EVALUATION OF THE SOUTHEASTERN WISCONSIN TIME PROGRAM – PHASE I

by

Dr. Bin Ran
Project Manager
University of Wisconsin – Madison

Prof. Ronald Sonntag
Deputy Project Manager
Marquette University

Dr. Alexander Drakopoulos
Marquette University

Bridget Barrett
Graduate Research Assistant
University of Wisconsin – Madison

Phansak Sattayhatewa
Graduate Research Assistant
University of Wisconsin – Madison

Bryan Nemeth
Graduate Research Assistant
University of Wisconsin – Madison

Shawn Leight
Graduate Research Assistant
University of Wisconsin – Madison

and

Taylor Miller
Graduate Project Assistant
University of Wisconsin – Madison

UW Project Number: 144-HC63
WisDOT Project Number: 1000-41-04

Sponsored by the
Wisconsin Department of Transportation
In Cooperation with
U.S. Department of Transportation
Federal Highway Administration

September 2000

UNIVERSITY OF WISCONSIN – MADISON
2256 Engineering Hall, 1415 Engineering Drive, Madison, WI 53706
This report summarizes the evaluation of Southeastern Wisconsin Traffic Incident Management Enhancement (TIME) Program. This evaluation has focused on the before and after studies of six components of the TIME Program, including Enhanced Freeway/Gateway Patrols, Crash Investigation Sites, Transverse Pavement Markings, Enhanced Location Reference Signs, Emergency Respondent Computer Aided Dispatch (CAD), and TIME Program User Acceptance. In summary, the evaluation results of the TIME Program have been very positive and have proven the TIME Program has been successful in achieving its goals of improving and enhancing freeway incident management, improving freeway safety, and enhancing the quality and efficiency of freeway travel in Southeastern Wisconsin.
DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Wisconsin Department of Transportation (WisDOT) or the Federal Highway Administration (FHWA). This report does not constitute a standard, specification, or regulation. This report was prepared by Dr. Bin Ran, Professor Ron Sonntag, Dr. Alexander Drakopoulos, Bridget Barrett, Phansak Sattayhatewa, Bryan Nemeth, Shawn Leight, and Taylor Miller.
# TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY ........................................................................................................... 1  
1.1 ENHANCED FREEWAY/GATEWAY PATROLS ................................................................. 1  
1.2 CRASH INVESTIGATION SITES ..................................................................................... 1  
1.3 TRANSVERSE PAVEMENT MARKINGS ........................................................................... 3  
1.4 ENHANCED REFERENCE SIGNS .................................................................................. 4  
1.5 COMPUTER AIDED DISPATCH (CAD)/EMERGENCY RESPONDENT ...................... 4  
1.6 USER ACCEPTANCE ......................................................................................................... 4  

2.0 EVALUATION GOALS, OBJECTIVES, AND APPROACHES ............................................ 7  
2.1 EVALUATION GOALS AND OBJECTIVES ........................................................................ 7  
2.2 PROGRAMS TO BE EVALUATED .................................................................................... 9  
2.3 EVALUATION APPROACH ............................................................................................... 12  
2.4 MEASURES OF EFFECTIVENESS (MOE) ................................................................. 13  

3.0 EVALUATION RESULTS ..................................................................................................... 15  
3.1 ENHANCED FREEWAY/GATEWAY PATROLS ................................................................. 15  
3.2 CRASH INVESTIGATION SITES ..................................................................................... 23  
3.3 TRANSVERSE PAVEMENT MARKINGS ........................................................................... 40  
3.4 ENHANCED REFERENCE SIGNS .................................................................................. 51  
3.5 COMPUTER AIDED DISPATCH (CAD)/EMERGENCY RESPONDENT ...................... 52  
3.6 USER ACCEPTANCE ......................................................................................................... 54  

4.0 CONCLUSION AND RECOMMENDATIONS ....................................................................... 76  

REFERENCES ............................................................................................................................. 79  

APPENDIX 1 – USER ACCEPTANCE SURVEY ........................................................................... 80
LIST OF FIGURES

FIGURE 1.3-1: FREQUENCY OF SPEED CHANGE .................................................................................. 3
FIGURE 3.1-1. INCIDENT TIMELINE ................................................................................................. 22
FIGURE 3.2-1: LOCATIONS OF THREE EXISTING CIS SITES ON I-94 ............................................... 26
FIGURE 3.2-2: CUMULATIVE NUMBER OF POSSIBLE SECONDARY CRASHES .............................. 31
FIGURE 3.2-3: REVISED CUMULATIVE NUMBER OF POSSIBLE SECONDARY CRASHES ........... 32
FIGURE 3.2-4. SAMPLE QUESTIONNAIRE ....................................................................................... 35
FIGURE 3.2-5: DISTRIBUTION OF ANSWERS TO QUESTION 2 ..................................................... 36
FIGURE 3.2-6 DISTRIBUTION OF ANSWERS TO QUESTION 3 ...................................................... 36
FIGURE 3.2-7: DISTRIBUTION OF ANSWERS TO QUESTION 4 ....................................................... 37
FIGURE 3.2-8: DISTRIBUTION OF ANSWERS TO QUESTION 5 ...................................................... 37
FIGURE 3.2-9. DISTRIBUTION OF ANSWERS TO QUESTION 6 ....................................................... 38
FIGURE 3.2-10. DISTRIBUTION OF ANSWERS TO QUESTION 7 .................................................... 38
FIGURE 3.3-1: TRANSVERSE PAVEMENT MARKINGS ..................................................................... 40
FIGURE 3.3-2. LOCATION MAP ........................................................................................................ 42
FIGURE 3.3-4. FREQUENCY OF SPEED CHANGE ........................................................................... 48
FIGURE 3.6-1: Q36 DISTRIBUTION .................................................................................................. 56
FIGURE 3.6-2: Q39 DISTRIBUTION .................................................................................................. 56
FIGURE 3.6-3: Q37 DISTRIBUTION .................................................................................................. 56
FIGURE 3.6-4: Q33 DISTRIBUTION .................................................................................................. 56
FIGURE 3.6-5: Q19 DISTRIBUTION .................................................................................................. 57
FIGURE 3.6-6: Q20 DISTRIBUTION .................................................................................................. 57
FIGURE 3.6-7: Q18 DISTRIBUTION .................................................................................................. 57
FIGURE 3.6-8: COUNTY DISTRIBUTION ...................................................................................... 57
FIGURE 3.6-9: Q40 DISTRIBUTION .................................................................................................. 58
FIGURE 3.6-10: Q6A – 6E DISTRIBUTION ...................................................................................... 58
FIGURE 3.6-11: Q6F-6I DISTRIBUTION ............................................................................................ 58
FIGURE 3.6-12: Q6J-6L DISTRIBUTION ........................................................................................... 59
FIGURE 3.6-13: Q6M-6O DISTRIBUTION .......................................................................................... 59
FIGURE 3.6-14: Q22 DISTRIBUTION ................................................................................................ 59
FIGURE 3.6-15: Q23 DISTRIBUTION ................................................................................................ 59
FIGURE 3.6-16: KNOWLEDGE OF CIS BY COUNTY ....................................................................... 60
FIGURE 3.6-17: Q28 DISTRIBUTION ................................................................................................ 60
FIGURE 3.6-18: Q29 DISTRIBUTION ................................................................................................ 60
FIGURE 3.6-19: Q30 DISTRIBUTION ................................................................................................ 62
FIGURE 3.6-20: Q34 DISTRIBUTION ................................................................................................ 62
FIGURE 3.6-21: Q35 DISTRIBUTION ................................................................................................ 62
FIGURE 3.6-22: Q33 DISTRIBUTION ................................................................................................ 62
FIGURE 3.6-23: Q7A DISTRIBUTION ................................................................................................ 64
FIGURE 3.6-24: Q13 DISTRIBUTION ................................................................................................ 66
FIGURE 3.6-25: Q15 DISTRIBUTION ................................................................................................ 67
FIGURE 3.6-26: Q14 DISTRIBUTION ................................................................................................ 67
FIGURE 3.6-27: Q26 DISTRIBUTION BY COUNTY ........................................................................... 68
FIGURE 3.6-28: Q26 DISTRIBUTION ................................................................................................ 68
FIGURE 3.6-29: Q27 DISTRIBUTION ................................................................................................ 68
FIGURE 3.6-30: Q27B DISTRIBUTION ............................................................................................. 69
FIGURE 3.6-31: Q27C DISTRIBUTION ............................................................................................. 69
FIGURE 3.6-32: Q27D DISTRIBUTION ............................................................................................. 69
FIGURE 3.6-33: Q27E DISTRIBUTION ............................................................................................. 69
FIGURE 3.6-34: Q27F DISTRIBUTION ............................................................................................. 70
FIGURE 3.6-35: Q27G DISTRIBUTION ............................................................................................. 70
FIGURE 3.6-36: Q3 DISTRIBUTION .................................................................................................. 71
FIGURE 3.6-37: Q5 DISTRIBUTION .................................................................................................. 71
FIGURE 3.6-38: Q4 DISTRIBUTION ................................................................. 72
FIGURE 3.6-39: Q16A DISTRIBUTION ......................................................... 73
FIGURE 3.6-40: Q16B DISTRIBUTION ......................................................... 73
FIGURE 3.6-41: Q16C DISTRIBUTION ......................................................... 73
FIGURE 3.6-42: Q16D DISTRIBUTION ......................................................... 73
FIGURE 3.6-43: Q16E DISTRIBUTION ......................................................... 74
TABLE OF TABLES

TABLE 2.1-1: EVALUATION GOAL AND OBJECTIVE MATRIX.......................................................... 8
TABLE 3.2-1: CRASH DATA SUMMARY FOR YEAR 1997................................................................. 26
TABLE 3.2-2: CRASH DATA SUMMARY FOR YEAR 1998.............................................................. 28
TABLE 3.2-3: CRASH DATA COMPARISON FOR 1997 AND 1998................................................. 30
TABLE 3.2-4: NUMBER OF ANSWERS TO EACH SURVEY QUESTION .......................................... 36
TABLE 3.3-1A. MEAN SPEED CHANGES FOR DIFFERENT TIMES OF THE DAY AT PUETZ ROAD .......... 45
TABLE 3.3-1B. MEAN SPEED CHANGES FOR DIFFERENT TIMES OF THE DAY AT PUETZ ROAD .......... 45
TABLE 3.3-2. FREQUENCY OF SPEED CHANGES BEFORE CONSTRUCTION.................................... 46
TABLE 3.3-3. FREQUENCY OF SPEED CHANGES DURING CONSTRUCTION (WITHOUT TRANSVERSE PAVEMENT MARKINGS) ................................................................. 46
TABLE 3.3-4. FREQUENCY OF SPEED CHANGES DURING CONSTRUCTION (WITH TRANSVERSE PAVEMENT MARKINGS) ................................................................. 47
TABLE 3.3-5. FREQUENCY OF SPEED CHANGES AFTER CONSTRUCTION .................................... 47
TABLE 3.3-6. MEAN SPEEDS FOR DIFFERENT TIMES OF THE DAY AT OAKWOOD ROAD & PUETZ ROAD (BEFORE CONSTRUCTION) ................................................................. 49
TABLE 3.3-7. MEAN SPEEDS FOR DIFFERENT TIMES OF THE DAY AT OAKWOOD ROAD & PUETZ ROAD (DURING CONSTRUCTION WITHOUT TRANSVERSE PAVEMENT MARKINGS) ................................................................. 49
TABLE 3.3-8. MEAN SPEEDS FOR DIFFERENT TIMES OF THE DAY AT OAKWOOD ROAD & PUETZ ROAD (DURING CONSTRUCTION WITH TRANSVERSE PAVEMENT MARKINGS) 50
TABLE 3.3-9. MEAN SPEEDS FOR DIFFERENT TIMES OF THE DAY AT OAKWOOD ROAD & PUETZ ROAD (AFTER CONSTRUCTION) ................................................................. 50
TABLE 3.6-1: TARGET POPULATION ................................................................................................. 55
TABLE 3.6-2: REACTION AFTER A CRASH - WHERE WOULD THEY GO IF THEY WERE IN AN ACCIDENT AND WHY? ................................................................. 61
TABLE 3.6-3: HOW LONG CAN A DISABLED VEHICLE BE LEFT ON THE FREEWAY? ................. 64
TABLE 3.6-4: RANK OF LOCATION REFERENCES ............................................................................ 64
TABLE 3.6-5: PERCENTAGE WHO CHOSE MILE MARKERS ......................................................... 65
TABLE 3.6-6: EFFECT OF TRAVELER INFORMATION ...................................................................... 66
TABLE 3.6-7: SOURCES OF TRAVELER INFORMATION ................................................................. 66
TABLE 3.6-8: TIME REQUIRED FOR EMERGENCY ASSISTANCE TO ARRIVE ............................. 71
1.0 EXECUTIVE SUMMARY

1.1 Enhanced Freeway/Gateway Patrols

The Wisconsin Department of Transportation (WisDOT) implemented two motorist assistance programs in order to better serve the motoring public traveling along portions of the I-94 corridor. The “Gateway Patrol” program serves the Racine and Kenosha County part of the corridor, and the “Enhanced Freeway Patrol” program serves the Milwaukee County freeway system.

Almost three-quarters of motorists traveling along the Racine-Kenosha I-94 corridor and having received assistance from Gateway Patrol Program tow trucks were stranded for a time not exceeding 10 minutes. The average time spent in service was 15 minutes, ranging from a low of 5 minutes to report an abandoned vehicle to a high of 36 minutes when towing from a crash scene was required. A 14% decrease in the number of secondary collisions associated with a downstream collision was measured in the period following the program implementation. The program was very well received by the motoring public, as expressed in written comments received by the WisDOT. The most common comments were about fast and courteous service, however, most responding motorists were not aware of the program before they were assisted.

The Enhanced Freeway Patrol program allowed a higher level of enforcement along the East-West corridor (a 29% increase in traffic stops was observed along the “East-West” corridor). An 8% decrease in the number of secondary collisions associated with downstream incidents was measured in the period following the program implementation. The service to disabled vehicles was shortened by 1 minute on average (from 14 minutes to 13 minutes) and dispatches to crashes were shortened by 3 minutes on average (from 31 minutes to 28 minutes).

1.2 Crash Investigation Sites

Safety Benefits

The evaluations have been conducted on three existing crash investigation sites in Racine and Kenosha counties. The crash data in 1997 is used as the “before” condition. Note that construction occurred on I-94 corridor from April 27, 1998 to October 22, 1998. The crash data from June 20, 1998 (official opening date of Crash Investigation Sites (CIS)) to December 31, 1998 is used as the “after” condition with construction and the crash data from October 22, 1998
to December 31, 1998 is used as the “after” condition without construction. In general, the secondary crash rate was reduced from 8.24% in 1997 to 5.15% in 1998. For the same periods from June 20 to December 31, the secondary crash rate was reduced from 4.92% in 1997 to 4.76% in 1998. Noticeably, after October 22, 1998 (when the construction ends), no secondary crashes were found. In conclusion, the implementation of Crash Investigation Sites is fairly successful and beneficial for reducing the chance of secondary crashes.

User's Perception

Based on the questionnaires returned from motorists, it is concluded that the users' perception of the CIS is positive and encouraging. Most of the CIS users agreed with the safety improvement benefits for performing their activities at CIS instead of being on the freeway shoulder.

1. In general, 24% drivers reported that the CIS signs are quite useful for guiding them to the CIS sites. Note that another 57% users who returned the forms were escorted to the site and didn't provide answers.
2. Regarding the provided space and location, 99% users agreed and felt satisfied with the current design. However, one comment from users is that the site is too far from the town.
3. About 51% users used the phone when it was available. Some motorists reported that they did not use the phone because they did not have change.
4. Considering the lighting condition, 46% users reported that it is quite ample for them to perform operation. Note that another 54% users who returned the forms were escorted to the site during daytime and didn't provide answers.

Agencies' Perception

From the agencies' perspectives, the implementation of the CIS program is quite successful and worked satisfactorily with the goals and objectives of the TIME program. The benefits of the CIS perceived by the sheriffs and state patrol can be summarized as follows.

1. Reducing incident clearance time. This program will work very effectively with the gateway.
2. Reducing the chance of secondary incident.
3. Facilitating the operation.
4. Enhancing safety for the responding personnel. All officers are clearly realizing this advantage.

One useful comment from agencies upon the success of the CIS program is to inform the public about the function of the CIS. From the officers’ observation and the lessons learned from other
deployments of incident management programs, this step is the most crucial activity to maximize the advantages of the CIS.

1.3 Transverse Pavement Markings

Transverse pavement markings were placed on the westbound lanes of I-94 during Phase II of the repaving construction in 1999. The study was on a 3-mile stretch from Oakwood Road to Puetz Road. The transverse pavement markings did have an effect on further reducing speeds in construction zones. The changes in speed were recorded for all four scenarios: before construction, during construction without the transverse pavement markings, during construction with the transverse pavement markings, and after construction. As shown in the histogram, most vehicles have a 0-5 mph decrease in speed before construction. Once construction begins and no transverse pavement markings are in place, most vehicles have a 10-15 mph speed reduction. With the transverse pavement markings in place, most vehicles have a 10-20 mph speed reduction. After construction, most vehicles again have a 0-5 mph speed reduction. The traffic flow on the roadway changes for different times of the day. This traffic flow had an effect on the speeds experienced on the roadway, but had minor impact on the speed changes experienced by vehicles.

![Figure 1.3-1: Frequency of Speed Change](image-url)
1.4 Enhanced Reference Signs

Based on the results of a survey questionnaire distributed to 911 operators and Sergeants at the Milwaukee County Sheriff’s Department, it was determined that the evaluation of the Enhanced Reference Signs should be postponed to allow additional time for outreach and training.

1.5 Computer Aided Dispatch (CAD)/ Emergency Respondent

The Milwaukee County Dispatch system is very outdated and needs to be upgraded. The many advantages of a CAD system definitely outweigh the disadvantages of having such a system. Implementing a CAD system that is tailored for use by law enforcement agencies or upgrading to faster computers could reduce many of the disadvantages of CAD.

1.6 User Acceptance

The purpose of this study was to evaluate the user’s perception of the effectiveness and benefits of the TIME Program. To accomplish this, a survey questionnaire was developed and mailed to a random sample of 1,000 drivers in seven Southeastern Wisconsin counties during November 1999. The survey was composed of 42 questions designed to determine the public’s awareness and perceptions of TIME in general and each component program in particular. Over 40% of those who received the survey completed and returned it. These survey responses were then used to determine the answers to the following key questions:

- Is the public aware of Crash Investigation Sites?

  The majority of users (72%) stated that they had heard of Crash Investigation Sites and 34% indicated that they had a high level of familiarity with them. Yet when asked where they would go if involved in a minor accident, only 7% responded that they would use a crash investigation site. In fact, while the majority would move their vehicles off the freeway, either to the shoulder of the freeway (60%) or to a safe well-lit area (11%), a sizable proportion (21%) would stay put. Of these users, 86% stated that they would do so because “they wanted the police to see the accident as it is”. The low-level use of the crash investigation sites appears to be due in part to a lack of understanding or familiarity with the sites. After reading a description of the sites, a majority (68%) stated that they would be willing to use a crash investigation site if they were involved in a minor accident in the future.
• **Is the public aware of 911 cellular service?**

Exactly half of the survey respondents own a cellular phone, and 25% have used it to report an accident or breakdown that they have seen accidents on the freeway. However, of those who did report accidents, 81% stated that they do so for less than 25% of the time. The most common reason users gave for not reporting an accident or breakdown was that they would assume that someone else already had.

• **Is the public aware of road marking systems?**

When asked to rank several options in terms of how likely would be to use them to report an accident or breakdown to a 911 operator, 36% selected mile markers as their first choice. Users in Kenosha, Racine, and Walworth counties were the most likely to use mile markers, with slightly more than half of the users in each of these counties selecting them as the option they would most likely use. However, the great majority of users did not know how long they could legally leave their cars on the freeway. 75% of users stated that they did not know the time limit, and the responses of those who claimed they did know, ranged from 0 to 72 hours with an average of 15 hours.

• **Is the public aware of expanded motorist information?**

A large proportion of users was aware of the existence of traffic information sources. In particular, users were very familiar with changeable message signs (86.8%), commercial radio (81%), local newspapers (79%), and commercial television (75%) as sources of travel information. Drivers were less likely however to use some of these sources. Only 7% stated that they use travel advisory radio, even though 25% were aware of it as a potential information source, and only 9% indicated that they used the Internet. Changeable message sign and commercial radio were the sources that the largest number of drivers (78% and 81%, respectively) stated they used. However, drivers indicated that they were using information about traffic congestion to adjust their traffic plans. 54% reported that they adjusted the time at which they left to travel, and 59% stated that they have adjusted their travel route within the past month. Almost all of the users (92%) also indicated that they considered the availability of information about traffic congestion and incidents to be important, with 62% indicating that it was very important. The majority of users also felt that the traffic information they were currently receiving was timely (61%) and accurate (70%).
• **What is the public’s general perception of the TIME program?**

The great majority of the drivers (90%) indicated that they had never heard of the TIME Program. However, after reading a description of the program, their responses to TIME were overwhelmingly positive. 71% of the users considered it to be a "good to very good" use of money, 74% agreed that it would improve freeway safety and speed up the clearing of accidents, and 77% indicated that they believed it would improve the response times of emergency vehicles.

• **What is the public’s perception of Southeastern Wisconsin’s freeway services?**

Based on users’ statements, the average time that it would take for emergency assistance to arrive was 32 minutes, while the average time that they felt it should take was 17 minutes. In addition, although 18% of users felt that the time for emergency assistance to arrive had decreased during the past year, the majority (57%) felt that it had stayed the same and 24% felt it had increased. Drivers also indicated that they were increasingly frustrated by their driving experience in general. 47% stated that the time they were delayed due to other peoples’ accidents, which had increased during the past year, and that their driving experience had worsened. A sizable proportion (12%) however, did indicate that their driving experience had improved and delay times had been reduced.

• **What is the public’s perception of the freeway patrol?**

Most users felt that putting more police on the road during rush hour would improve freeway safety (60%), speed up the clearing of accidents (73%), and reduce the number of accidents (50%). They did not feel positive, however, about the effects of more police on speeding the flow of traffic (27%) or saving driving time (34%).

Based on these responses, we recommend that outreach and branding efforts be continued and strengthened. Users indicated that they were frustrated and unhappy with driving conditions in Southeastern Wisconsin. Users were also largely unfamiliar with the TIME Program. Yet, the large number of drivers who took the time to fill out the survey, as well as their largely positive response to the information they were given about the TIME programs, indicates that they have not crossed the threshold to be apathetic or antagonistic. They are still interested in and open to the efforts of the Wisconsin Department of Transportation, law enforcement, and other TIME participants to improve conditions.
2.0 EVALUATION GOALS, OBJECTIVES, AND APPROACHES

2.1 Evaluation Goals and Objectives

The focus of the TIME evaluation is to determine how well the TIME Program is meeting its stated goals:
1) improve and enhance freeway incident management in Southeastern Wisconsin,
2) improve freeway safety in Southeastern Wisconsin, and
3) enhance the quality and efficiency of freeway travel in Southeastern Wisconsin.¹

In addition, another goal for the TIME evaluation is to understand and improve user’s acceptance of the TIME Program.

Subsequently, the specific evaluation is to determine how well the following objectives of the TIME Program have been achieved.
1. Facilitate interagency relationships
2. Detect, verify, respond to, and clear incidents
3. Reduce environmental impact
4. Enhance traveler information dissemination
5. Reduce collisions due to incidents
6. Ensure safety of responding personnel
7. Improve hazardous material management and emergency medical service response time
8. Improve the perception of effectiveness and benefits of the TIME Program

These objectives have been developed for each TIME Program goal. To conduct an objective evaluation, an evaluation goal and objective matrix has been developed. Table 2.1-1 illustrates how the evaluation objectives are related to each evaluation goal.
Table 2.1-1: Evaluation Goal and Objective Matrix

<table>
<thead>
<tr>
<th></th>
<th>GOAL 1. IMPROVE INCIDENT MANAGEMENT</th>
<th>GOAL 2. IMPROVE FREEWAY SAFETY</th>
<th>GOAL 3. IMPROVE USER’S ACCEPTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBJ 1A. Facilitate Inter agency Relationships</td>
<td>OBJ 1B Detect, Verify, Respond to, and Clear Incidents</td>
<td>OBJ 1C Reduce Environmental Impact</td>
</tr>
<tr>
<td>Enhanced Freeway Patrols</td>
<td>X X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Crash Investigation Sites</td>
<td>X X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Transverse Pavement Markings</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Enhanced Reference Markings and Signs</td>
<td>X X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Emergency Respondent Computer Aided Dispatch (CAD)</td>
<td>X X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Education Programs for Public, Respondents, and Drivers</td>
<td>X X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

8
Because TIME is such an involved project, some of the solutions will take years to implement, and it may take even longer to see the full realization of these goals. One problem with the assessment of such an involved program is that, when measuring TIME’s effects, other influences such as the I-94 resurfacing, the MONITOR Program, and increased traffic flow may be indirectly helping or detracting from TIME to meet its goals. This could possibly influence findings on to what extent the TIME Program itself is influencing the measures of effectiveness (MOE) related to how well the TIME Program is meeting its proposed goals.

In the evaluation, we have reduced the outside influence as much as possible by dividing our evaluation of the TIME Program into manageable parts that can be examined independently. We have accomplished this through measuring the effectiveness of implemented sample solutions that were designed to meet the objectives of TIME’s main goals. From those measurements and predictions, we are able to determine if the objectives of the TIME Program are met. If the objectives are met, the main goals are also achieved accordingly.

2.2 Programs To Be Evaluated

General Programs To Be Evaluated

The following TIME programs have been identified as potential subjects for evaluation:

1. Alternate route planning and traffic control plans
2. Cellular telephone locating systems
3. Crash investigation sites
4. East/West corridor planned traffic incident management system
5. Education programs for public, respondents, and drivers
6. Emergency and maintenance vehicle warning systems
7. Emergency respondent computer aided dispatch (CAD)
8. Emergency respondent equipment/personnel resource lists
9. Emergency respondent safety and I.M. procedures implementation program
10. Emergency response substations for high incident locations
11. Emergency telephone call-in 911 enhancement
12. Enhanced freeway patrols
13. Enhanced law enforcement exchange of existing incident data
14. Enhanced law enforcement traffic signal control interfaces
15. Enhanced location markings and signs
16. Enhanced media information/dissemination for incidents
17. Fire hydrant location identification
18. Freeway access enhancements for emergency response vehicles
19. HAZMAT clearance enhancement program
20. Incident command posts
21. Incident management equipment remote storage sites
22. Incident management evaluation program
23. Incident management legislation
24. Inter-jurisdictional mutual aide agreements
25. Inter-jurisdictional traffic signal coordination
26. Law enforcement teletype connection to WisDOT traffic operations center
27. MayDay Systems/Satellite locating systems
28. MONITOR closed circuit television (CCTV) for emergency respondents
29. MONITOR freeway traffic management systems (FTMS) expansion
30. Motorist aide call box systems and supplementary pay telephones
31. Multi agency traffic management center
32. On-call county/contractor freeway traffic control
33. Permanent road watch incident detection/verification programs
34. Portable traffic management system/center for planned incidents/special events
35. Portable changeable message signs
36. Pre-trip traveler information
37. Probe vehicles that supply real-time traffic information
38. Ramp gates
39. Regional interagency radio communication study
40. Regional mobile command post
41. Signal system hardware upgrades
42. Special events database and standard operating procedures manual
43. Speed incident prevention project
44. Surface street electronic monitoring
45. TIME administrative support and deployment support
46. TIME program steering committee
47. “Total Station” survey system and laser measuring device for crash investigation
48. Traffic information Internet site
49. Traffic signal emergency vehicle preemption
50. Traffic signal/ramp metering integration
51. “Trail blazer” route guidance signaling
52. Traveler information public opinion survey
53. Traveler information standards
54. Transverse pavement marking for speed reduction program

In conducting this evaluation, we plan to first determine if TIME’s programs are indeed set up to meet the given objectives. Secondly, if the program is set up to work towards an objective, we plan to determine if it is an inherently strong, working program that has generated positive short-term results. We will also evaluate the program’s outlook for future success. For programs that have not been implemented at the current time, we plan to determine if they should be able to meet the objectives in the future, based upon our current knowledge as well as our predictions for the future success of the TIME Program. In relation to those programs not yet implemented, we also plan to propose future time frames when evaluations would be beneficial, and recommend possible evaluation plans.

**Programs Evaluated in Phase I**

Since the TIME Program is implemented in multiple phases, the evaluation activities are also stratified into several phases. In Phase I, the evaluation will focus on the following TIME programs:
1. Enhanced Freeway/Gateway Patrols
2. Crash Investigation Sites
3. Transverse Pavement Markings
4. Enhanced Location Reference Signs
5. Emergency Respondent Computer Aided Dispatch (CAD)
6. Education programs for public, respondents, and drivers

Table 2.1-1 illustrates how the above programs meet specific evaluation goals and objectives.

### 2.3 Evaluation Approach

The above programs will be evaluated in the following manner.

1. Enhanced Freeway/Gateway Patrols - The evaluation will be based on the data gathered on I-94. The Enhanced Freeway Patrol evaluation will be based on the data collected on the “East-West” Freeway between the Marquette Interchange and the Milwaukee-Waukesha County Line in Milwaukee County. The Gateway Patrol evaluation will be based on the data gathered in Kenosha and Racine Counties. For the “East-West” Freeway, the incident duration data will be collected using the Milwaukee County Sheriff’s activity reporting system that is logged by the dispatchers of the Freeway Patrol Unit as well as crash records kept by WisDOT. Similar records will be used in the evaluation of the Gateway Patrols.

2. Crash Investigation Sites - The evaluation consists of analyzing crash-related records from police, sheriff’s department, and WisDOT for conditions before and after the implementation of Crash Investigation Sites. This analysis will focus on sites that are currently open on the USH45. The analysis will also involve interviews with sheriff’s departments, responding personnel, and drivers. These interviews will be conducted in order to determine the perception of improvement of the interested measures due to the implementation of the Crash Investigation Sites.
3. Transverse Pavement Markings - This evaluation will consist of documenting the speed reduction in work zones before and after the implementation of the transverse pavement markings.

4. Enhanced Location Reference Signs - The evaluation will consist of analyzing 911 logs and calls for conditions before and after the Enhanced Reference Signs are put into place.

5. Emergency Respondent Computer Aided Dispatch (CAD) - The evaluation will consist of analyzing records for response times before and after the CAD systems are put into place. The analysis primarily consists of interviews with agencies that are currently equipped with CAD. These agencies are the North Shore Fire Department, the County Sheriff Departments of Racine, Kenosha, Waukesha, and Ozaukee, and the Milwaukee Police Department.

6. Education programs for public, respondents, and drivers - The evaluation will be based on the results of a mail-out survey of Southeastern Wisconsin drivers. The survey will determine the public’s awareness and perceptions of:
   ♦ The TIME Program in general
   ♦ Crash Investigation Sites
   ♦ 911 Cellular Service
   ♦ Road Marking Systems
   ♦ Expanded Motorist Information about Traffic Conditions
   ♦ Freeway Patrol
   ♦ Southeastern Wisconsin’s Freeway Services

### 2.4 Measures of Effectiveness (MOE)

The following MOEs have been used in the evaluation.

1. Reduction in incident related delay
2. Reduction in vehicle emission rate
3. Reduction in the number of secondary incidents
4. Reduction in the percentage of injuries and fatalities due to secondary incidents
5. Reduction in the number of injuries and fatalities of responding personnel
6. Reduction in work zone entrance speed
7. Improved accuracy of 911 calls
8. Improved accuracy of 911 dispatch
9. Improved medical service response time
10. Improved verification and response time of incidents using CAD
11. Interconnection between agencies dispatched by the CAD system
12. Users’ perceptions
13. Agencies' perceptions
3.0 EVALUATION RESULTS

3.1 Enhanced Freeway/Gateway Patrols

3.1.1 Gateway Patrol Program Evaluation Summary and Discussion

Motorist Time Savings

The close agreement between information recorded daily on truck logs and information recorded during a ride with a GP service vehicle, is an excellent indicator that motorist-reported service time (TIME\textsubscript{KN}) information is accurate. The time a motorist waited for a GP service vehicle to arrive and provide service (TIME\textsubscript{AN}) was estimated to be 24 min., on average. It can be broken down into:

- The time a motorist waited for a GP service vehicle to arrive (TIME\textsubscript{AK}) estimated to be 9 min; and
- The time a motorist waited while being served by a GP service vehicle (TIME\textsubscript{KN}) estimated to be 15 min.

It should be noted that actual TIME\textsubscript{AK} was much lower that the theoretical time of 23 min., calculated on the assumption that GP service vehicles drive the entire length of the corridor in continuous loops.

The average time that elapsed between a 911 call reporting a stranded motorist, and the time an enforcement agency requested tow truck service (TIME\textsubscript{BE}) was 8.7 min., almost equal to the time stranded motorists waited for a GP service truck during GP hours of operation when no enforcement agency was involved.

Although the actual time a motorist was stranded was not recorded on enforcement agency logs, some conclusions about the effectiveness of the GP program can be drawn when comparing Racine County Sheriff (RCS) and GP data. According to RCS dispatch information, average 911 Notification-to-Squad Clearance Time (TIME\textsubscript{BP}) during periods when the EFP program was not active was 50.3 min. Based on the information available through GP logs and motorist surveys, the average time motorists spent waiting for and being serviced by GP service vehicles (TIME\textsubscript{AN}) was 24 min. Thus, during GP hours of
operation, the time stranded motorists had to spend on the freeway was shortened by at least 26.3 min. (52%) on average. The (currently unavailable) average time between breakdown occurrence and 911 notification for the before period should be added to these time savings.

**Service Times and Motorist Responses**

The most frequently provided type of service was fixing flat tires (19% of all responses) with an average service time of 14 min., which consumed 17% of all service hours. Most time-consuming were responses to crashes, which represented 6% of all responses, but consumed 14% of all service hours (average 36 min. per response).

The GP program cellular telephone was a frequently used service that afforded stranded motorists the opportunity to arrange for repairs to be performed at a service station of their choice. Cellular telephones provide an often-necessary service: many motorists report that they do not have change or other means to use a regular payphone, even when one is available.

Gateway Patrol operators spent 12% of their time providing service to motorists with 17% of that time allocated to fixing flat tires and 14% each, serving motorists involved in crashes, and towing stalled vehicles. Approximately one response was logged per two hours of program operation, the equivalent of three responses for every 200 service vehicle-miles driven at an average operating speed of 35 mph (average vehicle travel speed was between 55 and 60 mph).

Approximately 40% of analyzed GP response forms contain comments, all of which praise the program. Respondents were not aware of the GP program at the time they were offered assistance.
Discussion

The present effort identified a need to collect data on how long disabled vehicles typically spend on the freeway before they are removed. The only reliable “before” period data were collected by enforcement agencies, which typically were not interested in information in the time a motorist was stranded (TIMEA), the time the GP was notified (TIMEG), or when a disabled vehicle was removed from the freeway (TIMEM).

Based on information presented above, it is evident that the GP is very effective in promptly removing disabled vehicles from the freeway. The presence of the GP service vehicles provides many benefits to WisDOT: i) additional safety for stranded motorists due to reduced time they spend exposed to freeway traffic; ii) additional safety for all other motorists traveling through the corridor, since the probability of secondary collisions and collisions with disabled vehicles is reduced; iii) continuous freeway monitoring by GP personnel, so that maintenance, safety and other concerns can be promptly identified and reported during GP hours of operation; iv) major public relations benefits for WisDOT, in terms of evident customer satisfaction.

A campaign to increase GP program visibility may produce much wider public opinion support for WisDOT— it appears that, currently, only motorists who have received service from the GP program are aware of the program.

Information collected and analyzed in the course of the present effort will provide Wisconsin-based benchmark performance statistics for similar types of programs that WisDOT may be willing to initiate in the future.

The following recommendations will benefit future motorist assistance program evaluations:

• Information on the time motorists were stranded and the time they spent waiting for service is not likely to be systematically recorded by any agency—a database needs to
be constructed both for the before and the after period, in order to accurately assess program effectiveness.

- Motorist assistance program and enforcement agency dispatch protocols need to be reviewed during the original stages of planning: when tow trucks provide assistance to motorists without the need for an enforcement agency to request this service, valuable time can be saved in providing service and removing disabled vehicles. In addition, squads could focus on responding to higher priority calls. However, enforcement agency public safety concerns are the paramount consideration, and protocols that seek a balance between providing prompt motorist assistance without neglecting safety concerns should be at the basis of every new program.

- It may be desirable to investigate the possibility of a separate dispatch telephone number to report mechanical breakdowns. This option would reduce Enforcement agency 911 call traffic, and enforcement agency dispatchers would be able to concentrate on higher priority calls. However, the means to share information between GP and all enforcement agencies about disabled vehicle calls should be provided.

3.1.2 Enhancement Freeway Patrol Program Evaluation Summary and Discussion

*Dispatch Characteristics*

MCS activity on the East-West corridor increased by 7% during the “after” period, when the EFP program was active. The increase was more apparent during weekdays (+20%), particularly between 4:00 pm and 6:00 pm, when a 61% increase was noted. An increase of enforcement-related dispatches was also noted (+26%). The EFP program was responsible for 12% of the dispatches along the corridor during the after period. It was estimated that EFP squads logged approximately 17% of their dispatches along the East-West corridor. A statistically significant change toward more dispatches on Tuesdays and Wednesdays, and more enforcement dispatches were noted in the after period.
Average response times (TIME\textsubscript{BD} - Figure 3.1-1) were very short both before and after EFP program implementation (4.4 min.) Average on-scene time (TIME\textsubscript{DP}) was shorter by 2.3 min. in the “after” period (a reduction form 21.0 min. to 18.7 min.), during EFP hours of operation, a change that was almost statistically significant.

_Crash Characteristics_

The greatest number of crashes occurred on Mondays and Tuesdays, while the fewest occurred on weekends. Within weekdays, the highest crash concentration was during EFP hours, especially during peak traffic periods, and particularly during the PM peak. Half of all crashes were rear-end, and those occurred most frequently during EFP hours of operation. Approximately one-fifth of the crashes involved collisions with other-than-motor-vehicle-in-transport objects. Such collisions were less likely during EFP hours and more likely during non-EFP weekend hours. These collision type differences between weekdays and weekends were statistically significant.

Single-vehicle crashes accounted for one-fifth of all crashes. Such crashes were much less likely during EFP hours of operation, which were dominated by two-vehicle crashes. Differences in number of vehicles involved in crashes between weekdays and weekends were statistically significant.

One in three crashes involved an injury. When at least one vehicle involved in a crash was severely damaged, the chances of an injury were 55%. The presence of at least one very severely damaged vehicle was associated with a 62% chance of an injury.

There was an overall 9% reduction in crashes in the after period. During the after period: i) the distribution of crashes between EFP hours of operation and non-EFP hours of operation remained unchanged; ii) no statistically significant differences were identified in manner of collision, crash severity, and crashes occurring under different light
conditions; and, iii) the number of vehicles requiring towing after a crash and the number of single-vehicle crashes declined to an almost statistically significant extent.

No statistically significant changes were detected in mean Notification time (TIME_{AB}) and mean Response time (TIME_{BD}) for responses to crashes. A statistically significant overall drop by 10.3 min. (from 45.0 min. to 34.7 min.) was identified in mean on-scene time (TIME_{DP}). This finding was based primarily on statistics collected during EFP hours of operation. Statistically significant improvements were also identified for rear-end crashes (a reduction by 11.7 min.) and multi-vehicle crashes (a reduction by 14.3 min.)

Statistically significant reductions were identified for mean Crash-to-Clearance Time (TIME_{AP}) during EFP hours of operation. The overall identified reduction was 10.4 min. TIME_{AP} was reduced by 12.0 min. for rear-end crashes, and by 14.2 min. for multi-vehicle crashes.

Secondary collisions were reduced by 8% in the after period. Almost half (46%) of the primary incidents associated with secondary collisions were crashes and one-third (33%) involved disabled vehicles.

Discussion

Based on the information presented above, the EFP program has been shown to have addressed the most pressing needs of the motoring public: it was present during the hours that incidents were most likely to occur and, with the help of the MCS Department, was able to provide a more efficient service, particularly in relation to crash response. Service time reductions have the additional benefit of improving the Department’s productivity, by allowing the same number of squads to serve a greater number of dispatches.

Although no speed data specific to the evaluation periods was analyzed, crash patterns were consistent with the typically lower speeds present during congested EFP hours of
operation (a higher percentage of two-vehicle rear-end crashes, fewer crashes with fixed objects) and higher speeds during other hours when lower traffic volumes were present (a higher percentage of single-vehicle, fixed-object crashes and fewer rear-end crashes). The presence of the EFP program allowed the MCS Department to increase enforcement, a much-needed measure during the hours when no congestion was present.

Enhancement squads provided the above benefits for the East-West corridor, where they logged approximately 13% of their activity. Therefore, benefits from the EFP program can be expected to extend to other parts of the freeway system, where the enhancement squads logged the rest of their activity.
<table>
<thead>
<tr>
<th>TIME</th>
<th>Occurrence Notification</th>
<th>Law Enforcement Dispatch</th>
<th>Law Enforcement On-Scene Verification</th>
<th>Law Enforcement Request For Fire/EMS/Towing Service</th>
<th>Fire/EMS Notification</th>
<th>GP Notification</th>
<th>Fire/EMS Dispatch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>GP Dispatch</td>
<td>Fire/EMS On-Scene</td>
<td>GP On-Scene</td>
<td>GP Begin Work</td>
<td>Disabled Vehicle Clearance</td>
<td>GP End Of Work</td>
<td>Fire/EMS Vehicle Clearance</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>GP End Of Work</td>
<td>Fire/EMS Vehicle Clearance</td>
<td>Incident Clearance--Traffic Impacts Conclude</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Law Enforcement Response</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.1-1. Incident Timeline
3.0 Evaluation Results and Recommendations - Continued

3.2 Crash Investigation Sites

3.2.1 Agencies’ Perception

Introduction

Currently, there are three existing Crash Investigation Sites (CIS) located in Racine and Kenosha counties. These sites are operated, supervised, and maintained by various agencies. Therefore, the primary objective of this survey is to determine agency perceptions of the benefits of CIS. The on-site interview agency was used to gather both qualitative and quantitative information. In general, most of the questions were developed based on Measures of Effectiveness (MOE) proposed in the TIME evaluation test plan.

Two agencies that are responsible for the CIS were interviewed in this study. They are County Sheriff Departments and Wisconsin State Patrol District 2.

County Sheriff

In general, sheriffs are well informed about, and pleased with, the location of CIS and the CIS functions. The sheriffs perceived substantial benefits of the CIS in terms of reducing clearance time and facilitating operation. The benefit of reducing the chance of secondary accidents is also rated as substantial by most of the sheriffs. However, one officer rated this measure as “Not Particularly”, since he viewed this aspect as a byproduct. The Sheriffs perceived benefits in terms of enhancing officer safety. Even though there is no statistical record regarding the number of officers injured on the interstate during operation, all of the officers agreed that they felt much safer when performing their task at the CIS rather than on the freeway. One officer mentioned that three officers died on the freeway last summer while performing these duties. The utilization of the CIS by sheriffs varies according to the working period. In addition, the number of drivers using the CIS depends on various factors. In the case of a minor crash, the gateway patrol may inform the driver about the CIS and ask them to stop at a nearby CIS in order to conduct the crash investigation. It is noted that in poor weather conditions, many crash victims will drive their cars to the CIS. This substantially reduces the operation time of the sheriff. Contrary to the situation where motorists are towed by the gateway patrol, the sheriff does not have the records about the CIS users. Consequently, the perception of this group of users regarding the CIS is unattainable.
One additional comment from the sheriff is that this program is very effective when the gateway patrol is on duty. In terms of the currently provided area and location, sheriffs are satisfied.

From the sheriffs’ perspective, the success of the CIS depends primarily on public education. The fact is that most motorists do not know about the CIS. In general, they will wait until police arrive at the crash scene or go outside to observe the damage. Some motorists notice the CIS sign, but think that it is a designated area for emergency or authorized vehicles. In some cases, drivers do not want to move their cars since they think it is illegal to do so and it may cause them trouble with the insurance companies. The participation of motorists could truly drive the success of this program.

**Wisconsin State Patrol**

Wisconsin State Patrol District 2 was interviewed about the perception of the CIS under their jurisdictions. Similar to the sheriffs’ case, the degree of site use for each patrol is dependent on the working time. For instance, officers who work on the 3rd shift rarely had chance to use the CIS. Most of the work will be completed on the freeway. Some had chance to use but generally accompanied with the gateway. From the state patrol opinion, this program will be more effective when the gateway patrol is on board, which is congruent with the sheriffs’ comment. The provided space and location were identified as appropriate. However, one officer commented that there is not much space in the area when the semi parking area is full. In addition, some restriction signs may be needed. For instance, “No Parking” sign should be posted at the corner of the parking lot. The other benefits in terms of reducing response time, reducing clearance time, facilitating operation, and reducing chance of secondary accidents varied considerably from officer to officer. One officer felt that the CIS program offers substantial improvement in all of the categories. The others rated “Somewhat” and/or “Not Particularly” improvements for these aspects. However, most of the officers agreed that the CIS program enhanced safety during their operations.

Analogous to the sheriffs’ comment, the state patrol emphasized public education about the purpose of the CIS program. Most drivers are not familiar with the CIS program. Therefore, they do not go there by themselves.

The benefits and suggestions of the CIS perceived by the sheriffs and state patrol can be summarized as follows.
1. Reducing incident clearance time. This program will work very effectively with the gateway patrol. Since the main objective of an incident clearance program is to keep the roadway free of any temporary obstructions, the gateway patrol could provide incident clearance services to the motorists, instead of operating a fleet of vehicles themselves.

2. Reducing the chance of secondary incident. This benefit is closely related with the above benefit. By shortening the incident clearance time, this could decrease the exposure time of passerby traffic. Therefore, the rear-end collision from the rubbernecking phenomena could be reduced. In addition, the collision from the lane-changing maneuver could also be expected to diminish.

3. Facilitating the operation. The CIS provides more space for the officer to perform operation.

4. Enhancing safety for the respond personnel. All officers are evidently realizing this advantage.

5. Informing public about the CIS program. From the officers’ observation and the lessons learned from other deployment of the incident management programs, this step is the most crucial activity to maximize the advantages of the CIS.

In summary, from the agencies’ perspectives, the implementation of the CIS program is quite successful and works satisfactorily with the goals and objective of the TIME Program.

### 3.2.2 Safety Benefits

Note: This summary is for evaluating the benefits of CIS on reducing the secondary crashes. The benefits of delay reduction will be reported later when data is obtained from WisDOT.

**Assumptions:**

In order to evaluate the impact of Crash Investigation Sites (CIS) on secondary crashes, the following two major assumptions have been made.

1. Possible secondary crashes are identified through spatial-temporal relationships. Relative to a specific crash, other crashes are identified as secondary if they occur upstream within a 2-mile radius, and within 1 hour time after the first crash.

2. The opening date of the CIS was June 20, 1998. Therefore, crashes occurring prior to this date are used as the “before” condition.
It is noted that different evaluation results could be obtained if the above assumptions are changed. The evaluation has been conducted on three of four existing crash investigation sites primarily located in Racine and Kenosha counties. The locations are shown in Figure 3.2-1.

Site #1: South of CTH G, SB of I-94 at the Weigh Station.
Site #2: STH 20, West of I-94 at the Racine County Sheriff Substation
Site #3: STH 165 at the Wisconsin Tourist Information Center.

Crash Data Summary for 1997 and 1998

The crash logs obtained from the WisDOT are analyzed based on previous assumptions. The crash data for 1997 and 1998 are summarized in Tables 3.2-1 and 3.2-2, respectively.

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Time</th>
<th>Station</th>
<th>Direction</th>
<th>Distance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/9/97</td>
<td>10-11 AM</td>
<td>326D</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Code</td>
<td>Direction</td>
<td>Condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>------</td>
<td>-----------</td>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>NOON</td>
<td>326D</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>5-6 AM</td>
<td>347G</td>
<td>E</td>
<td>uncertain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>5-6 AM</td>
<td>345D</td>
<td>E</td>
<td>1.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>6-7 AM</td>
<td>344D</td>
<td>E</td>
<td>1.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>6-7 AM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>6-7 AM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>8-9 AM</td>
<td>343D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>8-9 AM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>8-9 AM</td>
<td>346G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>8-9 AM</td>
<td>346G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/97</td>
<td>8-9 AM</td>
<td>346G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10/97</td>
<td>4-5 AM</td>
<td>333G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10/97</td>
<td>5-6 AM</td>
<td>333G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10/97</td>
<td>9-10 PM</td>
<td>340T</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10/97</td>
<td>9-10 PM</td>
<td>340T</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/15/97</td>
<td>7-8 AM</td>
<td>342G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/15/97</td>
<td>8-9 AM</td>
<td>340G</td>
<td>E</td>
<td>1.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/16/97</td>
<td>7-8 AM</td>
<td>341G</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/16/97</td>
<td>7-8 AM</td>
<td>340T</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/16/97</td>
<td>7-8 AM</td>
<td>335G</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/16/97</td>
<td>8-9 AM</td>
<td>335G</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/24/97</td>
<td>3-4 PM</td>
<td>337D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/24/97</td>
<td>3-4 PM</td>
<td>338D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/27/97</td>
<td>7-8 AM</td>
<td>343D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/27/97</td>
<td>7-8 AM</td>
<td>345T</td>
<td>E</td>
<td>Uncertain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/12/97</td>
<td>5-6 AM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/12/97</td>
<td>6-7 AM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2/12/97</td>
<td>7-8 AM</td>
<td>342G</td>
<td>E</td>
<td>1.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/12/97</td>
<td>10-11 PM</td>
<td>344D</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4/12/97</td>
<td>10-11 PM</td>
<td>345T</td>
<td>W</td>
<td>1.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Date</td>
<td>Time</td>
<td>Station</td>
<td>Direction</td>
<td>Distance</td>
<td>Status</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>--------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>1/20/98</td>
<td>7-8 PM</td>
<td>345D</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/20/98</td>
<td>7-8 PM</td>
<td>345T</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1/22/98</td>
<td>10-11 PM</td>
<td>329</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1/22/98</td>
<td>10-11 PM</td>
<td>329K</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3/3/98</td>
<td>5-6 AM</td>
<td>333G</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/3/98</td>
<td>6-7 AM</td>
<td>335G</td>
<td>W</td>
<td>2.01</td>
<td>Uncertain</td>
</tr>
<tr>
<td>4</td>
<td>3/15/98</td>
<td>2-3 PM</td>
<td>344D</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/15/98</td>
<td>2-3 PM</td>
<td>347D</td>
<td>W</td>
<td>3.02</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>

Table 3.2-2: Crash Data Summary for Year 1998
<table>
<thead>
<tr>
<th>n</th>
<th>Date</th>
<th>Time</th>
<th>Code</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5/9/98</td>
<td>10-11 AM</td>
<td>339</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>5/9/98</td>
<td>11-12 NOON</td>
<td>339</td>
<td>W</td>
</tr>
<tr>
<td>6</td>
<td>5/17/98</td>
<td>5-6 PM</td>
<td>345T</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>5/17/98</td>
<td>6-7 PM</td>
<td>345T</td>
<td>E</td>
</tr>
<tr>
<td>7</td>
<td>5/20/98</td>
<td>8-9 PM</td>
<td>326D</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>5/20/98</td>
<td>9-10 PM</td>
<td>326D</td>
<td>E</td>
</tr>
<tr>
<td>8</td>
<td>5/31/98</td>
<td>4-5 PM</td>
<td>337D</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>5/31/98</td>
<td>4-5 PM</td>
<td>335G</td>
<td>E</td>
</tr>
<tr>
<td>9</td>
<td>6/7/98</td>
<td>1-2 PM</td>
<td>333G</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>6/7/98</td>
<td>12-1 PM</td>
<td>335G</td>
<td>E</td>
</tr>
<tr>
<td>10</td>
<td>6/21/98</td>
<td>2-3 PM</td>
<td>339D</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>6/21/98</td>
<td>3-4 PM</td>
<td>340T</td>
<td>W</td>
</tr>
<tr>
<td>11</td>
<td>7/3/98</td>
<td>1-2 PM</td>
<td>348K</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>7/3/98</td>
<td>1-2 PM</td>
<td>348K</td>
<td>W</td>
</tr>
<tr>
<td>12</td>
<td>7/7/98</td>
<td>10-11 AM</td>
<td>333G</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>7/7/98</td>
<td>9-10 AM</td>
<td>333G</td>
<td>E</td>
</tr>
<tr>
<td>13</td>
<td>7/21/98</td>
<td>1-2 PM</td>
<td>337D</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>7/21/98</td>
<td>1-2 PM</td>
<td>338D</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>7/21/98</td>
<td>1-2 PM</td>
<td>338D</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>7/21/98</td>
<td>1-2 PM</td>
<td>339D</td>
<td>W</td>
</tr>
<tr>
<td>14</td>
<td>9/19/98</td>
<td>5-6 PM</td>
<td>332D</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>9/19/98</td>
<td>5-6 PM</td>
<td>332D</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>9/19/98</td>
<td>6-7 PM</td>
<td>332D</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>9/19/98</td>
<td>6-7 PM</td>
<td>332D</td>
<td>W</td>
</tr>
</tbody>
</table>

In Tables 3.2-1 and 3.2-2 above, the possible secondary crashes are grouped together with the major associated crash. The acronym OBS represents the observation number. This number is
based on the crash record obtained from WisDOT. To verify the secondary crash for uncertain cases, all possible secondary crashes will be checked with the detailed crash logs at the WisDOT.

**Analysis of Results**

Crash data in 1997 is used as the “before” condition. Specifically, two sets of crash data statistics are generated, one for the entire 1997 and another one for the period from June 20, 1997 to December 31, 1997. The second crash data statistics will be used for comparison with the “after” condition from June 20, 1998 to December 31, 1998.

Subsequently, two sets of crash data statistics are generated for 1998 and the period from June 20, 1998 to December 31, 1998. Since the CIS was implemented June 20, 1998, the crash data from that date to December 31, 1998 is used as the “after” condition. The quantitative comparison of crash data for 1997 and 1998 is provided in Table 3.2-3.

With the implementation of the CIS, the data has shown a reduction in the number of the secondary crashes. Specifically, the total number of possible secondary crashes (including or excluding uncertain cases) has been reduced to 9 during the period from June 20 to December 31 in 1998.

Comparing the crash data in 1997 and 1998, the secondary crash rate was reduced from 9.36% to 6.19% when uncertain cases are included, or from 8.24% to 5.15% when uncertain cases are excluded. For the same period from June 20 to December 31 in 1997 and 1998, the secondary crash rate was reduced from 5.74% to 4.76% when uncertain cases are included, or from 4.92% to 4.76% when uncertain cases are excluded.

**Table 3.2-3: Crash Data Comparison for 1997 and 1998**

<table>
<thead>
<tr>
<th>Period Description</th>
<th>1997</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1 – Dec 31 Total Possible Secondary Crashes</td>
<td>267</td>
<td>100%</td>
</tr>
<tr>
<td>Number of Possible Secondary Crashes (Including Uncertain Cases)</td>
<td>25</td>
<td>9.36%</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>6.19%</td>
</tr>
<tr>
<td>Number of Possible Secondary Crashes</td>
<td>22</td>
<td>8.24%</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5.15%</td>
</tr>
<tr>
<td></td>
<td>(Excluding Uncertain Cases)</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>June 20 – Dec 31</td>
<td>Total Possible Secondary Crashes</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>Number of Possible Secondary Crashes</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(Including Uncertain Cases)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of Possible Secondary Crashes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(Excluding Uncertain Cases)</td>
<td></td>
</tr>
</tbody>
</table>

The cumulative numbers of possible secondary crashes in 1997 and 1998 are shown in Figure 3.2-2. Note that after 3 months of CIS implementation, no secondary crashes are identified in 1998 (from late September to the end of December), although the total number of crashes in 1998 is more than the total number of crashes in 1997. A possible explanation for this is the use of CIS facilities leading to fewer secondary crashes.

![Cumulative Number of Possible Secondary Crashes](image)

**Figure 3.2-2: Cumulative Number of Possible Secondary Crashes**

Considering the construction period on the I-94 during summer 1998, this could have significant impact on the normal travel pattern. In addition, it could possibly induce an unusually high number of accidental frequencies. Therefore, based on the information received from WisDOT, the crashes that occurred during the period of construction from April 27, 1998 to October 22, 1998 are excluded from further evaluation. The summary of the revised crash data is shown in
Note that after excluding the construction period, the success of the CIS can be clearly perceived. By excluding the construction time, this could smooth the noise that is possibly caused by the construction. Two test data show the similar trend during the first part of the study period. In fact, there is a slightly higher rate of secondary crashes during February and March in 1998. However, after the construction period, there is no indication of secondary crashes. This result agrees with, and strongly supports, the previous finding. Based on the above analysis, the implementation of Crash Investigation Sites does reduce the chance of secondary crashes.
3.2.3 Users’ Perception and Response

Assumptions
This evaluation has been conducted by analyzing the questionnaires distributed by the gateway patrol to users of three existing crash investigation sites (CIS) in Racine and Kenosha counties. These sites are located at the following places:

1. Weigh station on SB of I-94, South of CTH G.
2. STH 20, West of I-94 at the Racine County Sheriff Substation.
3. STH 165 at the Tourist Information Center.

The survey results were transformed into numerical format. However, it is noted that drivers sometimes did not answer all of the questions. Therefore, the total number of observations in each question is not identical. Moreover, most drivers did not report the name of the CIS site that they had used. Thus, the evaluation has been conducted at an aggregate level.

Preliminary Results
The survey results were collected from three CIS locations during the period from December 1998 to August 1999 and were summarized in Table 3.2-4. Subsequently, the survey results categorized by each question are graphically shown in Figures 3.2-4 through 3.2-10. For the sake of easy understanding, the major question and answer choices in the user survey are summarized as follows:

- Question 1: Which CIS did you make use of? I-94 and…
  Answers: 1. Site #1 (HWY 165)  2. Site #2 (HWY 20)  3. Site #1 (HWY G)

- Question 2: Were the CIS signs helpful in directing you to the site?
  Answers: 1. Yes  2. No  3. Did not see signs  4. Was escorted to the site

- Question 3: Was the area provided large enough for vehicle parking, and for you to complete the required activities?
  Answers: 1. Yes  2. No

- Question 4: Was there sufficient lighting for you to complete the required activities?
• Question 5: Did you make use of the phone which was available?
   Answers: 1. Yes    2. No    3. With difficulties

• Question 6: Is the location of this site convenient?
   Answers: 1. Yes    2. No

• Question 7: How would you rate your level of safety at this site, compared to being on the freeway shoulder, to complete the required activities?
            4. Not at all safer

The questionnaire sample used in this evaluation is shown in Figure 3.2-4. Table 3.2-4 summarizes the numerical results classified by question.
Dear Motorist:

The Wisconsin Department of Transportation in cooperation with the Racine and Kenosha County Sheriff’s Departments, is pleased to introduce the WISCONSIN GATEWAY PATROLS. This program provides road assistance free of charge in the event your vehicle becomes inoperable on the highway. It is our goal to help keep Wisconsin Interstate Highways clear of disabled vehicles and to continue the flow of traffic following an incident. The GATEWAY PATROLS provide road service to stranded motorists, including; towing to designated “safe” zones, changing tires, and temporary repairs to breakdowns. All of the services mentioned will be performed at no charge, and no gratuities will be accepted.

Please let us know what you think of our service by completing and returning this postage paid response form. Thank You and Ride Safe!

DATE OF ASSISTANCE: __/__/____ TIME OF ASSISTANCE: ______ AM PM

REASON FOR ASSISTANCE: (check all that apply)
☐ INVOLVED IN CRASH ☑ MECHANICAL BREAKDOWN ☐ OTHER

TYPE OF SERVICE YOU RECEIVED FROM THE GATEWAY PATROL: (check all that apply)
☒ TOW OR PUSH ☐ CHANGED A TIRE
☐ BATTERY BOOST/JUMP ☐ OVERHEATED
☐ FUEL ☐ OTHER (please describe)

LENGTH OF TIME YOU WERE STRANDED BEFORE GATEWAY PATROL ARRIVED:
☒ 0-5 minutes ☐ 5-10 minutes ☐ 10-20 minutes ☐ MORE THAN 20 minutes

Please take time to answer the following questions if you were taken to, or chose to drive to a Crash Investigation Site (CIS). Please check the appropriate box.

☐ Site #1 (HWY 165) ☑ Site #2 (HWY 20) ☐ Site #3 (HWY 6)

2. Were the CIS signs helpful in directing you to the site?
☐ Yes ☐ No ☐ Did not see signs ☑ Was escorted to the site

3. Was the area provided large enough for vehicle parking, and for you to complete the required activities?
☒ Yes ☐ No

4. Was there sufficient lighting for you to complete the required activities?
☐ Yes ☐ No ☑ Daytime occurrence

5. Did you make use of the phone which was available?
☐ Yes ☐ No ☐ With difficulties (comment)

6. Is the location of this site convenient?
☐ Yes ☐ No (comment)

7. How would you rate your level of safety at this site, compared to being on the freeway shoulder, to complete the required activities?
☒ Much Safer ☐ Somewhat Safer ☐ Not Particularly Safer ☐ Not at All Safer

HOW WOULD YOU RATE THE GATEWAY PATROL SERVICE? (please circle)
☐VERY GOOD ☐ GOOD ☐ POOR ☐ VERY POOR

OTHER COMMENTS/SUGGESTIONS:

( THE FOLLOWING IS OPTIONAL)

NAME: ____________________________
ADDRESS: ________________________
CITY: ____________________________ STATE: __________ ZIP: _______

TELEPHONE: ______________________

Figure 3.2-4. Sample Questionnaire
Table 3.2-4. Number of Answers To Each Survey Question

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer 1</th>
<th>Answer 2</th>
<th>Answer 3</th>
<th>Answer 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>20</td>
<td>5</td>
<td>11</td>
<td>47</td>
<td>83</td>
</tr>
<tr>
<td>3</td>
<td>87</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>88</td>
</tr>
<tr>
<td>4</td>
<td>42</td>
<td>-</td>
<td>49</td>
<td>N/A</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>45</td>
<td>43</td>
<td>1</td>
<td>N/A</td>
<td>89</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>83</td>
</tr>
<tr>
<td>7</td>
<td>77</td>
<td>4</td>
<td>1</td>
<td>-</td>
<td>82</td>
</tr>
</tbody>
</table>

Note: N/A means there is no check box for users to select.

Figure 3.2-5: Distribution of Answers To Question 2
(Were the CIS signs helpful in directing you to the site?)

Figure 3.2-6: Distribution of Answers To Question 3
(Was the area provided large enough for vehicle parking, and for you to complete the required activities?)
Figure 3.2-7. Distribution of Answers To Question 4
(Was there sufficient lighting for you to complete the required activities?)

Figure 3.2-8: Distribution of Answers To Question 5
(Did you make use of the phone that was available?)
Analysis of Results

Based on the above results, we can conclude that the users' perceptions of the CIS are positive and encouraging. Most of the CIS users agreed with the safety improvement benefits for performing their activities at CIS instead of being on the freeway shoulder. Furthermore, the following observations and user responses could also be drawn from these questionnaires.
(1) In general, drivers reported that the CIS signs are quite useful for guiding them to the CIS sites. However, two drivers reported that they did not perceive the usefulness of the CIS sign. Moreover, eleven drivers reported that they did not see the CIS signs (8 drivers for site #2, 2 drivers for site #3, and 1 driver for site #1). Unfortunately, based on these questionnaires, we could not determine whether it is because they stayed too far from the nearby CIS location or due to other factors.

(2) Regarding the provided space and location, most of the users agreed and felt satisfied with the current design. However, one comment from users is that the site is too far from town.

(3) In terms of the provided telephone, one user complained that it was too hot to use since it was located outdoor. Furthermore, some users reported that they did not use the phone because they did not have change.

(4) Considering the results of lighting condition, users reported that it is quite ample for them to perform operation. Note that more than half of the users who returned the forms were escorted to the site during daytime.

Note that motorists, in some cases, drive their cars by themselves to the nearby CIS. The sheriff does not have the form used by the gateway patrol for these drivers to fill out. In this case, the information of this group of user on the CIS is unavailable. Therefore, this group of users is unavoidably excluded from this report.
3.3 Transverse Pavement Markings

Significance of Studying Transverse Pavement Markings

Traffic crashes are a huge problem within construction zones in the United States. Speed is very often the contributing factor in these crashes. Consequently, reducing the speeds of vehicles within construction zones is a major concern. At present, vehicle speeds are reduced through the use of speed reduction signs, stricter fines for speeding through construction zones, lane reductions, and radar signals. These methods help reduce vehicle speeds, but there is a concern that these methods alone do not reduce vehicle speeds sufficiently. Recently, new attempts to slow down traffic within construction zones have been looked at. One such attempt is through the use of pavement markings that take the advantage of driver’s perceptual systems. Transverse Pavement Markings are stripes that are painted across the roadway surface such that the distance between the stripes decreases as you drive downstream, as shown in Figure 3.3-1.

![Figure 3.3-1: Transverse Pavement Markings](image)

The markings are placed on the roadway in a converging pattern, which, in theory, creates an optical illusion of increasing speed as a driver travels downstream. This is due to the fact that the driver sees the painted bars at an increasing frequency. This evaluation is one effort to study the effectiveness of these markings and to see if these markings could be placed in other construction zones to slow down traffic. It is expected that these markings will help reduce traffic speeds.
immediately after they are placed, but may not produce reduction in speeds over an extended period of time due to driver familiarity.

**Introduction and Data Collection**

Transverse pavement markings were placed on the westbound lanes of I-94 during Phase II of the repaving construction in 1999. The study was on a 3-mile stretch from Oakwood Road, located 25.30 miles from the Illinois border, to Puetz Road, located 28.31 miles from the Illinois border, as shown in Figure 3.3-2. The objective of this evaluation is to assess the impact of the transverse pavement markings on the speed change at Puetz Road with reference to the speed at Oakwood Road.

The speed and volume data were collected before construction, during construction without the transverse pavement markings, and during construction with the transverse pavement markings. This data was collected from April 15, 1999 to June 29, 1999. The phase of no-construction was from April 15, 1999 to April 29, 1999. The construction phase with no markings was from May 15, 1999 to May 25, 1999. The markings were placed in the evening of May 26, 1999. Thus, the construction phase with transverse pavement markings was from May 27, 1999 to June 7, 1999. Finally, an after-construction phase was included in the analysis; this phase was from June 15, 1999 to June 29, 1999.
First of all, the data collection ran into some problems: the detectors that would be used to collect speed and volume data for after-counts did not have any traffic running over them because traffic was diverted to the shoulder at that location (Ryan Road). As a result of this, a new detector location had to be found for the downstream data collection. The new detector was located at Puetz Road, which is 0.8 miles from the detector location at Ryan Road. Since this detector is not located at the most appropriate place, it is postulated that the data will not be as valid as the data that would have been collected by the detector at Ryan Road. The detector locations that were used in the evaluation are illustrated in Figure 3.3-3.

Figure 3.3-3. Detector Locations
The speed and volume data were collected from the detectors at 15-minute time intervals. The speeds and volumes refer to the average speeds and volumes for the vehicles recorded during each 15-minute interval.

The lane reductions, speed reduction signs, and other speed reduction techniques are considered in this evaluation. In the phase of construction without transverse pavement markings, all the above speed reduction techniques were used. In the phase of construction with transverse pavement markings, all the above speed reduction techniques and the transverse pavement markings were used. Thus, the impact of other speed reduction techniques, including lane reductions and speed reduction signs, is taken into consideration in the evaluation. The speed reduction signs and lane reductions occurred approximately one mile south of Oakwood Road. Due to this, vehicle at Oakwood Road should be reduced from the posted speed limit of 65 mph to 55 mph.

Data Analysis

From the data collected, it can be seen that the transverse pavement markings did have an effect on further reducing speeds in construction zones. The changes in speed were recorded for all four scenarios: before construction, during construction without the transverse pavement markings, during construction with the transverse pavement markings, and after construction. The traffic flow on the roadway changes for different times of the day. This traffic flow had an effect on the speeds experienced on the roadway, but had minor impact on the speed changes experienced by vehicles. During the PM peak hour, the traffic flow was about 1100 vph to 1200 vph on the center lane. By using a weighting factor, this change in traffic flow was accounted for in the evaluation of the speed changes. The sample sizes are 1337 for before construction, 945 during construction without markings, 853 during construction with markings, and 1426 after construction.

As illustrated in Figure 3.3-3, the speed change at Puetz Road is defined as zero if the speed at Oakwood Road equals the speed at Puetz Road. In other words, the traffic has a constant travel speed from Oakwood Road to Puetz Road. Once again, the objective of this evaluation is to assess the impact of the transverse pavement markings on the speed change at Puetz Road with reference to the speed at Oakwood Road. Tables 3.3-1a and 3.3-1b summarize the mean speed changes for different times of the day at Puetz Road. As shown in Tables 1a and 1b, the transverse pavement markings did reduce vehicle speeds further over the highway segment from
Oakwood Road to Puetz Road for different times of the day. It is noted that in this evaluation, the traditional speed reduction techniques were used for scenarios with and without the transverse pavement markings.

**Table 3.3-1a. Mean Speed Changes for Different Times of the Day at Puetz Road**

<table>
<thead>
<tr>
<th></th>
<th>Before Construction</th>
<th>Construction without Markings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed Change (mph)</td>
<td>Std. Dev. (mph)</td>
</tr>
<tr>
<td>AM Peak Hour</td>
<td>-2.34 ± 2.51</td>
<td>-4.68 ± 13.42</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>-3.18 ± 2.47</td>
<td>-9.22 ± 11.08</td>
</tr>
<tr>
<td>Afternoon</td>
<td>-3.34 ± 2.68</td>
<td>-7.15 ± 12.20</td>
</tr>
<tr>
<td>Evening</td>
<td>-3.22 ± 6.95</td>
<td>-9.26 ± 7.28</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>-1.62 ± 5.76</td>
<td>-9.25 ± 8.19</td>
</tr>
</tbody>
</table>

**Table 3.3-1b. Mean Speed Changes for Different Times of the Day at Puetz Road**

<table>
<thead>
<tr>
<th></th>
<th>Construction with Markings</th>
<th>After Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed Change (mph)</td>
<td>Std. Dev. (mph)</td>
</tr>
<tr>
<td>AM Peak Hour</td>
<td>-7.46 ± 13.82</td>
<td>-4.22 ± 13.28</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>-10.11 ± 16.23</td>
<td>-3.56 ± 14.96</td>
</tr>
<tr>
<td>Afternoon</td>
<td>-13.10 ± 10.19</td>
<td>-6.91 ± 13.16</td>
</tr>
<tr>
<td>Evening</td>
<td>-14.35 ± 7.74</td>
<td>-7.71 ± 11.43</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>-10.63 ± 6.08</td>
<td>-5.30 ± 11.59</td>
</tr>
</tbody>
</table>

Other meaningful results can also be produced using the original data above. Based on the vehicle speeds recorded, the average, or mean vehicle speed, was computed for every 15-minute time interval. Then, the number of mean vehicle speed changes was recorded for different times of day for all four scenarios: before construction, during construction without the transverse pavement markings, during construction with the transverse pavement markings, and after construction. Subsequently, for each scenario, the speed change frequency was computed for various types of speed changes: speed increase, 0-5 mph decrease, 5-10 mph decrease, 10-15 mph decrease, 15-20
mph decrease, 20-25 mph decrease, 25-30 mph decrease, and >30 mph decrease. Note that the speed change frequency is defined as the percentage or ratio of the number of speed changes for each type over the total number of speed changes recorded for all types. These results are summarized in Tables 3.3-2~3.3-5.

**Table 3.3-2. Frequency of Speed Changes Before Construction**

<table>
<thead>
<tr>
<th>Speed Increase</th>
<th>Number of Average Speed Changes</th>
<th>Frequency of Speed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 – 5 MPH Decrease</td>
<td>246</td>
<td>18.4%</td>
</tr>
<tr>
<td>5 – 10 MPH Decrease</td>
<td>829</td>
<td>62.0%</td>
</tr>
<tr>
<td>10 – 15 MPH Decrease</td>
<td>221</td>
<td>16.5%</td>
</tr>
<tr>
<td>15 – 20 MPH Decrease</td>
<td>27</td>
<td>2.0%</td>
</tr>
<tr>
<td>20 – 25 MPH Decrease</td>
<td>6</td>
<td>0.5%</td>
</tr>
<tr>
<td>25 – 30 MPH Decrease</td>
<td>5</td>
<td>0.4%</td>
</tr>
<tr>
<td>&gt;30 MPH Decrease</td>
<td>1</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

**Table 3.3-3. Frequency of Speed Changes During Construction (Without Transverse Pavement Markings)**

<table>
<thead>
<tr>
<th>Speed Increase</th>
<th>Number of Average Speed Changes</th>
<th>Frequency of Speed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 – 5 MPH Decrease</td>
<td>206</td>
<td>21.8%</td>
</tr>
<tr>
<td>5 – 10 MPH Decrease</td>
<td>120</td>
<td>12.7%</td>
</tr>
<tr>
<td>10 – 15 MPH Decrease</td>
<td>150</td>
<td>15.9%</td>
</tr>
<tr>
<td>15 – 20 MPH Decrease</td>
<td>213</td>
<td>22.5%</td>
</tr>
<tr>
<td>20 – 25 MPH Decrease</td>
<td>173</td>
<td>18.3%</td>
</tr>
<tr>
<td>25 – 30 MPH Decrease</td>
<td>62</td>
<td>6.6%</td>
</tr>
<tr>
<td>&gt;30 MPH Decrease</td>
<td>17</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

As can be seen in Table 3.3-2, there were small changes in the vehicle speeds before the construction. After the construction began, there were a large number of speed reductions (Table 3.3-3). Moreover, after the transverse pavement markings were in place, it seems that speeds did decrease further (Table 3.3-4). After construction was complete (Table 3.3-5), the vehicle speeds had little change again, but not as significant as before the construction ever began.
Table 3.3-4. Frequency of Speed Changes During Construction (With Transverse Pavement Markings)

<table>
<thead>
<tr>
<th>Speed Increase</th>
<th>Number of Average Speed Changes</th>
<th>Frequency of Speed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Increase</td>
<td>76</td>
<td>8.9%</td>
</tr>
<tr>
<td>0 – 5 MPH Decrease</td>
<td>56</td>
<td>6.6%</td>
</tr>
<tr>
<td>5 – 10 MPH Decrease</td>
<td>178</td>
<td>20.8%</td>
</tr>
<tr>
<td>10 – 15 MPH Decrease</td>
<td>238</td>
<td>27.9%</td>
</tr>
<tr>
<td>15 – 20 MPH Decrease</td>
<td>207</td>
<td>24.3%</td>
</tr>
<tr>
<td>20 – 25 MPH Decrease</td>
<td>64</td>
<td>7.5%</td>
</tr>
<tr>
<td>25 – 30 MPH Decrease</td>
<td>27</td>
<td>3.2%</td>
</tr>
<tr>
<td>&gt;30 MPH Decrease</td>
<td>7</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Table 3.3-5. Frequency of Speed Changes After Construction

<table>
<thead>
<tr>
<th>Speed Increase</th>
<th>Number of Average Speed Changes</th>
<th>Frequency of Speed Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Increase</td>
<td>304</td>
<td>21.3%</td>
</tr>
<tr>
<td>0 – 5 MPH Decrease</td>
<td>298</td>
<td>20.9%</td>
</tr>
<tr>
<td>5 – 10 MPH Decrease</td>
<td>224</td>
<td>15.7%</td>
</tr>
<tr>
<td>10 – 15 MPH Decrease</td>
<td>288</td>
<td>20.2%</td>
</tr>
<tr>
<td>15 – 20 MPH Decrease</td>
<td>225</td>
<td>15.8%</td>
</tr>
<tr>
<td>20 – 25 MPH Decrease</td>
<td>62</td>
<td>4.3%</td>
</tr>
<tr>
<td>25 – 30 MPH Decrease</td>
<td>18</td>
<td>1.3%</td>
</tr>
<tr>
<td>&gt;30 MPH Decrease</td>
<td>7</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

For better understanding, a histogram of the results of Tables 3.3-2~3.3-5 is shown in Figure 3.3-4.
This histogram shows that before construction, most vehicles have a 0-5 mph decrease in speed. Once construction begins, and before the transverse pavement markings are placed, most vehicles have a 10-15 mph decrease. With the transverse markings in place, most vehicles have a 10-20 mph decrease. After construction, most vehicles again have a 0-5 mph decrease.
Tables 3.3-6~3.3-9 summarize the speeds and the standard deviation of those speeds for Oakwood Road and Puetz Road for all four scenarios. It is interesting to note that vehicles that should be slowing down to 55 mph at Oakwood Road when construction starts actually do not. Vehicles only slow down in their usual pattern (approximately 65-mph at Oakwood Road and approximately 55 mph at Puetz Road). Even though these speeds are similar with and without construction, there is a more significant difference in speed during construction, as can be seen earlier. It is also interesting to note that a longer construction period is associated with more deviation from the mean speed at each location.

**Table 3.3-6. Mean Speeds for Different Times of the Day at Oakwood Road & Puetz Road (Before Construction)**

<table>
<thead>
<tr>
<th></th>
<th>Speed at Oakwood Road (mph)</th>
<th>Std. Dev. (mph)</th>
<th>Speed at Puetz Road (mph)</th>
<th>Std. Dev. (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak Hour</td>
<td>61.64</td>
<td>±2.53</td>
<td>59.30</td>
<td>±3.65</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>62.74</td>
<td>±1.14</td>
<td>59.56</td>
<td>±2.62</td>
</tr>
<tr>
<td>Afternoon</td>
<td>62.31</td>
<td>±1.29</td>
<td>58.97</td>
<td>±3.00</td>
</tr>
<tr>
<td>Evening</td>
<td>58.80</td>
<td>±6.33</td>
<td>55.58</td>
<td>±6.69</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>57.21</td>
<td>±5.51</td>
<td>55.58</td>
<td>±5.65</td>
</tr>
</tbody>
</table>

**Table 3.3-7. Mean Speeds for Different Times of the Day at Oakwood Road & Puetz Road (During Construction Without Transverse Pavement Markings)**

<table>
<thead>
<tr>
<th></th>
<th>Speed at Oakwood Road (mph)</th>
<th>Std. Dev. (mph)</th>
<th>Speed at Puetz Road (mph)</th>
<th>Std. Dev. (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak Hour</td>
<td>61.30</td>
<td>±13.29</td>
<td>56.62</td>
<td>±3.99</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>66.75</td>
<td>±10.70</td>
<td>57.53</td>
<td>±2.78</td>
</tr>
<tr>
<td>Afternoon</td>
<td>62.69</td>
<td>±11.61</td>
<td>55.53</td>
<td>±4.57</td>
</tr>
<tr>
<td>Evening</td>
<td>65.65</td>
<td>±7.39</td>
<td>56.39</td>
<td>±3.77</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>63.92</td>
<td>±7.27</td>
<td>54.68</td>
<td>±4.62</td>
</tr>
</tbody>
</table>
Table 3.3-8. Mean Speeds for Different Times of the Day at Oakwood Road & Puetz Road (During Construction With Transverse Pavement Markings)

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Speed at Oakwood Road (mph)</th>
<th>Std. Dev. (mph)</th>
<th>Speed at Puetz Road (mph)</th>
<th>Std. Dev. (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak Hour</td>
<td>64.99</td>
<td>±12.84</td>
<td>57.53</td>
<td>±3.87</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>63.84</td>
<td>±17.34</td>
<td>53.73</td>
<td>±11.35</td>
</tr>
<tr>
<td>Afternoon</td>
<td>66.84</td>
<td>±12.50</td>
<td>53.74</td>
<td>±10.32</td>
</tr>
<tr>
<td>Evening</td>
<td>70.14</td>
<td>±6.91</td>
<td>55.79</td>
<td>±6.89</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>66.84</td>
<td>±4.96</td>
<td>56.21</td>
<td>±4.32</td>
</tr>
</tbody>
</table>

Table 3.3-9. Mean Speeds for Different Times of the Day at Oakwood Road & Puetz Road (After Construction)

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Speed at Oakwood Road (mph)</th>
<th>Std. Dev. (mph)</th>
<th>Speed at Puetz Road (mph)</th>
<th>Std. Dev. (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak Hour</td>
<td>61.68</td>
<td>±12.89</td>
<td>57.46</td>
<td>±3.39</td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>57.04</td>
<td>±17.24</td>
<td>53.48</td>
<td>±12.55</td>
</tr>
<tr>
<td>Afternoon</td>
<td>58.00</td>
<td>±16.11</td>
<td>51.08</td>
<td>±13.74</td>
</tr>
<tr>
<td>Evening</td>
<td>62.84</td>
<td>±10.51</td>
<td>55.13</td>
<td>±9.67</td>
</tr>
<tr>
<td>Late Evening/Early Morning</td>
<td>61.27</td>
<td>±11.39</td>
<td>55.97</td>
<td>±3.83</td>
</tr>
</tbody>
</table>

Notes

Caution must be taken when interpreting and applying the above findings. For the immediate “after” period, motorists might not be prepared for the transverse pavement markings after they were just installed on the roadway. Over time, these markings may have reduced effects because motorists are getting used to them. The reduced effects may also be experienced if these markings are used in many construction zones. Motorists may get used to these markings and will not reduce their speeds, as shown in this evaluation.
3.4 Enhanced Reference Signs

Prior to performing a full evaluation, a short survey questionnaire was distributed to 911 operators and Sergeants at the Milwaukee County Sheriff’s Department to determine the level of usage and understanding of the Enhanced Reference Signs. The results of the survey indicated that the Signs were not being fully utilized due to institutional issues and a lack of familiarity by drivers and Milwaukee County Sheriff Department personnel. Therefore, it was determined that a full evaluation of the Enhanced Reference Signs could not be performed effectively at the present time and should be postponed to allow for further outreach and training to be completed.
3.5 Computer Aided Dispatch (CAD)/Emergency Respondent

3.5.1. Data Collection

Interviews with the law enforcement agencies were completed. Two agencies have implemented CAD (Computer Aided Dispatch) systems. They are and Waukesha County Sheriff Departments. Another interviewed, the Milwaukee County Sheriff Department, has not implemented a CAD system yet.

3.5.2. Data Analysis

The interview questions are mainly related to the advantages and disadvantages of a CAD system. In the following, the advantages and disadvantages identified by the agencies are summarized.

Advantages of CAD System

- Keep track of units if on a call.
  - Ensure equal share of calls via the Tow Truck rotation lists.
- Track phone calls via the Reverse Phone Book.
  - Track where phone call is being made from.
- Premise history (Red Flags)
  - Tell if a call has been made to the same address before and what that call was for.
- Demographic search on license plates
- Mapping system
  - Keep track of vehicles and where they are located, and involve use of automatic vehicle location system.
- Great for record keeping (retrieving calls)
  - Unit status
  - Number of complaints
    - Quicker to retrieve information
    - Interagency interaction:
      - Racine County Sheriff Department can share records with Racine Police Department.
      - When a call is created, the agent can choose to share the information with the city.
      - Tell the city that it needs to service a call.
Go into a call list.

**Disadvantages of CAD System**

- Can not associate two incidents with one vehicle or one officer.
  - Times are not tracked if one vehicle or one officer is on multiple calls.
  - Times have to be entered in manually.
- For most of the time, it does not matter which vehicles are closest to incident.
- Not very efficient
  - Typing information into the computer can be slow due to a step-by-step process.
- The System was built for fire department dispatch originally.
  - A lot of information required as input into the system is not useful in Law Enforcement Dispatch.
- GIGO (Garbage In/ Garbage Out)
  - Must rely on information that a deputy or 911 caller gives to dispatchers (information may be incomplete or incorrect).
  - The information in the system is only as good as the original information entered.

**Milwaukee County Sheriff Department**

Currently, the dispatch of law enforcement vehicles is done using cards. These cards are not very helpful and require a lot of hand-written paperwork. Record keeping consists of keeping track of the cards. If information needs to be retrieved, one must look through daily logs of calls, followed by looking at the cards one by one. Sheriffs also keep their own daily logs, which include more information about each call.

In conclusion, the Milwaukee County Dispatch System is very outdated and needs to be upgraded. The many advantages of a CAD system outweigh the disadvantages of having such a system. Implementing a CAD system that is tailored for use by law enforcement agencies, or upgrading to faster computers, could reduce many of the disadvantages of CAD.
3.6 User Acceptance

The purpose of this study was to evaluate the user’s perception of the effectiveness and benefits of the TIME Program. To accomplish this, a survey questionnaire was developed and mailed to drivers in Southeastern Wisconsin.

3.6.1 Survey Design

The general question was “What is the public’s level of awareness and perception of the TIME Program”. To answer this general question, seven more focused questions were developed as follows:

1. Is the public aware of crash investigation sites?
2. Is the public aware of 911 cellular services?
3. Is the public aware of road marking systems?
4. Is the public aware of the expanded motorist information about traffic conditions?
5. What is the public’s general perception of the TIME Program?
6. What is the public’s perception of Southeastern Wisconsin’s freeway services?
7. What is the public’s perception of freeway patrol?

These questions were then used to develop a set of more specific questions and eventually to develop the text of the survey questionnaire.

3.6.2 Implementation of the Survey

Sampling Strategy

It was determined that the survey population should be representative of the distribution of drivers on each of the improved routes. This was accomplished by taking a sample population from each of the counties affected by the TIME improvements. The size of the sample taken from each county was weighted according to the county’s population as follows:
Table 3.6-1: Target Population

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
<th>Target Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milwaukee</td>
<td>908,940</td>
<td>49%</td>
</tr>
<tr>
<td>Waukesha</td>
<td>348,808</td>
<td>19%</td>
</tr>
<tr>
<td>Racine</td>
<td>185,393</td>
<td>10%</td>
</tr>
<tr>
<td>Kenosha</td>
<td>142,872</td>
<td>8%</td>
</tr>
<tr>
<td>Washington</td>
<td>112,694</td>
<td>6%</td>
</tr>
<tr>
<td>Walworth</td>
<td>84,404</td>
<td>4%</td>
</tr>
<tr>
<td>Ozaukee</td>
<td>80,737</td>
<td>4%</td>
</tr>
</tbody>
</table>

Licensed drivers, rather than registered drivers, were selected as the target population so as to reach the broadest cross-section of users, including those who do not own a car.

Survey Mailing Strategy

The goal of this survey was to obtain a minimum sample size of 200. Due to the length and complexity of the survey, a moderate response rate of 20% was predicted. The survey was therefore mailed to a total random sample of 1000 drivers based on the target county percentages. In order to increase the response rate, an incentive was offered to complete the survey. Two postage stamps were included with the survey, and individuals who completed the survey by the stated deadline were mailed additional postage stamps.

Survey Response and Data Analysis

Of the 1000 surveys mailed, 401 completed surveys were returned. Taking into account the surveys that were returned due to incorrect addresses, the response rate was 42%, well above the expected response rate of 20%. The responses were recorded in a MS Access database and statistical analysis was performed to determine users’ perceptions.
3.6.3 Survey Results

General Information about the Drivers Who Answered the Survey

Figure 3.6-1: Q36 Distribution

![Q36: Gender](image)

Figure 3.6-2: Q39 Distribution

![Q39: Marital status](image)

Figure 3.6-3: Q37 Distribution

![Q37: Age](image)

Figure 3.6-4: Q33 Distribution

![Q33: Ethnicity](image)
Figure 3.6-5: Q19 Distribution

Figure 3.6-6: Q20 Distribution

Figure 3.6-7: Q18 Distribution

Figure 3.6-8: County Distribution
Figure 3.6-9: Q40 Distribution

Education Level

Route Use Frequency for Milwaukee County

Route Use Frequency for Ozaukee and Washington Counties

Figure 3.6-10: Q6a – 6e Distribution

Figure 3.6-11: Q6f-6i Distribution
Is the public aware of Crash Investigation Sites?

Where they would go after an accident?

![Figure 3.6-14: Q22 Distribution](image)

Why they would go there?

![Figure 3.6-15: Q23 Distribution](image)
Do they know what a Crash Investigation Site is? (By County)

Figure 3.6-16: Knowledge of CIS by County

Level of Knowledge

Q28: Knowledge of crash investigation site

Figure 3.6-17: Q28 Distribution

Would they be willing to use a Crash Investigation Site?

Q29: Willingness to use crash investigation site

Figure 3.6-18: Q29 Distribution
Table 3.6-2: Reaction after a Crash - Where would they go if they were in an accident and why?

<table>
<thead>
<tr>
<th>Where would you go?</th>
<th>% Who would go to each location</th>
<th>Want the police to see the accident as it is</th>
<th>Feel safer not moving the car</th>
<th>Insurance agent told me not to move the car</th>
<th>Safer to move the car</th>
<th>Don’t know what to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nowhere I would stay put</td>
<td>21.3</td>
<td>85.7</td>
<td>4.8</td>
<td>1.2</td>
<td>1.2</td>
<td>7.1</td>
</tr>
<tr>
<td>My home</td>
<td>.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Crash Investigation Site</td>
<td>6.9</td>
<td>18.5</td>
<td>0</td>
<td>7.4</td>
<td>66.7</td>
<td>7.4</td>
</tr>
<tr>
<td>Freeway shoulder</td>
<td>60.0</td>
<td>14.8</td>
<td>5.1</td>
<td>2.5</td>
<td>71.2</td>
<td>6.4</td>
</tr>
<tr>
<td>Safe well lit area nearby</td>
<td>11.2</td>
<td>15.9</td>
<td>2.3</td>
<td>0</td>
<td>68.2</td>
<td>13.6</td>
</tr>
<tr>
<td>Police station</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

User Comments:

- “I am concerned about Crash Investigation Sites. What type of security will be at these sites? Will there be sheriff or police there?”
- “I think crash investigation sites are a worthwhile venture. I also feel the public in general is ill informed about how to react when involved in an accident (moving vehicles out of traffic, unless serious injuries or extraordinary circumstances). On the same note, I don’t think people realize how dangerous it is to be out of a vehicle on the shoulder of the freeway.”
Is the public aware of 911 cellular services?

Cell Phone Ownership

Q30: Own cellular phone

Figure 3.6-19: Q30 Distribution

Reported an accident using cell phone?

Q34: Ever seen an accident and reported it?

Figure 3.6-20: Q34 Distribution

How often do they use a cell phone to report an accident?

Q35: Percent time see accident and report

Figure 3.6-21: Q35 Distribution

Reasons for not reporting

Q33: Reason for answer to Q32 series

Figure 3.6-22: Q33 Distribution
User Comments:

- “Free phone # (other than 911) to report minor accidents on freeway would be a better approach than using emergency 911 line now. Needs promotional campaign with a new number.”
- “I may be wrong in believing that 911 was for life threatening emergencies not minor breakdowns. I will call in the future.”
- “I'm very disturbed by the use and abuse of the cell phone! In my estimation, driving an automobile requires 100% driver’s attention. Almost every time I'm driving the expressway, I see close calls by drivers using cell phones. This practice has become a very serious problem.”
- “Is calling 911 for abandoned car good use of 911? Is there an optional number?”
Is the public aware of road marking systems?

Do they know how long they can legally leave their car on the freeway?

![Figure 3.6-23: Q7a Distribution](image)

Table 3.6-3: How long can a disabled vehicle be left on the freeway?

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>72.0</td>
<td>14.6</td>
</tr>
</tbody>
</table>

What would drivers use to describe the location of an accident/breakdown to a 911 operator?

Table 3.6-4: Rank of Location References

<table>
<thead>
<tr>
<th>User Rank (%)</th>
<th>Freeway signs</th>
<th>Mile markers</th>
<th>On/off ramps</th>
<th>Buildings in view</th>
<th>Billboards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Choice</td>
<td>46.2</td>
<td>36.0</td>
<td>39.7</td>
<td>9.0</td>
<td>5.2</td>
</tr>
<tr>
<td>2nd Choice</td>
<td>27.3</td>
<td>16.8</td>
<td>34.7</td>
<td>5.5</td>
<td>3.0</td>
</tr>
<tr>
<td>3rd Choice</td>
<td>22.0</td>
<td>18.9</td>
<td>18.7</td>
<td>19.2</td>
<td>4.7</td>
</tr>
<tr>
<td>4th Choice</td>
<td>3.1</td>
<td>8.8</td>
<td>3.7</td>
<td>45.8</td>
<td>21.3</td>
</tr>
<tr>
<td>5th Choice</td>
<td>1.3</td>
<td>19.5</td>
<td>3.2</td>
<td>20.5</td>
<td>65.7</td>
</tr>
</tbody>
</table>
Percentage of users who selected mile markers as their first choice by county

Table 3.6-5: Percentage Who Chose Mile Markers

<table>
<thead>
<tr>
<th>County</th>
<th>% Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenosha</td>
<td>53.3</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>34.9</td>
</tr>
<tr>
<td>Ozaukee</td>
<td>29.4</td>
</tr>
<tr>
<td>Racine</td>
<td>53.1</td>
</tr>
<tr>
<td>Walworth</td>
<td>53.8</td>
</tr>
<tr>
<td>Washington</td>
<td>18.2</td>
</tr>
<tr>
<td>Waukesha</td>
<td>30.7</td>
</tr>
</tbody>
</table>

User Comments:

- “Better mile markers would aid in location identification-promoting campaign would raise awareness significantly as well as teaching ALL new drivers.”
- “I have never gotten lost on Wisconsin Freeways. Signs are more than adequate. Would appreciate a pamphlet explaining interstate signs and markers.”
Is the public aware of expanded motorist information?

What is the effect of available traffic information on user behavior?

Table 3.6-6: Effect of Traveler Information

<table>
<thead>
<tr>
<th></th>
<th>% yes</th>
<th>% no</th>
<th>Average # of times adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted travel time</td>
<td>53.6</td>
<td>46.4</td>
<td>4.7</td>
</tr>
<tr>
<td>Adjusted travel route</td>
<td>60.7</td>
<td>39.3</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Which sources of traffic information are they aware of and which do they use?

Table 3.6-7: Sources of Traveler Information

<table>
<thead>
<tr>
<th>Information Source</th>
<th>% Aware</th>
<th>% Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Television</td>
<td>75.2</td>
<td>52.3</td>
</tr>
<tr>
<td>Cable Television</td>
<td>52.3</td>
<td>26.0</td>
</tr>
<tr>
<td>Local Newspaper</td>
<td>79.0</td>
<td>43.7</td>
</tr>
<tr>
<td>WisDOT Flyers</td>
<td>40.9</td>
<td>12.3</td>
</tr>
<tr>
<td>Travel Advisory Radio</td>
<td>68.9</td>
<td>39.5</td>
</tr>
<tr>
<td>Changeable Message Signs</td>
<td>88.3</td>
<td>78.3</td>
</tr>
<tr>
<td>Commercial Radio</td>
<td>84.1</td>
<td>81.4</td>
</tr>
<tr>
<td>Travel Advisory Television</td>
<td>25.8</td>
<td>7.1</td>
</tr>
<tr>
<td>Internet</td>
<td>35.9</td>
<td>9.2</td>
</tr>
</tbody>
</table>

How important is traffic information to the public?

Figure 3.6-24: Q13 Distribution
User Comments:

- “I would like to see an "all traffic" radio station that would provide traffic conditions instantly.”
- “Not enough information on radio regarding travel at times other than rush hour.”
- “I retired last year @ age 52 after 30 years of commuting in Milwaukee area. The radio traffic reports were sometimes useful, but most opportunities to report accidents were missed because the helicopter/plane didn't pass over the site and report it. The freeway message signs get the job done very well now. A daily report available in newspapers/web, etc. of construction problems and progress status would be useful to a lot of people, and to avoid surprises by changing conditions by non-commuters especially.”
What is the public’s general perception of the TIME Program?

Are users aware of TIME?
(by county)

Figure 3.6-27: Q26 Distribution by County

Level of knowledge of TIME
(overall)

Figure 3.6-28: Q26 Distribution

Is TIME a good use of money?

Figure 3.6-29: Q27 Distribution
Q27b: TIME affect on freeway safety (0=none, 4=positive effect)

Q27c: TIME affect on accident clearing (0=none, 4=positive effect)

Q27d: TIME affect on driving time (0=none, 4=positive effect)

Q27e: TIME affect on number of collisions (0=none, 4=positive effect)
Figure 3.6-34: Q27f Distribution
Perception of TIME’s affect on traffic information

Figure 3.6-35: Q27g Distribution
Perception of TIME’s affect on EMS response time
What is the public’s perception of Southeastern Wisconsin’s freeway services?

Table 3.6-8: Time Required for Emergency Assistance to Arrive

<table>
<thead>
<tr>
<th></th>
<th>Minimum (min)</th>
<th>Maximum (min)</th>
<th>Average (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long would it take for emergency assistance to arrive?</td>
<td>3.0</td>
<td>420.0</td>
<td>28.3</td>
</tr>
<tr>
<td>How long should it take?</td>
<td>1.0</td>
<td>60.0</td>
<td>9.7</td>
</tr>
</tbody>
</table>

Figure 3.6-36: Q3 Distribution

Figure 3.6-37: Q5 Distribution
User Comments:

- “Am enjoying the resurfaced roads from the state line to Mil Downtown.”
- “I love the new smooth and (sometimes) widened roads. Thank you!!”
- “It is really worsening in the corridor to northern Chicago, getting congested.”
- “Dislike metered freeway on ramps and motorist who ignore them and use the bus/car pool lane illegitimately. Like the traffic signals at the top of some of the off ramps to assist access to the city street.”
- “I would like something done about trucker speeding, which is very common. I think on and off ramps should be better lit up at night.”
- “I never have had a serious problem, and feel over all the system works extremely well.”
- “We need another East-West corridor badly!”
- “I have noticed that in the last year or so, congestion on the freeways (at least the ones I travel) are at an all time "High" now! It seems as if the "back roads" are faster (sometimes) now than the freeways!”
- “It’s irritating to have construction on your regular drive to work for six months and then have construction start on your alternate drive before your regular drive is completed!”

**Figure 3.6-38: Q4 Distribution**
What is the public’s perception of the freeway patrol?

Perception of effect of putting more police on the road during rush hour:

Effect on safety

Effect on accident clearance

Effect on driving time

Effect on traffic flow

Figure 3.6-39: Q16a Distribution

Figure 3.6-40: Q16b Distribution

Figure 3.6-41: Q16c Distribution

Figure 3.6-42: Q16d Distribution
Effect on number of collisions

Figure 3.6-43: Q16e Distribution

User Comments:

- “Law officers [do] an excellent job.”
- “I think that more available police on the roads will help clear up accidents quicker. The other items seem like a waste of money. [...] only having more police available will help. The rest is a waste of taxpayer money.”
- “So. Eastern Wisconsin is a great place to drive. The Hwy. Patrol and County Sheriffs do a good job.”
- “Cruising police cars slow traffic. Parked police cars just cause drivers to hit their brakes when they see them.”
- “What about speed limits? They are routinely ignored by everyone, including police, sheriffs, etc. If no one cares, why have them?”
3.6.4 Conclusions and Recommendations

1. **Drivers in Southeastern Wisconsin are concerned about traffic conditions** – Users have strong feelings about the Southeastern Wisconsin freeway system and existing traffic conditions. Of the drivers who completed the survey, 44% provided comments - many are lengthy and some are quite personal. In general, these comments were not negative. Instead, drivers expressed their concerns and in many cases made constructive suggestions. This strong interest is probably due in large part to the user’s perception that traffic conditions have not improved or have worsened. About 47% of users indicated that the time they are delayed due to other people’s accidents has increased in the past year and their driving experience has worsened.

2. **Users are not familiar with the TIME Program or its component programs** – About 90% of surveyed drivers indicated that they had never heard of the TIME Program. 72% of drivers had also never heard of crash investigation sites.

3. **Users generally feel positively about TIME and are receptive to TIME** – Drivers are not familiar with TIME. However, after the program was described to the surveyed users, their responses to it were overwhelmingly positive. 71% of users indicated that they felt it was a good to very good use of money and 74% felt that it would improve freeway safety.

4. **Outreach and public education efforts need to be continued and increased** – The lack of familiarity with the TIME Program indicates that outreach efforts need to be continued and strengthened. In particular, drivers are still unfamiliar with what they should do following an accident. A large percentage of drivers are not aware of crash investigation sites, how long they can leave their vehicles on the roadway, or whether they should move their vehicles. In addition, while users appear to be aware of most of the travel information sources, only 35.9% are aware of the Internet and 25.8% are aware of travel advisory radio. Since users are concerned about worsening traffic conditions and are open to the solutions that are offered by the TIME Program, this is an ideal opportunity to increase the positive public perception of the Wisconsin Department of Transportation, the State Patrol, and other TIME stakeholders.
4.0 Conclusion and Recommendations

The results of our research suggest that the Gateway Patrol Program and the Enhanced Freeway Patrol, implemented along the I-94 corridor, were successful in reducing service times and the number of secondary collisions. Services times for non-collision related problems were reduced to 10 minutes and 13 minutes with Gateway Patrol and Enhanced Freeway Patrol, respectively. In addition, secondary collisions decreased 14% with the gateway patrol and 8% with the enhanced freeway patrols. Written comments received by motorists who received service were mostly positive, but few knew about the Gateway Patrol Program.

The Crash Investigation Sites were successful in reducing the rate of secondary crashes. The secondary crash rate was reduced from 8.24% in 1997 to 5.15% in 1998 along the I-94 corridor when the Crash Investigation Sites were implemented. Of the drivers who used the Crash Investigation Sites, 24% reported that the CIS signs were quite useful, 99% agreed with the design, 51% used the phone provided, and 46% thought the lighting was ample. The agencies’ perspectives were also quite positive, and they noted benefits of: reduced incident clearing time, reduced chance of a secondary accident, operation facilitation, and enhanced safety for the responding personnel.

The Transverse Pavement Markings were successful in reducing speeds both with and without construction. Speeds were reduced from 0-5 mph when there was no construction on the road, and a reduction in speed from an average of 10-15 mph to 10-20 mph was noted when there was construction on the road.

In regards to the Enhanced Reference Signs, initial feedback from the 911 operators and the Sergeants at the Milwaukee County Sheriff’s Department suggests that additional time and training will be necessary.
The Milwaukee County Dispatch system is outdated and needs to be upgraded. A Computer Aided Dispatch system that is tailored for use by law enforcement agencies could make the benefits of such a system outweigh the disadvantages of such a system.

The User Acceptance Survey that was conducted in November of 1999 had an acceptance rate of 40%, and the results can be summarized as follows: 72% of users were aware of CIS and 68% noted that they would use the sites now; 81% of respondents reported that they would call 911 to report an accident less than 25% of the time; 36% wrote that they would use mile markers as their first choice of marking system used to report an accident to a 911 operator, but 75% of users did not know how long a car could be left on the freeway; 92% of people reported that they considered the expanded motorist information to be useful, changeable message signs and radio were the most commonly used sources of information, and 54% stated they adjusted their travel time given this information; 71% of the users considered TIME to be a "good to very good" use of money, 74% agreed that it would improve freeway safety and speed up the clearing of accidents, and 77% indicated that they believed it would improve the response times of emergency vehicles; the majority of users (57%) felt that driving time had stayed the same and 24% felt it had increased over the past year; and 60% of users felt that the freeway patrol would improve freeway safety, 73% reported it would speed the clearing of accidents, and 50% reported it would reduce the number of accidents.

Based on these responses, we recommend that outreach and branding efforts be continued and strengthened. Users indicated that they were frustrated and unhappy with driving conditions in Southeastern Wisconsin. Users were also largely unfamiliar with the TIME Program. Yet, the large number of drivers who took the time to fill out the survey, as well as their largely positive response to the information they were given about the TIME programs, indicates that they have
not crossed the threshold to be apathetic or antagonistic. They are still interested in and open to the efforts of the Wisconsin Department of Transportation, law enforcement, and other TIME participants to improve conditions.
References


Appendix 1 – User Acceptance Survey

Survey Questions

The final version of the survey questionnaire contained the following forty-two questions:

1. If you were to have an accident or your car were to break down on the side of a highway in Southeast Wisconsin, how long do you think it would take emergency assistance to arrive?

2. If you were to have an accident or your car were to break down on the side of a highway in Southeast Wisconsin, how long do you think it should take emergency assistance to arrive?

3. Do you think that in the past year the time for emergency assistance to arrive at an accident or breakdown site in southeast Wisconsin has (please circle a number):

<table>
<thead>
<tr>
<th>Decreased a lot</th>
<th>Decreased some</th>
<th>Stayed the same</th>
<th>Increased some</th>
<th>Increased a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

4. In the past year, do you think that the amount of time that you have been delayed in Southeast Wisconsin due to other people’s car accidents has (please circle a number):

<table>
<thead>
<tr>
<th>Decreased a lot</th>
<th>Decreased some</th>
<th>Stayed the same</th>
<th>Increased some</th>
<th>Increased a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

5. How has your driving experience in Southeast Wisconsin changed in the past year (please circle a number)?

<table>
<thead>
<tr>
<th>Worsened a lot</th>
<th>Worsened some</th>
<th>Stayed the same</th>
<th>Improved some</th>
<th>Improved a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

6. In the past month, which of the following routes have you driven on? Please circle the routes you have used and let us know approximately the number of times you have used them in the past month. Each one way trip counts as a single time. You can use the map on the back page to assist you.
<table>
<thead>
<tr>
<th>Milwaukee County</th>
<th>Waukesha County</th>
<th>Racine County</th>
<th>Walworth County</th>
<th>Kenosha County</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-43</td>
<td>I-43</td>
<td>I-43</td>
<td>I-43</td>
<td>I-43</td>
</tr>
<tr>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
</tr>
<tr>
<td>I-94</td>
<td>I-94</td>
<td>STH 16</td>
<td>I-94</td>
<td>I-94</td>
</tr>
<tr>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
<td>___ number of times</td>
</tr>
<tr>
<td>I-894</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-794</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STH 145</td>
<td></td>
<td></td>
<td>I-94</td>
<td>I-94</td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td>___ number of times</td>
<td>___ number of times</td>
</tr>
<tr>
<td>Ozaukee County</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington County</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USH 41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USH 45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STH 145</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ number of times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Do you know how long you can legally leave your car on the shoulder of the freeway if you have been in an accident or your car has broken down (please give the number of hours or circle “Do not know”)?

8. Imagine that you had to call 911 to report an accident or a broken down vehicle on the freeway. Which of the following options would you be most likely to use to explain the location to the dispatcher? Please answer this question by ranking the options in terms of how likely you would be to use it to explain the accident/breakdown location to the 911 dispatcher. 1=most likely to use. 5=least likely to use.

   a. ___ freeway signs
d. ___ buildings in view
   b. ___ mile markers  e. ___ billboards
   c. ___ on/off ramps

9. You can find motorist and travel information from all of the sources below. Please let us know which ones you are aware of as a source of travel information? (please circle “yes” or “no” for each)

   a. Commercial TV  Yes  No
   b. Local cable TV  Yes  No
c. Information in local  Yes  No
   f. Freeway changeable message signs  Yes  No
g. Commercial radio  Yes  No
   h. Traveler  Yes  No
10. Which of the following traveler information sources do you use to monitor traffic so that you can adjust your travel time or your travel route in Southeast Wisconsin? (please circle “yes” or “no” for each)

| d. Wisconsin Department of Transportation flyers | Yes | No |
| e. Traveler advisory radio | Yes | No |
| i. Internet | Yes | No |
| j. Other | Yes | No |
| k. Freeway changeable message signs | Yes | No |
| l. Commercial radio | Yes | No |
| m. Traveler advisory telephone | Yes | No |
| n. Internet | Yes | No |
| o. Other | Yes | No |

11. In the past month, have you adjusted the time at which you leave to travel in Southeast Wisconsin due to traffic congestion information that you found out about from any of the information sources listed in question #9?

   a. No
   b. Yes
   If “Yes”, about how many times? _____

12. In the past month, have you adjusted your travel route in Southeast Wisconsin due to traffic congestion information that you found out about from any of the information sources listed in question #9?

   a. No
   b. Yes
   If “Yes”, about how many times? _____
13. Do you think that the availability of information about traffic congestion, accidents and other incidents is important (please circle a number)?

<table>
<thead>
<tr>
<th>Not important</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very Important</th>
</tr>
</thead>
</table>

14. Do you feel that the travel or traffic information that you receive is given in a timely manner (please circle a number)?

<table>
<thead>
<tr>
<th>Not timely</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very timely</th>
</tr>
</thead>
</table>

15. Do you feel that the travel or traffic information that you receive is accurate (please circle a number)?

<table>
<thead>
<tr>
<th>Not accurate</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Very accurate</th>
</tr>
</thead>
</table>

16. Do you think that putting more police on the road during the rush hour would (please circle a number for each line):

- a. Decrease freeway safety 0 1 2 3 4 Greatly improve freeway safety
- b. Slow down the clearing of accidents 0 1 2 3 4 Greatly speed up clearing accidents
- c. Increase driving time 0 1 2 3 4 Greatly help you save driving time
- d. Slow down the flow of traffic 0 1 2 3 4 Greatly speed up the flow of traffic
- e. Increase the number of collisions 0 1 2 3 4 Greatly reduce the number of collisions

17. How long have you been driving in southeast Wisconsin?

- a. 0-3 months e. 2 – 5 years
- b. 4-6 months f. 5 – 10 years
- c. 6-12 months g. 10 –20 years
- d. 13 months –2 years h. More than 20 years
18. In what capacity do you do most of your driving?

a. Commuter  
   b. Recreational driver  
   c. Taxi driver  
   d. Commercial deliveries (for example, UPS)  
   e. Truck driver  
   f. Police officer  
   g. Bus driver  
   h. Chauffeur  
   i. Sales  
   j. Daily errands (shopping, etc.)

19. How many miles do you normally travel each week on freeways in southeast Wisconsin?

a. 0-50  
   b. 51-200  
   c. 201-500  
   d. 501-1000  
   e. 1001-5000  
   f. 5000 +

20. How many hours per week do you normally travel each week on freeways in southeast Wisconsin?

a. 0-2 hours  
   b. 3-4 hours  
   c. 5-6 hours  
   d. 7-8 hours  
   e. 9-10 hours  
   f. 11-20 hours  
   g. 21-30 hours  
   h. 31-40 hours  
   i. 41 + hours

21. In the past two years have you been in an accident in southeast Wisconsin?

a. No  
   b. Yes

If Yes, where (street & cross-streets)? _______________________

22. If you were involved in a minor accident on your most traveled area of freeway, where would you go to exchange information and wait for police assistance?

a. Nowhere. I would stay put  
   b. My home  
   c. Crash investigation site  
   d. Shoulder of the freeway  
   e. A safe, well lit area nearby  
   f. Police station
23. Consider your answer to the previous question (question 22). Why did you circle the answer that you did? Please only circle the one most important reason.

a. I want the police to see the accident as it is.
b. I feel safer not moving my car.
c. My insurance agent told me not to move my car if I am involved in an accident.
d. It is safer to move the cars off of the freeway.
e. I do not really know what I should do.

24. Is there a crash investigation site on any of the routes you travel most frequently? You can refer back to question #6 to help you remember what you stated as your most frequently traveled route.

a. No
b. Yes
c. Not sure

25. Have you heard of the TIME Program?

a. No
b. Yes

26. Do you know what the TIME Program is?

<table>
<thead>
<tr>
<th>Never heard of it</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Very familiar</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Now that you have answered questions #25 and #26, we would like to tell you a little bit about the TIME program (please do not change your answers to questions #25 and #26). The TIME program is a series of projects aimed at (1) improving and enhancing how accidents and breakdowns on freeways are handled, (2) improving freeway safety, and (3) enhancing the quality and efficiency of freeway travel. Some of these projects include using crash investigation sites, enhancing road markers, increasing the number of police on the road during rush hour, improving emergency vehicle response capabilities, and improving the cooperation between 911 dispatchers, police, ambulances, and hospitals.

27. Now that you know a little bit about the TIME program, please describe your reactions to the TIME program by circling the number that represents your feelings for each line:
a. Waste of money
b. Will do nothing for freeway safety
c. Will do nothing for clearing accidents
d. Will not help me save driving time
e. Will do nothing to reduce the number of collisions
f. Will do nothing to improve travel information
g. Will do nothing to improve response time of emergency vehicles

0 1 2 3 4

Good use of money
Will improve freeway safety
Will speed up clearing accidents
Will help you save driving time
Will reduce the number of collisions
Will improve travel information
Will improve response time of emergency vehicles

28. Do you know what a crash investigation site is?

Never heard of it

Very familiar

0 1 2 3 4

29. A crash investigation site is a special area on the side of a freeway where people who have been in minor accidents can move their cars and wait for police. Would you be willing to use a crash investigation site if you were in a minor accident (please circle a number)?

Definitely Not

Not

Probably

Maybe

Probably

Definitely

0 1 2 3 4

30. Do you own a cellular phone?

a. No
b. Yes

31. Are you aware that you can call 911 for free using your cellular phone?

a. No
b. Yes

32. If you were driving down the freeway, would you call 911 with a cellular phone to report an incident if you saw (please circle “yes” or “no” for each situation):
33. (If you answered “yes” to all of the options in question #32, please skip to question #34 now). If you answered “no” to any of the four scenarios in question #32, what is the reason that you would not make the call?

a. I’m usually in a hurry.
b. My cellular phone is not accessible to me when I am driving.
c. I would not know who to call.
d. I would assume that someone else had made the call.
e. I do not like to talk on the phone and drive at the same time.
f. I would make the call if there was a passenger in the car to use the phone.

34. Have you ever seen an accident or a breakdown on the freeway and reported it using your cellular phone?

a. I do not own or use a cellular phone (please skip to question #36)
b. No (please skip to question #36)
c. Yes

35. If you answered “yes” to the previous question, could you estimate what percent of the time you see an accident or breakdown on the freeway AND also report it with your cellular phone?

a. 0-25% (never to about one-quarter of the time)
b. 26-50% (one-quarter to about half of the time)
c. 51-75% (half to about three-quarters of the time)
d. 75-100% (three-quarters to about all of the time)

36. Are you:

a. Male
b. Female

37. What is your age?
a. 16-17  e. 25-30  i. 45-50  m. 65-70  
b. 17-18  f. 30-35  j. 50-55  n. 70-80  
c. 18-20  g. 35-40  k. 55-60  o. 80+  
d. 20-25  h. 40-45  l. 60-65

38. What is your ethnic background?
   a. American Indian or Alaskan Native
   b. Asian or Pacific Islander
   c. Black, not of Hispanic origin
   d. Hispanic
   e. White, not of Hispanic origin

39. What is your marital status?
   a. Married
   b. Single
   c. Separated
   d. Divorced
   e. Widowed

40. What is your education level?
   a. Some elementary school (grades 1-7)
   b. Completed elementary school (8 grades)
   c. Some high school (grades 9-11)
   d. Graduated from high school or G.E.D
   e. Some college or technical training beyond high school (1-3 years)
   f. Graduated from college (BA, BS)
   g. Some graduate school
   h. Graduate degree (Masters, Ph.D., M.D., etc.)

41. Which of the following employment categories best describes you?
   a. Employed full-time
   b. Employed part-time
   c. Unemployed
   d. Home maker
   e. Student
   f. Retired
   g. Other ___________________________

42. What other comments do you have about travel in Southeast Wisconsin?