						
02	HE	3K3R	3,100.2	11.00	M	36	4 5	96 113	72	172	36	1 1	84 99	125	210	F						
03	HE	3K3R	1,226.6	10.85	M	36	2 2	35 43	33	70	36	2 2	43 53	70	115							
04																						
05	SUBTOTAL		5,018.0	25.29	M		6 7	131 156	105	242		3 3	127 152	195	325							
06																						
07	HE	3M	231.5	1.33	M	36	0	12 15	18	30	36	0	12 13	22	34	F						
08																						
09	RR	5B		1	R	36	0	2 5	5	7	36	0	2 3	8	10	F						
10	RR	5B		2	R	36	0	5 8	25	30	36	0	13 19	23	36	F						
11	RR	5B		1	R	36	0	1 3	0	1	36	0	1 2	1	2	F						
12	RR	5B		1	R	36	0	3 7	2	5	36	0	1 2	2	3	F						
13																						
14	SUBTOTAL			5			0	11 23	32	43		0	17 26	34	51							
15																						

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

TABLE 2

STATE MICHIGAN | M | I | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line	Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvement (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)	Volume Information Before AADT (17)	Volume Information After AADT (18)	Volume Information (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	RR	5D		1	R	36	0	2 3	2	4	36	0	2 5	5	7	F						
02	RR	5D		1	R	36	0	0	0	0	36	0	0	0	0	F						
03	RR	5D		1	R	36	0	0	0	0	36	0	1 1	0	1	F						
04	RR	5D		1	R	36	0	1 1	2	3	36	0	0	1	1	F						
05	RR	5D	54.9	1	R	36	0	0	3	3	36	0	0	2	2	F						
06	RR	5D		1	R	36	0	10 22	5	15	36	0	0	2	2	F						
07	RR	5D		1	R	36	0	9 21	3	12	36	0	0	1	1	F						
08																						
09	SUBTOTAL			7	R		0	22 47	15	37		0	3 6	11	14				1			
10																						
11	RR	5I	69.8	3	R	20	0	0	0	0	20	0	0	0	0	P						
12	RR	5I	72.2	3	R	24	0	2 3	5	7	24	0	2 2	10	12	P						
13	RR	5I	15.2	1	R	36	0	1 1	19	20	36	0	0	23	23	F						
14	RR	5I	114.9	3	R	24	0	1 1	0	1	24	0	1 1	1	2	P						
15	RR	5I	16.8	1	R	36	0	2 2	1	3	36	0	1 2	0	1	F						

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

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ANNUAL REPORT 1988
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01	RR	5I	35.0	1	R	24	0	1(1)	1	2	24	0	2(2)	0	2	P						
02	RR	5I	34.9	1	R	36	0	0	3	3	36	0	0	2	2	F						
03	RR	5I	33.4	1	R	24	0	1(1)	3	4	24	0	1(1)	3	4	P						
04	RR	5I	24.5	1	R	36	0	1(1)	4	5	36	0	5(6)	5	10	F						
05	RR	5I	45.5	2	R	36	0	1(2)	3	4	36	0	2(7)	3	5	F						
06	RR	5I	97.9	1	R	36	0	10(22)	3	13	36	0	0	3	3	F						
07	RR	5I	166.3	2	R	36	0	2(4)	11	13	36	1(1)	2(3)	11	14	F						
08	RR	5I		1	R	36	0	5(7)	14	19	36	0	4(4)	10	14	F						
09	RR	5I		1	R	36	0	1(1)	3	4	36	0	1(1)	12	13	F			1			
10	RR	5I		1	R	36	0	0	0	0	36	0	0	0	0	F						
11	RR	5I	66.8	1	R	36	0	0	9	9	36	0	3(3)	9	12	F						
12	RR	5I		1	R	36	0	0	1	1	36	0	2(4)	1	3	F						
13	RR	5I		1	R	36	0	1(1)	13	14	36	0	6(9)	11	17	F						
14	RR	5I	154.7	2	R	36	0	2(2)	4	6	36	0	6(7)	6	12	F						
15	RR	5I		1	R	36	0	1(1)	6	7	36	0	5(6)	8	13	F						

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

TABLE 2

STATE MICHIGAN (FIPS CODE (Alpha): M I)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line	Safety Improvement Project (1)	Safety Classification Code (2)	Total Cost of Project 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)	Volume Information Before AADT (17)	Volume Information After AADT (18)	Volume Information (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	RR	5I		1	R	36	0	0	0	0	36	0	0	0	0	F						
02																						
03	SUBTOTAL:			30	R		0	32 (50)	112	144		1 (1)	43 (58)	118	162							
04																						
05	RR	5L	26.3	2	R	36	0	2 (2)	7	9	36	0	1 (1)	5	6	F						
06	RR	5L	50.1	7	R	36	0	5 (6)	7	12	36	0	5 (6)	6	11	F						
07	RR	5L	23.9	1	R	36	0	2 (4)	5	7	36	0	2 (4)	10	12	F						
08	RR	5L	158.4	10	R	36	0	1 (1)	10	11	36	0	1 (3)	13	14	F						
09	RR	5L	33.3	1	R	36	0	0	2	2	36	0	0	2	2	F						
10	RR	5L	50.4	3	R	24	0	1 (1)	8	9	24	0	1 (1)	7	8	P						
11	RR	5L	66.8	1	R	36	0	2 (2)	14	16	36	0	3 (3)	13	16	F						
12	RR	5L	36.0	2	R	24	0	4 (4)	3	7	24	0	5 (11)	15	20	P						
13	RR	5L	26.1	1	R	24	0	0	1	1	24	0	0	0	0	P						
14	RR	5L	103.6	3	R	36	0	4 (10)	9	13	36	0	3 (5)	10	13	F						
15	SUBTOTAL:		694.4	31			0	21 (30)	66	87		0	21 (34)	81	102							

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

TABLE 2

STATE MICHIGAN | M | I | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1988
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)	Volume Information Before AADT (17)	Volume Information After AADT (18)	Volume Information (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	RR	50	49.3	1	S	24	0	0	0	0	24	0	0	1	1	P						
02																						
03	TOTALS ALL PROJECTS			94			11 12	382 568	643	1036		6 6	326 451	756	1088							
04																						
05																						
06																						
07																						
08																						
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.)_____

Program Statistical Analysis

Accidents at all 94 locations totaled 1,036 in the "before" period and 1,088 in the "after" period. A statistical evaluation of all projects using the Poisson technique, 95 percent confidence level based on three years of before and after data shows the following results:

$$E_f = B_{pf} \times \frac{A_{cf}}{B_{cf}} = 1036 \times 1.3760 = 1425$$

B_{pf} = Before Period Accident Frequency (1,036)

A_{cf} = After Control Group Accident Frequency
Statewide Trunkline Accidents 1985 - 1987 (429,959)

B_{cf} = Before Control Group Accident Frequency
Statewide Trunkline Accidents 1981 - 1983 (312,456)

E_f = Expected Accident Frequency (1,425)

Accidents for all locations were reduced by 337 when compared to the Expected Accident Frequency resulting in 23.6 percent reduction, which is statistically significant.

The three Yellow Book type projects, (safety classification code 3K3R) can be evaluated by the same method using statewide run-off-roadway type accidents (fixed-object and overturn accidents) as the control. The Expected Accident Frequency is:

$$E_f = 242 \times \frac{62,528}{51,948} = 242 \times 1.2037 = 291$$

This indicates that off-road accidents increased by 34 or 11.68 percent. This increase could be attributed to the small sampling of projects.

The six intersection projects on lines 1 through 6 of the table involving widening to add lanes to the traveled way can also be evaluated using statewide trunkline accident trends at signalized intersections. The Expected Accident Frequency is:

$$E_f = 161 \times \frac{99,598}{74,767} = 161 \times 1.332 = 214$$

Comparing the Expected Accident Frequency with the "after" period accident total of 158 shows accidents were reduced by 56, a 26 percent decrease, which is statistically significant.

SAFETY PROGRAM ACTIVITIES

Our Safety Improvement Process is described in the Highway Safety Improvement Process (HSIP) available from the traffic and safety division. It includes a process for developing and implementing non-state trunkline HES projects. Engineering evaluation and analysis on the state trunkline system continues to be the primary responsibility of the Traffic and Safety Division's Safety Programs Unit. Major activities of the unit are discussed below.

Crash Analysis/Roadside Safety Program

The Crash Analysis/Roadside Safety Program evaluated approximately 400 trunkline locations last year which exceeded predetermined thresholds of accident types (including ran-off-road). A more detailed discussion of the data analysis/ evaluation/project selection process is included in the HSIP.

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 identify and solve traffic engineering problems. The local street review is accomplished by our Traffic Engineering Assistance Program funded by Federal Section 402 funds distributed through the Michigan Office of Highway Safety Planning. The TOPICS reviews are closely coordinated with the Metropolitan Planning Organization (MPO) in the 16 larger urbanized areas and with appropriate local officials in the smaller communities.

During the past year, we initiated a TOPICS study for the Grand Rapids metropolitan area. The study involves 110 locations identified because of accidents or concerns of M.P.O. members. Fifty of the locations are on the state trunkline system, and 60 are on streets or roads under local jurisdiction. Completion of the study, including a written report of findings and recommendations for safety and operational improvements, is planned for FY 88-89.

Historically, since 1982, TOPICS studies have been completed in 18 urban areas addressing approximately 750 locations. Approximately 50 percent were on the local road system and were included using the resources available through the Traffic Engineering Services Program (description of that Program follows). Accident countermeasure and operational improvement recommendations consisted of about 85 percent low-cost operational and 15 percent capital-outlay (construction). Implementation rates have ranged between 80-90 percent.

Identification of "Slippery When Wet" Pavements

The department monitors the friction characteristics of its pavements and identifies locations with disproportionate numbers and rates of wet surface accidents.

The Materials and Technology Division notifies us of all locations with average friction numbers (FN) of less than 30 identified in conjunction with their annual statewide pavement friction testing program. Analysis of this data supplements our routine annual accident surveillance effort which includes identification of locations, primarily intersections, with concentrations of "wet" accidents.

We compile three years of accident data within the identified areas to determine if a concentration of accidents exists associated with low pavement friction. The "expected annual accident reduction," is calculated by assuming that "wet" accidents will decrease to the district average. Those locations evidencing expected annual reductions of at least three or more accidents are subjected to additional analysis to determine if a friction improvement project would be cost-effective. We use National Safety Council accident/casualty costs to determine the "benefit" and unit costs for a bituminous overlay to calculate project costs. The project time-of-return is determined and any section with an analyzed time-of-return of five years or less is considered a candidate for a friction improvement project.

Traffic Engineering Assistance Program

The Traffic Engineering Assistance Program assists local governmental agencies 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 Traffic Engineering 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 Traffic Engineering Assistance Program does, however, continue to respond to any local agency requesting its services on the locally governed roadway system.

During fiscal 1987-88, the Traffic Engineering Assistance Program analyzed 22 locations in response to spot location requests of local governmental officials. Thirty-eight operational and four construction type accident countermeasure recommendations were offered as a result of these analyses.

In addition, analyses were partially completed at 60 local locations as part of a Grand Rapids area TOPICS study. Completion of the study is expected in F.Y. 88-89.

An analysis of this program is being conducted by Michigan State University, under contract with the Michigan Office of Highway Safety Planning.

3R/4R Project Plan Reviews

The Safety Programs Unit reviews all federal aid 3R/4R projects to assure that any reasonably cost-justified safety enhancements are included as part of the projects. The review includes the following steps:

1. Determine milepoints for project limits.

2. Check accident threshold lists to determine if any location within the project limits exceeds one of the accident parameters used as a basis for our statewide accident surveillance program.

3. Review one-line accident listings for any accident concentration not identified by step 2.

4. Review photolog.

5. Identify roadside hardware (guardrail, bridgerail, end treatments, etc.) which are not to current MDOT standards.

6. Identify justified accident countermeasures and roadside hardware enhancements based on accident history and accident potential.

7. Send written recommendations to Design squad leader.

Last year, nearly 200 such project plan reviews were completed involving 105 bridges and approximately 450 miles of roadway. A significant amount of guardrail, guardrail end sections, and bridgerail are being upgraded to current design standards through this program.

Guardrail Improvement Program

The department currently manages three guardrail improvement programs.

1. A five-year program currently funded up to $700,000 per year to replace deteriorated wood posts on Types B, C, and T guardrail.

2. A ten-year, $500,000 per year program to upgrade cable and Type A guardrail.

3. Guardrail improvements are also included with 3R/4R projects which account for a large number of miles of guardrail upgrading. This work is generally handled by the Design Division.

As an option, guardrail can be eliminated under any of these three programs where it would be more cost effective to modify the element protected by the guardrail (i.e. slope flattening). There is a pilot program in District 4 to eliminate guardrail and flatten slopes. This may be expanded statewide.

During the current fiscal year the following guardrail upgrading projects have been, or soon will be, let to contract: US-23, from M-36 to the north Livingston County line; M-22 from the south Leelanau County line to Glenn Arbor; M-37 at the C&0 railroad structure, Grand Traverse County; M-22 from the south Kalkaska County line to M-72; M-75 from Boyne City to Walloon Lake, Charlevoix County; US-27 from Round Lake Road to St. Johns, Clinton County; M-15 from I-75 to the north Oakland County line.

In addition, $250,360 of additional guardrail upgrading work was accomplished last year by work authorization to department maintenance forces or to contract counties. Also, the first work authorizations to eliminate guardrail in District 4 by slope flattening, culvert extension etc. were processed recently using surplus funds in the post replacement program.

Interchange Upgrading Program

As part of its overall capital outlay program, the Michigan Department of Transportation budgets funds for interchange improvements. The most recent "Call for Projects" includes over $3 million of recommended projects to upgrade freeway interchanges.

The Traffic and Safety Division, with assistance from Michigan State University, has developed an inventory of interchanges and their geometric features. We have merged accident data with that file and are now attempting to develop an automated process which identifies locations or interchange elements which experience disproportionate numbers of accidents or accident types.

In the interim, we have initiated a program of identifying interchanges which exceed predetermined accident parameters. Our first effort is a "pilot program in District 6.

The purpose of the "pilot" interchange analysis is to determine if interchange accident data can be addressed in a timely fashion using our present computerized interchange inventory/accident data program. In addition to identifying potential corrective countermeasures based on the interchange accident printouts, we intend to segregate truck accidents for special attention. We also hope to be able to identify any enhancements to the present computer program which would better enable us to monitor accident data within interchanges.

The initial step was to generate a listing of interchange accident data for District 6. This was completed by doing a "Lit 6" search of the master file. Statewide truck accident data was also acquired for 1986 giving us a corresponding three-year history of truck interchange accidents. There are 85 interchanges of various types in the district.

The second step was to generate a listing a listing of projects let during 1986 and 1987 and anticipated projects through 1994 that could involve an interchange improvement. This information from the Programming Division allows us to eliminate interchanges with active or recently completed projects but coordinate needed improvements with future projects. This step eliminated six interchanges.

The third step was to review our central files for any information relative to traffic signal or pavement marking changes for each of the remaining interchanges. This step did not eliminate any interchanges.

The fourth step was to reduce the remaining list of 79 interchanges to a more manageable size. This was done by developing a set of criteria that would hopefully direct our attention to the most critical interchange needs. When this criteria was applied identifying only interchanges that met three or more of the criterion, 10 interchanges required a more in-depth analysis.

Following are a list of those criteria:

1. Seventy percent or more of the total accidents for interchanges with 30 or more accidents attributed to the crossroads(s).

2. Fifty percent or more of the total accidents occurred during hours of darkness.

3. The severity ratio (injury/fatal accidents to total accident) exceeds 40 percent.

4. Forty percent or more of the total accidents involved a wet pavement surface.

5. At least four overturn type accidents occurred on one or more of the interchange elements.

6. Fifteen or more accidents occurred on one or more of the interchange ramps.

7. Two or more of the total accidents produced a fatality.

8. Any accident pattern representing 60 percent or more of the total accidents for any interchange element with 15 or more accidents except service drive elements.

9. Twenty-five or more accidents for any service drive element within an interchange.

Step five is to review each location with district personnel to determine those factors contributing to the accidents and develop corrective counter measures.

The data has been sent to the district traffic and safety engineer. When his comments are received, we will proceed with further analysis.

Traffic Signals

The division investigated 293 locations in fiscal 86-87 to determine the need for new or modified traffic control signals. There were 291 additional requests for studies to determine the need for new or improved traffic control signals during the past year. Studies of the need for new traffic control signals increased from 93 in 1986 to 147 in 1987.

Work authorizations were issued for 193 improvements, including 37 new traffic control signals and eight new flashing beacons at a cost of $2,003,595. Traffic signalization improvements at 61 other locations were authorized by contract. The cost for consultant engineering services was approximately $225,000 and the total contract installation costs were approximately $1,500,000. Additional contracting accounted for 24 percent of previous direct forces type work to reduce the increasing backlog of signal work. The number of work authorizations issued to the Maintenance Division was reduced by ten percent this past year. The division prepared a "request of proposal" for consultant design services for the development of plans and estimates required for the installation of new electronic traffic signal control devices. Five proposals were received and evaluated by a division Evaluation Committee. Two consulting firms were selected to provide the necessary engineering services.

We are now installing new state-of-the-art solid state traffic signal controllers in place of the old electro-mechanical controllers. The new controllers increase the efficiency of operation by allowing many more timing plans for the traffic signal. They also allow more flexibility, have built-in time based coordinators (used to coordinate with nearby signals), and require much less maintenance. The department is installing over 100 of these controllers each year to update the 2,300 traffic signal controllers on the state highway system.

The division also participated in coordinating the second full year of reactivation of the BEAR freeway motorists aid system. There are currently 40 volunteers participating in the operation of the system, which currently provides an 80 percent coverage for freeway motorist aid services. The division also participates in the equipment maintenance and operational functions required for the system.

Traffic Records and Data Acquisition

This division is extensively involved in the Michigan Traffic Accident Records Committee. Work group tasks include determining the direction and character of improvements to the state's accident records system. We are involved in defining needs, processing/output, systems development, and definition areas. This committee is unique in that it crosses department lines and has focused attention on a record system that will meet the needs for all users of accident records in both public and private agencies.

We also developed, this past year, a computerized file for speed and parking Traffic Control Orders (TCO). This involves determining, collecting, and coding data for entry into a computerized inventory while maintaining existing speed and TCO file data.

In cooperation with the Department of State Police, new speed zone setting procedures were developed. Implementation of these new procedures will be facilitated through a training seminar developed by Michigan State University, in cooperation with our division and the Department of State Police.

The "Michigan Automated Records System" (MARS) provided data on a 27-mile section of County Road 550, between Marquette and the community of Big Bay, at the request of the Bureau of Transportation Planning. Full roadway alignment, speed limits, no-passing zones, and structure data were compiled in three days, including travel time. Subsequently, a graphic layout of the roadway was provided for use at a joint meeting of local legislators, department and county personnel.

A second special MARS project provided a profile of Auburn Road (Old M-59) between I-75 and Rochester Road in Oakland County. Data obtained was used to help assess the use of the 85th percentile to set speed limits on this rolling section of roadway. The survey was requested by the Metro District as a result of complaints from businesses and residents on Auburn Road concerning lack of sight distance.

Raised Pavement Markers

For several years the department has been interested in snow plowable and recessed pavement markers to improve roadway delineation, particularly during adverse weather.

In 1984, Stimsonite snowplowable and recessed markers were installed along I-275 in Wayne and Oakland Counties to evaluate their durability. Based on visual observations and laboratory reflectance testing, the snowplowable marker was judged superior. As a result of the favorable assessment of their durability, it was decided to further evaluate the effectiveness of the markers on safety.

A candidate list of locations, where we believed raised pavement markers had the potential to reduce the incidence of ran-off-road type accidents during dark hours were selected. These locations were reviewed with the district traffic and safety engineers and several locations where the districts anticipated resurfacing in the future were eliminated.

The proposed project sites were selected from an initial list of locations along roadways with an accident density of five or more ran-off-road type accidents per mile during dark hours for a period of three years (1984-86). These locations were then reviewed on the photolog to select those with curvilinear alignment (frequent passing restrictions), relatively high speeds, no street lighting, and which were primarily rural (without roadside development). Whenever two or more candidate segments were located close to each other, they were combined as one continuous segment. In addition, two recycled, bituminous freeway segments were selected, one in each district, to allow us to evaluate the performance and impact on safety of the markers in these environments. Also, one short "spot" location was included in each district at the request of the district traffic and safety engineer and a few freeway "gore" areas near Lansing were added to the project site list.

The proposed locations are confined to Districts 7 and 8 to minimize contract cost, enhance field monitoring of the installed markers by Lansing personnel, and simplify evaluation. Once these markers are in place for two to three years, we will conduct a before/after study to evaluate their effectiveness in reducing ran-off-road type accidents during dark hours.

Truck Safety

In response to the department's concern for truck safety, we initiated a "pilot" truck accident review which eventually culminated in a detailed accident analysis and field review of 14 locations. A written summary report of that review, including specific recommendations to reduce truck accidents, has been completed.

As a result of the pilot study, we are proposing that "large truck accidents" be incorporated as an additional accident type parameter monitored as part of our statewide accident surveillance program. This will require some "software" modifications to the accident analysis computer programs.

Call for Projects

In conjunction with the department's 89/90 Call for Projects, the Traffic and Safety Division is proposing a $33.8 million program. That program includes $10.8 million for signing, $7,8 million for pavement markings, $5.1 million for traffic signals, $6.4 million for safety improvements, $3.2 million for interchange improvements, and $0.6 million for guardrail upgrading.

Traffic Signing and Pavement Marking

On November 29, 1987, the speed limit on rural interstate freeways was increased to 65 mph. Seven hundred and twenty miles of interstate freeways were affected by this change. By the next day, the department had installed or modified over 200 signs advising motorists where higher speeds were permitted and areas where the speed limit remained at 55 mph. Subsequently, in January, 1988, following enabling national legislation, an additional 425 miles on non-interstate rural freeway were signed for the 60 mph speed limit.

The department installed pavement markings on the entire 9,470-mile state highway system last year. Sixty percent of the mileage was completed by contract and the remaining by state forces. The total cost of the program was $5.3 million. State forces installed fast-dry paint on 2,000 miles of highway at an approximate cost of $1.0 million and contractor installed fast-dry paint on 2,100 miles of highway cost at an approximate cost of $1.1 million. The remaining 5,370 miles of highway was marked with polyester, cold plastic, and hot-applied thermoplastic pavement marking materials by contract, at a cost of $3.2 million.

A computerized sign inventory and contract plan and work authorization system for non-freeway state trunklines was developed in cooperation with the Engineering and Scientific Data Center. The system was successfully implemented in District 4 and is being expanded statewide. The inventory, when fully operational, will document all traffic signing activity statewide. The system will maintain a current inventory of all 300,000 signs on our state highways, provide data for a statewide maintenance program, and will allow district personnel to develop sign contract plans, authorize changes to signs in the field, and update the master inventory from microcomputers in the district offices. The system will also generate graphical pictures of the road and signs on it and will replace a labor-intensive manual system.

Litigation Management

The Traffic and Safety Division continue to provide coordination and traffic engineering support for the department's tort liability defense. There are nearly 450 active cases involving the department, with 70 percent involving the Traffic and Safety Division. This year the division contributed 4,920 hours to litigation activities, or 2.5 full time positions. Activities included expert testimony, consultations with department attorneys, and response to discovery questions and "freedom of information" requests. During this past year the division participated in over 50 trials which resulted in over 400 hours of deposition and trail testimony. The discovery process preceding each trial required 300 responses to requests for information, including 73 "freedom of information" requests. Accident data and photolog film reproduction are the most requested information. During 1988, the division will continue to participate in the preparation for the trial of litigation with special emphasis on past case reviews and development of new or modified standards and programs to minimize the department's liability risk.