Management and Analysis of Michigan Intelligent Transportation System Center Data with Application to the Detroit Area I-75 Corridor

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ABSTRACT

Incidents, pre-programmed or random, are major sources of congestion on urban freeways. With many urban freeways in the United States operating close to capacity, the need to reduce the impact of incident-related congestion has become critical. Incident Management Strategies (IMS), when properly developed and deployed, have the potential to reduce such urban congestion. The primary purpose of this study is to develop an analytic framework for the calibration and application of a micro-simulation model for testing the impact of alternate IMS's on an urban transportation network.

Following the presentation of the framework in a conceptual form, the authors demonstrate the application of the proposed model structured in Advanced Interactive Microscopic Model for Urban and Non-urban Networks (AIMSUN) micro-simulator. The model that is based upon the principles of dynamic traffic assignment is calibrated with various parameters to reflect real world traffic conditions for different times of day. The calibration and application of the proposed model is demonstrated on a heavily traveled portion of an urban network in the Detroit metropolitan region. The network spanning over 150 miles of freeways and arterials is instrumented with ITS devices. Adverse traffic scenarios such as incidents, lane closures and forced turnings are simulated on the freeways and the resulting effect for unguided and guided vehicles traversing the network are observed. The benefits of route guidance in terms of savings in travel time and in delay are observed. The model framework presented is found to be conceptually sound and robust, and it incorporates critical steps needed to test various traffic conditions reflected in operational improvements through proposed IMS's.

Keywords: incident management, dynamic traffic assignment, congestion, travel time, delay

TABLE OF CONTENTS

LIST OF TABLES

TABLE | **Page**

LIST OF FIGURES

FIGURE | **Page**

1. INTRODUCTION

Incidents continue to be major sources of congestion on urban freeways and arterials. Law enforcement and transportation agencies, along with emergency service providers in the United States are working together to develop viable Incident Management Strategies (IMS) to alleviate freeway congestion problems. A traffic incident is defined as "any occurrence on a roadway that impedes normal traffic flow" *(1)*. Typically, these are non-recurring events that cause temporary reductions in roadway capacity. Similar definitions are also provided in other sources *(2-3)*. Incidents can be pre-programmed, such as pre-announced work zone activities, or random, such as traffic crashes, disabled vehicles, spilled cargo, etc. Events as defined above, contribute significantly to traffic congestion on U.S. highways (*4*).

With many of the U.S. roadways operating close to capacity under the best of conditions, the need to reduce the impact of incident-related congestion has become critical. One way to achieve this is to improve the management of traffic after an incident has occurred, including the use of traffic diversion strategies. Key components of successful IMS's are early detection, efficient recovery, and effective diversion of traffic to the surrounding links in the network using variable message signs (VMS), and emerging technologies such as vehicle-to-vehicle communication, vehicle infrastructure integration (VII), intellidrive applications etc. Crucial components of an IMS are the recovery process and the use of traffic diversion strategies. Prolonged recovery is associated with increased delay and longer queues.

1.1 Problem Statement

The problem addressed in this report deals with the question of dynamically finding alternate paths in a given network for travel between zone pairs, when a section of the network is temporarily incapacitated because of incidents, either pre-programmed or random. Instant knowledge of such alternate paths with surplus capacities may enable Traffic Management Centers (TMC) to efficiently divert traffic from the affected portion of the network, thereby helping alleviate congestion. The overall purpose of the project conducted jointly at Wayne State University (WSU) with Grand Valley State University is to develop methods necessary to describe traffic flow in a freeway environment, both with and without traffic incidents. The role of WSU was to assist GVSU team in identifying, mining, and compiling data from the Michigan Intelligent Transportation Center (MITSC), Traffic.com, and other sources. As a part of this effort, the WSU team developed a micros-simulation model to assess the impact of deploying IMS's on an urban network. A major focus of this report is the calibration and application of the micro simulation model.

1.2 Literature Review

As a part of an earlier project that served the basis of the work, a thorough review of the pertinent literature was conducted in four specific areas: (1) IMS's and alternate route diversion on freeways and arterials, (2) various types of path and route choice models applied in IMS, (3) measures of effectiveness (MOE's) used to evaluate IMS, and (4) the application of micro-simulation models to analyze IMS's *(5)*. A detailed discussion of this literature is beyond the scope of this report. Only a brief summary of this review is presented below.

Many simulation software packages have been used over the years for dynamic traffic assignment, a complete discussion of which is beyond the scope of this paper. Examples include: CONTRAM (*6*), INTEGRATION (*7*) and DYNASMART (*8*), DYNAMIT/MITSIM (9-*10*), AIMSUN (*11*), CORSIM (*12*), PARAMICS (*13*), VISSIM (*14*). Each model has its own special characteristics, and was developed with a specific focus.

CONTRAM, INTEGRATION and DYNASMART are 'macro-particle' traffic simulation models where individual vehicles are tracked as they move through the network, but their velocities are determined by macroscopic speed/flow/density relationships. By contrast, DYNAMIT/MITSIM, CORSIM, PARAMICS, and VISSIM are microsimulation models, where each vehicle is modeled as an individual entity through the entire simulation process. AIMSUN is unique in it that all the three features, (i.e. macro, micro and meso) are embedded in the model. Some models also allow representation of alternative route choice behaviors, including allowances for dynamic response to real-time information. Examples of simulation-based research under congested conditions are included in the works of Breheret et al. (*15*), Ha et al. (*16*), Hounsell et al. (*17*), Smith and Ghali (*18*) and Smith and Russam (*19*)

Koutsopoulos et al. proposed a stochastic traffic assignment approach for assessing the effectiveness of motorist information systems in reducing recurrent traffic congestion *(20)*. The model was used for examining interactions among important parameters of the problem such as level and amount of information provided, users' access to information, and congestion levels. Abdel-Aty et al. reviewed a number of studies to understand driver behavior when influenced by an Advanced Traveler Information System (ATIS) (*21*). They concluded that there is a need to understand how drivers choose or change routes in the absence of information in order to gain an understanding of route choice behavior in the presence of information. The study concluded that ATIS is helpful in driver decision making.

Khattak et al. developed a methodology for incident duration prediction by using a series of truncated regression models (*22*). The model accounts for the fact that incident information at a Traffic Operations Center is acquired over the life of the incident. Cragg and Demetsky examined the merits and demerits of using simulation model as a decision aid for deploying traffic diversion strategies (*23*). A methodology for using such a model was demonstrated to determine the effects of various incident types on freeway traffic flow and the diversion of freeway traffic on the arterial network. The study concluded that simulation is an effective tool for IMS.

Madanat and Feroze predicted incident clearance time for Borman Expressway, Indiana (*24*). A parametric least-generalized cost path algorithm was developed to determine a complete set of extreme efficient time-dependent paths that simultaneously consider travel time and cost criteria. FHWA developed a framework for evaluating a multiagency traffic incident management program involving many agencies (*25*).

Balke et al. conducted a survey of traffic, law enforcement, and emergency service personnel to identify incident management performance measures in Texas (*26*). The basic objective of the survey was to collect driver behavior information and preferred route selection during incidents on road networks. Hidas et al. investigated the effectiveness of variable message signs (VMSs) for incident management (*27*). A survey was conducted in the Sydney Metropolitan Region to collect information on driver response to a range of VMS messages. They proposed a route-choice model to predict diversion rates resulting from various VMS's.

FHWA developed an alternate route information guide during various types of incidents (*28*). Five aspects are broadly discussed in the study (a) alternate route planning (b) alternate route selection (c) alternate route plan development (d) traffic management planning, and (e) implementation. FHWA also developed an Incident Command System (ICS), a tool for systematic command, control, and coordination for emergency response (*29*). ICS allows agencies to work together using a common terminology and a standardized operating procedure for controlling personnel, facilities, equipment, and communications at an incident scene

Wirtz et al. tested a dynamic traffic assignment model for managing major freeway incidents (*30*). Incidents of various scales and durations were modeled for a highway network in the northern Chicago area, and the impact of incidents and response actions were measured. It was found that the best response action to a given incident scenario was not necessarily intuitive and that implementing the wrong response could often worsen congestion.

The detailed literature review conducted as part of the project (only a part of which is reported above) clearly indicated that:

- Traffic incidents are major causes of delays on US highways. IMS's, if properly deployed, may have a significant impact on reducing traffic congestion and delay.
- Micro-simulation models are being increasingly used to analyze procedures to alleviate congestion problems
- Various MOE's have been used to evaluate different operational strategies, including: travel time, delay, queue length, traffic volume and volume to capacity ratio.
- Information, when properly communicated to motorists relative to time, space and sequence can be utilized effectively by motorists to find alternate paths in the network.

2. METHODOLOGY

A framework for using micro-simulation techniques in assessing the effect of IMS's is presented in this report along with the calibration and application of the framework on an actual transportation network in the Detroit metropolitan area. The Michigan Department of Transportation (MDOT), in collaboration with the U.S. Department of Transportation (USDOT) has established a Traffic Management Center (TMC) in Detroit, designed to monitor the performance of the regional freeway network, instrumented with state-of-the-art ITS equipment, including sensors, detectors, cameras, and close-circuit televisions. Much of the data used in the calibration and application of the model was extracted from archived records of the MDOT/TMC commonly referred to as the Michigan Intelligent Transportation Systems Center (MITSC), as well as from the web-based database provided by the Southeast Michigan Council of Governments (SEMCOG).

2.1 Framework

The proposed framework is presented in Figure 1. The five-step methodology encompassing policy and operational strategies associated with IMS can be summarized as follows:

Step 1: Network creation and assembling different databases.

Step 2: Identification of policies and development of algorithm that comprise the IMS.

Step 3: Calibration of micro-simulation model.

Step 4: Conducting micro-simulation-based experiments, by creating incidents on the network, and by using the databases, algorithm and policies identified in the earlier steps.

Step 5: Analysis of results.

The experimental design used in testing the framework encompasses two major components: (1) Model Calibration (Step-3) and (2) Model Application (Step-4) that are jointly referred to as the Model Development Process. Step-1 and Step-2 can be considered as preparatory procedures to the model development process, while Step-5 can be looked upon as the synthesis of the entire framework development.

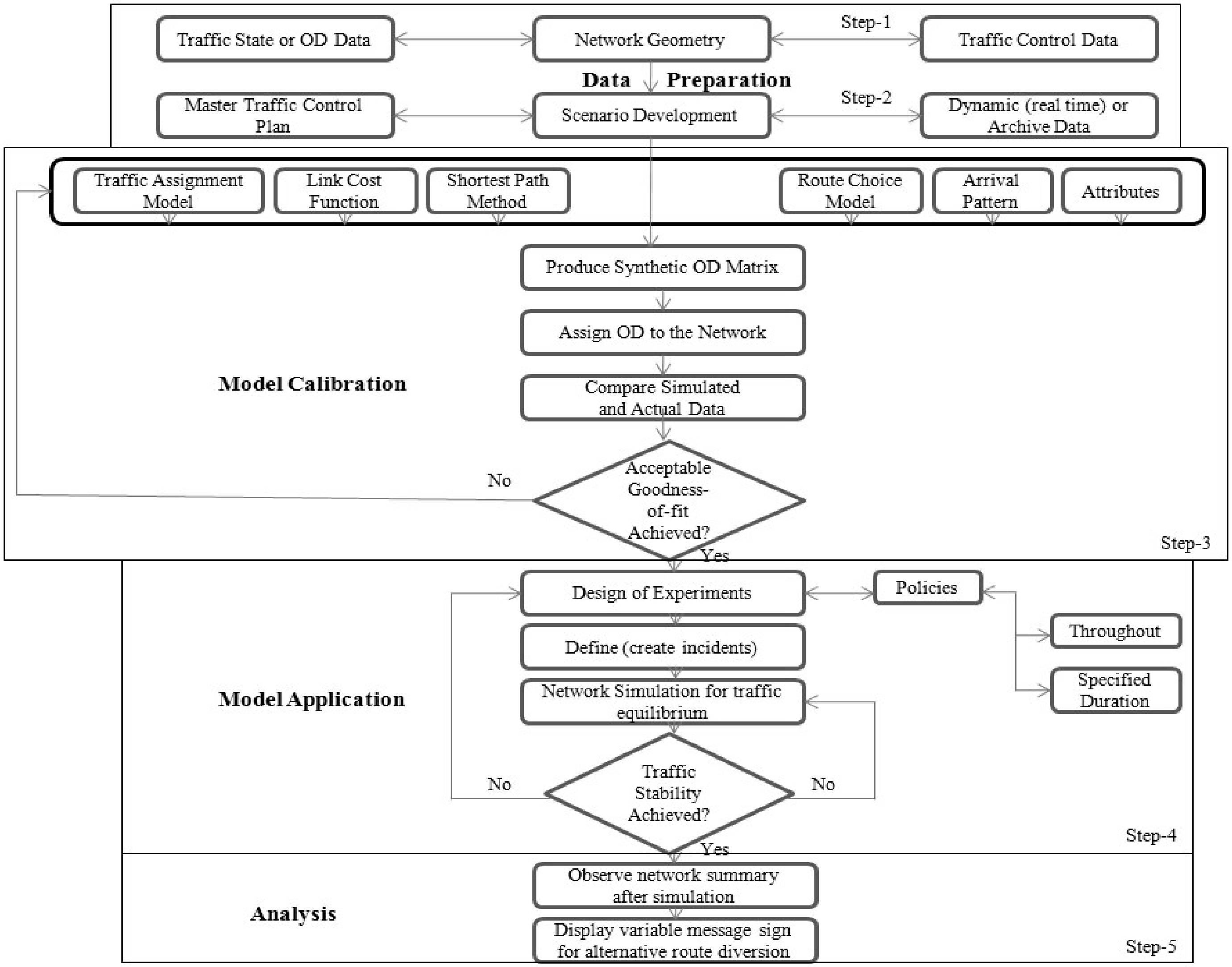

FIGURE 1 Framework for testing Incident Management Strategies (IMS)

2.2 Network Description

The test network in the Detroit metropolitan area consists of two freeways and 11 arterials (Figure 2). The freeways, Interstate 75 (I-75) and Interstate 696 (I-696) provide major mobility needs in the region in the North-South and East-West directions respectively. The arterials serve a combination of mobility and access function in the region. A summary of the network features is presented in Table 1.

The object of analysis is to assess the possible impact of incidents on I-75 in the northern part of the region where a major reconstruction program is to be undertaken soon by MDOT. All the E-W routes with an interchange on I-75 and all N-S facilities connecting to the major E-W arterials are included in the network so that any traffic diverted from I-75 because of incidents can find alternate routes.

The network analyzed consists of 3263 nodes and 3721 sections shown in Figure 2. A section is defined as a group of contiguous links where vehicles move in the same direction. The partition of the traffic network into sections is usually governed by the physical boundaries of the area and the existence of turning movements. There are 185 centroids representing 185 zones that comprise 34225 origin destination (O-D) pairs. The network has a total of 50 sensors on the two freeways that record the traffic characteristics continuously. VMSs can be placed before freeway exits to inform drivers of regulations that are applicable only during certain periods of the day or under certain traffic conditions. Freeway ramps, merging points and exit points are coded according to their lengths and curvatures. Traffic volume and signal timing data were collected from the Southeast Michigan Council of Governments (SEMCOG), Macomb County Road Commission (MCRC), and Traffic.com, a private agency that works closely with MDOT.

TABLE 1 Network Summary

Highway Name	Highway Class	# of Lanes per direction	Posted Speed Limit (miles per hour)	Approximate Length (miles)
I-75	Freeway	3*	70	18.97
I-696	Freeway	3*	70	14.48
Telegraph	Major Arterial	3	40	15.16
Woodward	Major Arterial	4	40	16.05
Ryan	Major Arterial	2	30	12.38
Van Dyke	Major Arterial	3	40	12.58
M-59	Arterial	3	40	15.88
8 Mile	Arterial	4	45	13.57
12 Mile	Arterial	2	40	13.32
14 Mile	Arterial	2	40	13.27
Big Beaver	Arterial	3	40	7.90
Baldwin Ave	Arterial	2	40	4.15
Walton Blvd	Arterial	2	40	3.00

Note*: Some sections of freeway (I-75 and I-696) consist of 4 lanes per direction

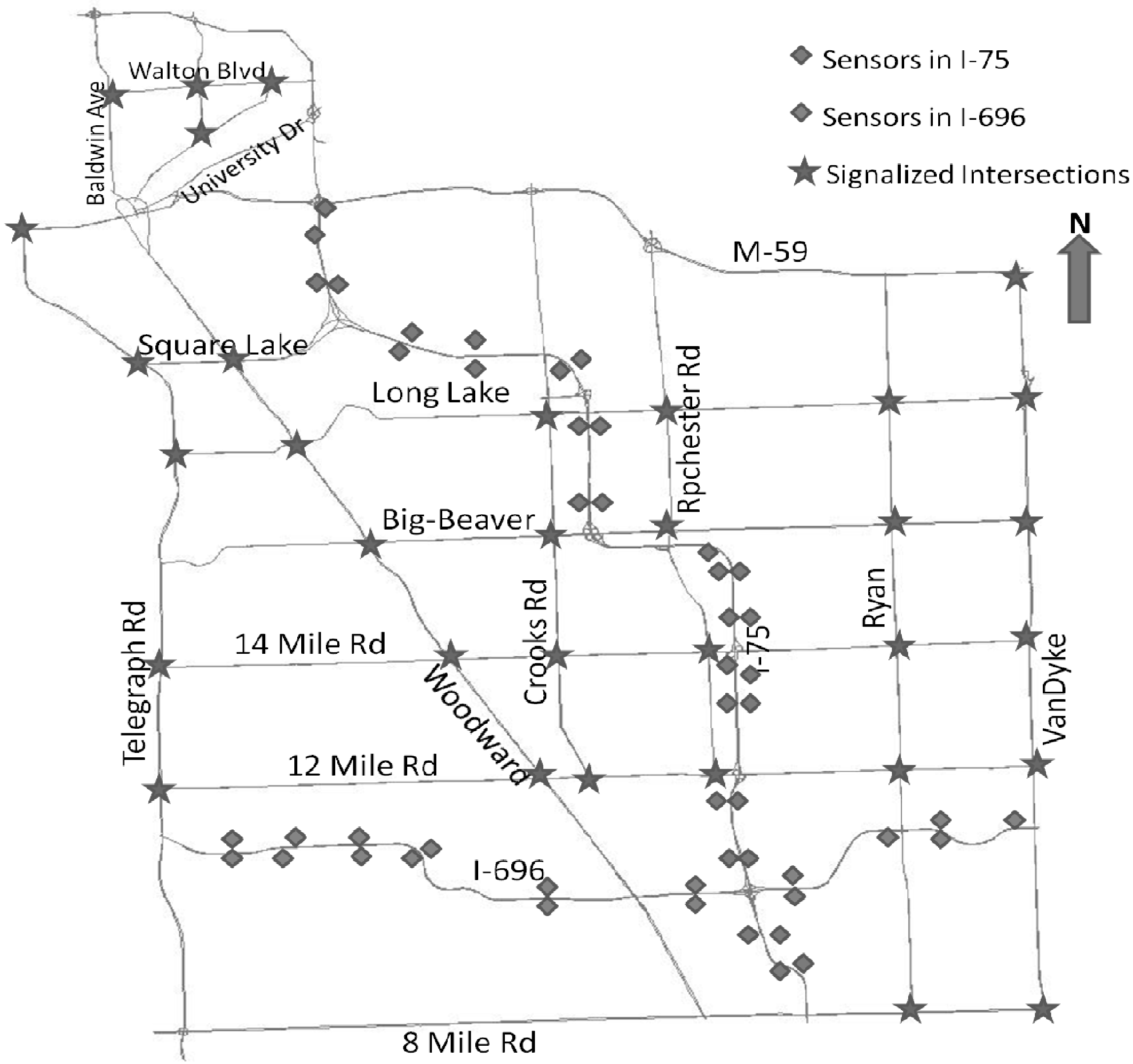

FIGURE 2 Study Area Network

2.3 Freeway Courtesy Patrol (FCP) Program

The Alliance for a Safer Greater Detroit initiated a Freeway Courtesy Program in September 1994 with the purpose of enhancing motorist safety and security while reducing traffic congestion. The program that started with two vans in 1994 has continued to grow, and is currently administered by MDOT as a part of its larger freeway incident management program over the three county area (Wayne, Oakland and Macomb) in metro Detroit. FCP is now integrated with the Michigan Intelligent Transportation Systems Center (MITSC) in Detroit. In 2007, the program employed 24 drivers who operated 24 vans 24 hours a day over the weekdays with a reduced service during weekends.

An analysis of the FCP data shows that the Benefit cost ratio of the program, that considered all costs associated with implementing the program, and the travel time savings of the motorists as the only benefit, ranged from a low of 6.6 in 1995-96 to a high of 17.1 in 1998. The data also showed that since the year 2005, the Benefit cost ratio has stabilized around 15.5 *(31)*. The program has also resulted in significant reductions in the emission of volatile organic compounds (VOC), nitrogen oxides (NOx), and Carbon monoxide (CO) pollutants.

Currently, the FCP database includes six types of events or troubles: Flat Tire, No Gas, Mechanical, Accident, Debris and Abandoned Vehicle. Detailed information on 30 such events on the first four categories and 15 on the last two categories were collected for the study from the FCP data for the year 2009. Wherever possible the FCP data was co-ordinated with traffic sensor data (nearest to the location of the event) for information on the exact location, clearance time, date, flow and travel time. These data were then used for calibration (2 sensor locations for each of the six types of events), and application purposes (approximately 50 events representing all the six categories).

3. TESTING OF THE FRAMEWORK

The micro-simulator available in the AIMSUN software is used to test the methodology. AIMSUN is developed by Transportation Simulation Systems (TSS), Barcelona, Spain and is capable of incorporating various types of incidents in a network consisting of detectors, traffic signals, VMS and other attributes. The input data requirement for AIMSUN is a set of scenarios (network description, traffic control plan and traffic demand data) and parameters (simulation time, statistical intervals, reaction time, etc.) which define the experiment *(10)*. MOEs used in assessing the performance of the model are: travel time, delay and queue length.

The proposed approach for testing the framework is shown in Figure 2. The model calibration is conducted in two sequential channels. Initially, the model is calibrated without any incident data. Upon completion of no incident calibration, the model is further validated with incident data. The validated model is then used to test different IMS strategies. These are further elaborated in the following sections.

3.1 Model Calibration

The purpose of model calibration is to ensure that the model output is a reasonable replication of traffic flow characteristics observed in the field. The parameters that explain the field data are then used in testing the effectiveness of different strategies. A special characteristic of this study is the utilization of archived data collected from sensors in the freeway network available through MDOT/MITSC and a private operator, Traffic.com. Model calibration is discussed in details later in this report.

The model calibration is divided into two categories. They are classified as No-Incident calibration and Incident calibration. Also, under the No Incident Calibration, a set of four OD matrices are shown in Figure 3. These are explained below.

- OD Matrix 1: This OD matrix is developed for calibration of model under no-incident scenario. The observed traffic volume data recorded by various sensors on a specific day is input into the AIMSUN tool. This data is used by AIMSUN to generate a trip table (185*185)[1] (OD Matrix 1) in 5 minute intervals through matrix adjustment. The OD matrix thus developed is used for simulating the real time scenario.

- OD Matrix 2: This OD matrix is developed for calibration under no-incident scenario. Unlike the OD Matrix 1, this matrix (185*185) is generated from SEMCOG's large regional matrix estimated for the year 2015. This data is input into AIMSUN tool in the form of an OD Matrix directly.

- OD Matrix 3: This OD Matrix is developed for calibration of model under incident scenario. The procedure is similar to the development of OD Matrix 1 excepting that the traffic volume data used in this case is the data recorded by various sensors over the incident duration.

[1] The study area includes a total of 185 Traffic Analysis Zones (TAZ) that includes 158 internal zones and 27 external stations.

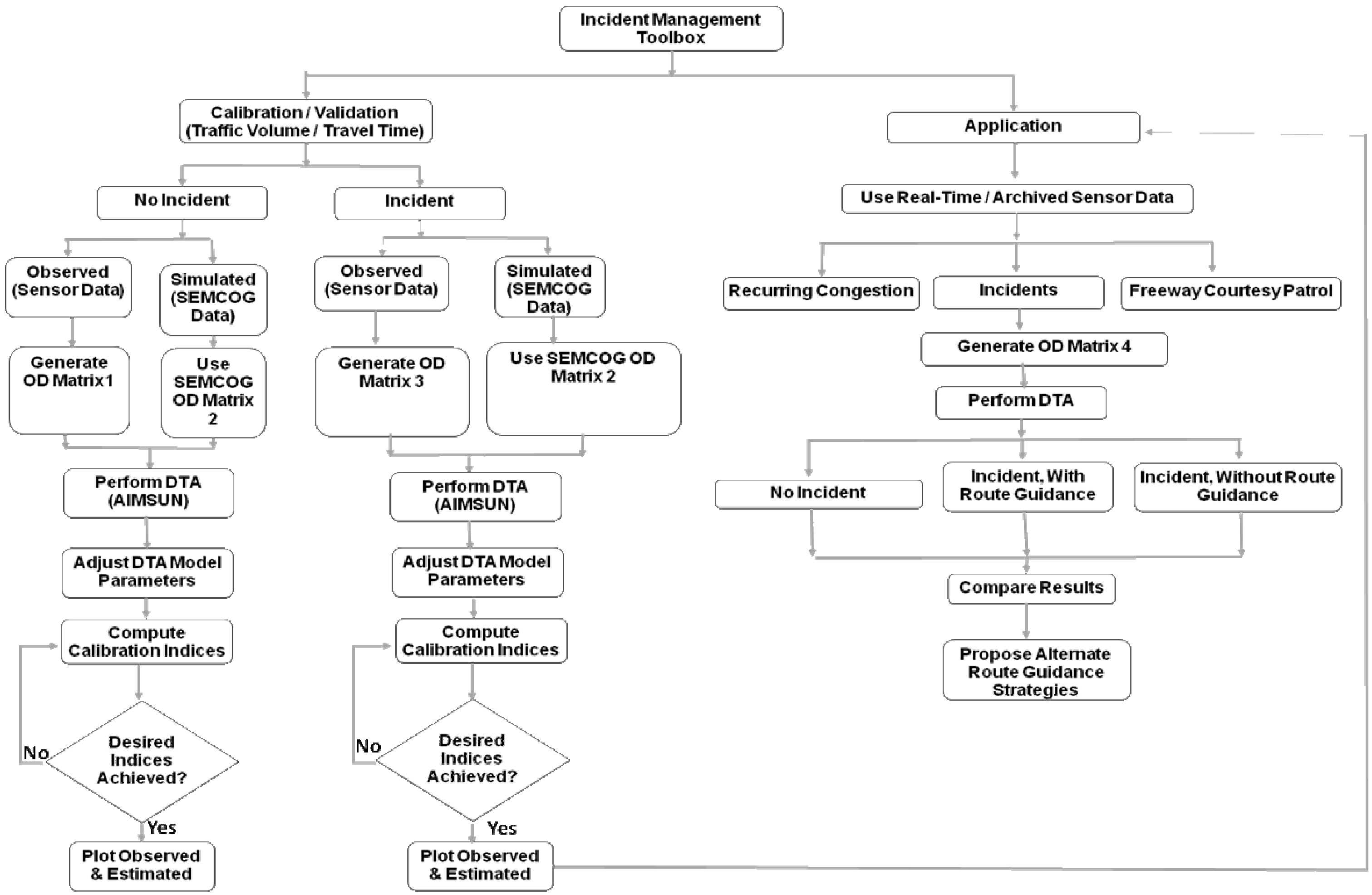

FIGURE 3 Model Development Process

- OD Matrix 4: This matrix is developed for the application part of the model under the incident scenarios. This matrix is same as the OD-matrix 3 except that a different day and time of the incident is selected.

3.1.1 No Incident Calibration

- Traffic volume data was collected from Traffic.com in the form of sensor data for a period of 3 hours on 7/12/2008 from 3:00PM to 6:00PM.

- This volume data, when input to AIMSUN was instrumental in creating a 185 x 185 O-D matrix for the exact time period between 3:00 PM and 6:00 PM. (OD Matrix 1)

- A sub-area O-D matrix (185*185) is generated for the network under consideration from SEMCOG'S large regional matrix for the year 2015. (OD Matrix 2)

- The two 185 x 185 O-D matrices developed using two different tools from two different sources are input back to AIMSUN and are subjected to dynamic traffic assignment (DTA) while adjusting the DTA parameters.

- Sensors present in the model are used to record traffic volumes at 5 minute intervals.

3.1.1(a) Traffic Volume Calibration

  - These traffic volumes are compared to achieve a reasonable correspondence. DTA parameters are adjusted until a desired degree of correspondence is achieved between the two data sources.

  - In Figures 4(a)-4(c), the authors present the best match for three sensor locations on I-75 freeway. Each of the data pairs represents a five minute volume, the observed data (OD Matrix 1) and the simulated data (OD Matrix 2). There are 36 five minute intervals over the simulation period of three hours as shown in figures 4(a) through 4(c).

  - These figures indicate that even though there is not a perfect match between the two sets of data, a reasonable correspondence was achieved.

  - Table 2 lists a set of tests that were conducted to further validate the model. These goodness-of-fit statistics are used in literature for micro-simulation model calibration *(32-37)*.

  - The procedure is repeated with an entirely different set of sensor data collected on 9/22//2008 from 3:00PM to 6:00PM for more reliability and the results are presented in figures 5(a) through 5(c).

  - Results of the tests are presented in Table 3 and the goodness-of-fit statistics are acceptable for all the tests conducted.

TABLE 2 Goodness-of-fit measures for Calibration (*31-36*)

Goodness-of-fit Measures	Formulae	Desirable
RMSE (Measures Overall % Error)	$\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i - y_i}{y_i}\right)^2}$	Close to 0
Correlation Coefficient: *r* (Measures Linear Association)	$\frac{1}{n-1}\sum_{i=1}^{n}\frac{\left(x_i-\bar{x}\right)\left(y_i-\bar{y}\right)}{\sigma_x\sigma_y}$	Close to 1
Theil's Inequality Coefficient: *Ui* (Disproportionate Weight of Large Errors)	$\frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(x_i-y_i\right)^2}}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}y_i^2}+\sqrt{\frac{1}{n}\sum_{i=1}^{n}x_i^2}}$	Close to 0
Theil's Component: *Us* (Measure of Variance Proportion)	$\frac{n\left(\sigma_y-\sigma_x\right)^2}{\sum_{i=1}^{n}\left(y_i-x_i\right)^2}$	Close to 0
Theil's Component:*Uc* Measure of Covariance Proportion	$\frac{2\left(1-r\right)n\sigma_y\sigma_x}{\sum_{i=1}^{n}\left(y_i-x_i\right)^2}$	Close to 1
Theil's Component:*Um* (Measure of Bias Proportion)	$\frac{n\left(\bar{y}-\bar{x}\right)^2}{\sum_{i=1}^{n}\left(y_i-x_i\right)^2}$	Close to 0

Notations used in the goodness-of-fit measures are:

x_i :	Simulated traffic measurement value at time *i*
y_i :	Actual traffic measurement value at time *i*
$\bar{x}$:	Mean of simulated traffic measurement values
$\bar{y}$:	Mean of actual traffic measurement values
σ_x :	Standard deviation of simulated traffic measurement values
σ_y :	Standard deviation of actual traffic measurement values

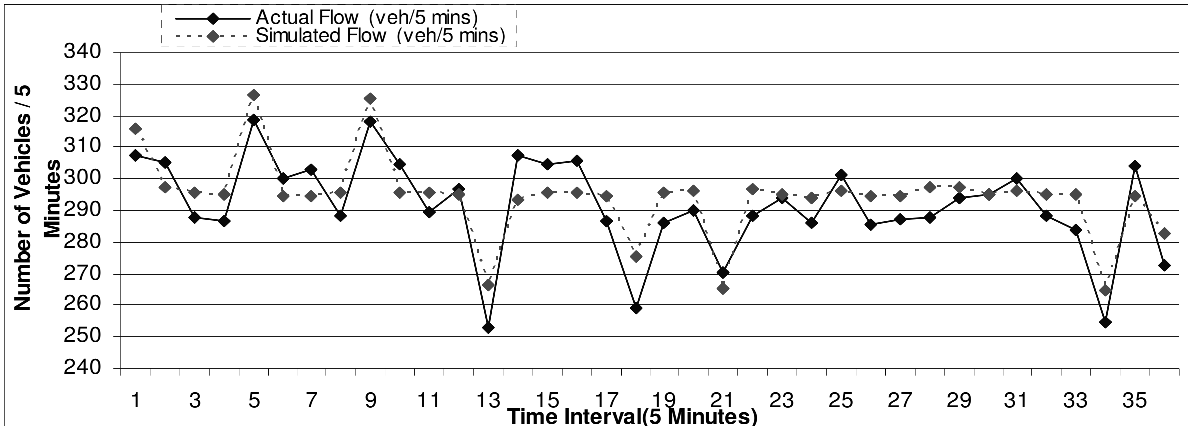

FIGURE 4(a): No Incident - Sensor MI075200N (S of 12 Mile at I-75), Date:7/12/2008, Time: 3:00PM-6:00PM

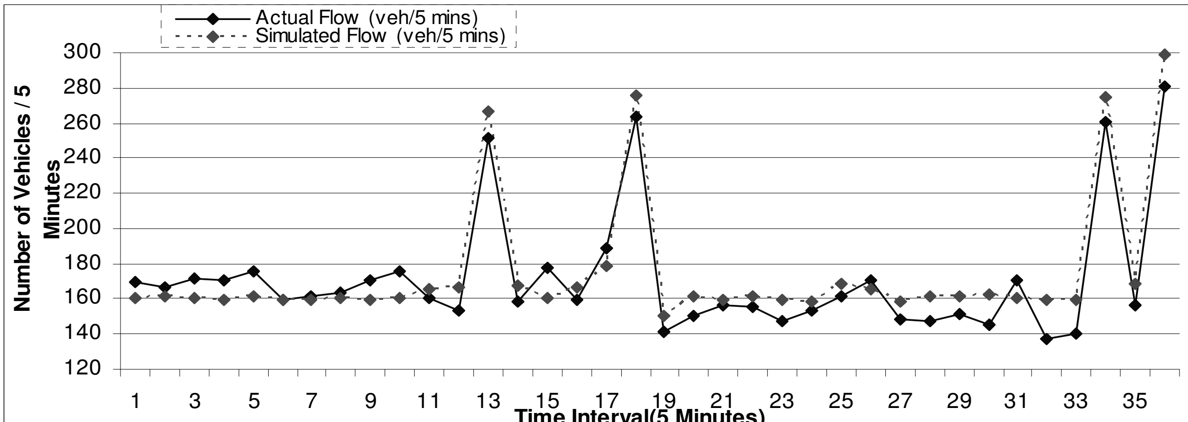

FIGURE 4(b): No Incident - Sensor MI075220N (S of 14 Mile at I-75), Date:7/12/2008, Time:3:00PM-6:00PM

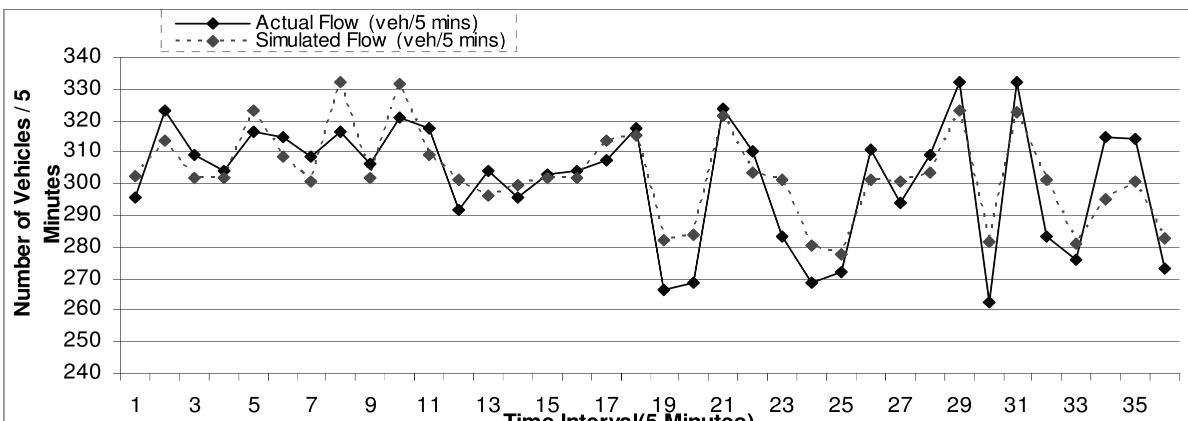

FIGURE 4(c): No Incident - Sensor MI075200S (S of 12 Mile at I-75), Date:7/12/2008, Time: 3:00PM-6:00PM

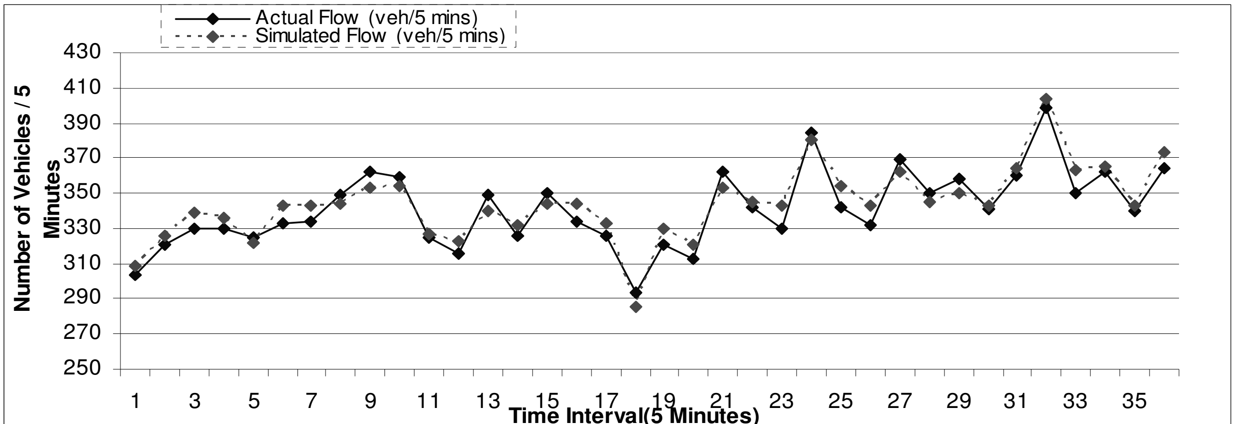

FIGURE 5(a): No Incident - Sensor MI075200N (S of 12 Mile at I-75), Date:9/22/2008, Time: 3:00PM-6:00PM

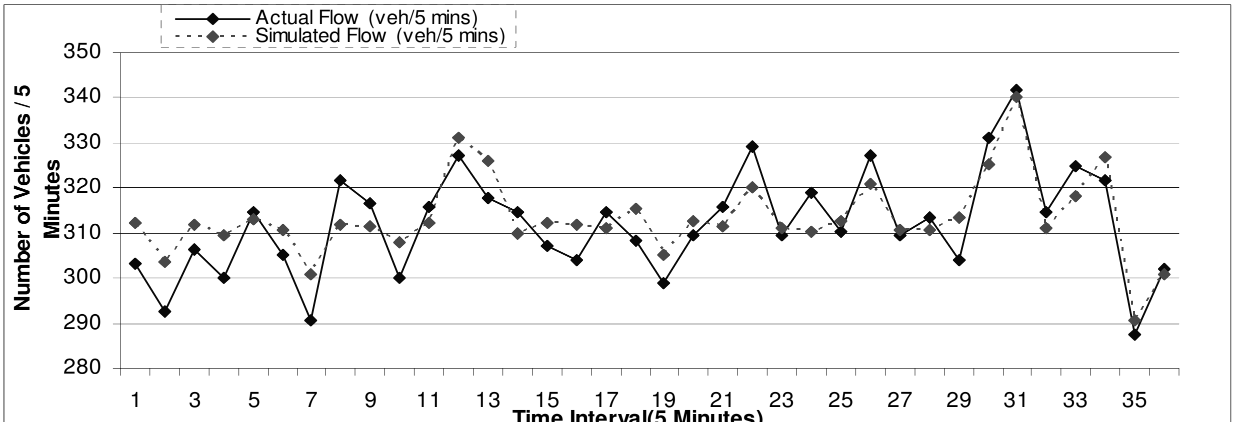

FIGURE 5(b): No Incident - Sensor MI075240N (S of 14 Mile at I-75), Date:9/22/2008, Time: 3:00PM-6:00PM

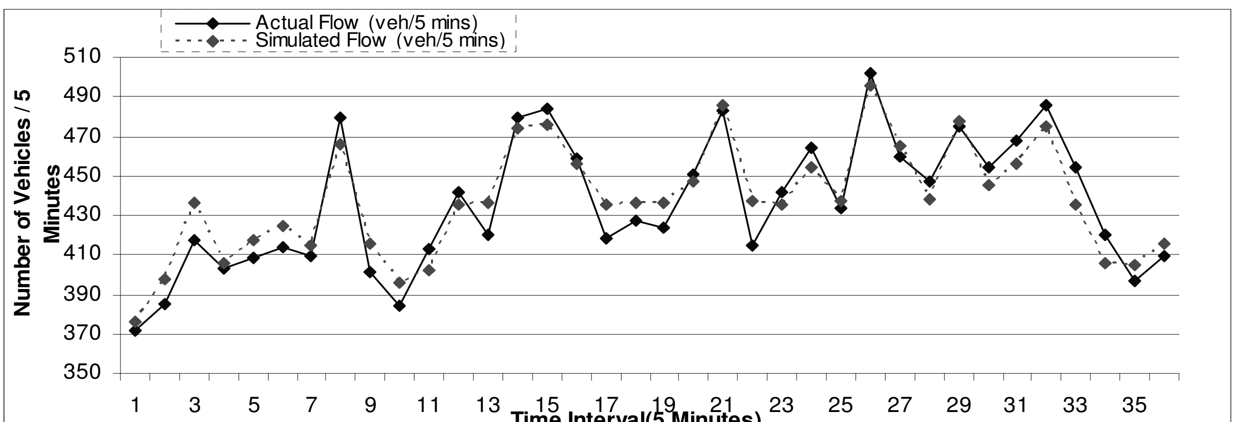

FIGURE 5(c): No Incident - Sensor MI075200S (S of 12 Mile at I-75), Date:9/22/2008, Time: 3:00PM-6:00PM

3.1.1(b) Travel Time Calibration

- The actual travel time observed on various links is obtained from SEMCOG Cutline (Transportation Data Management System) At the end of animated simulation, AIMSUN is capable of calculating the travel time on various links of the network.

- Thus the simulated travel time is plotted against observed travel time on 7/12/2008 for the selected links and is shown in Figure 6(a). Figure 6(b) shows the actual and simulated travel time for second set of data observed on 9/22/2008.

- It is to be noted that the SEMCOG Cutline (Transportation Data Management System) does not provide day specific travel time data. Thus both sets of simulated data are compared with the same set of observed travel time recorded on 3/1/2009.

- As in the case of Traffic volume calibration, goodness-of-fit statistics are used to further validate the model and are shown in Table 4.

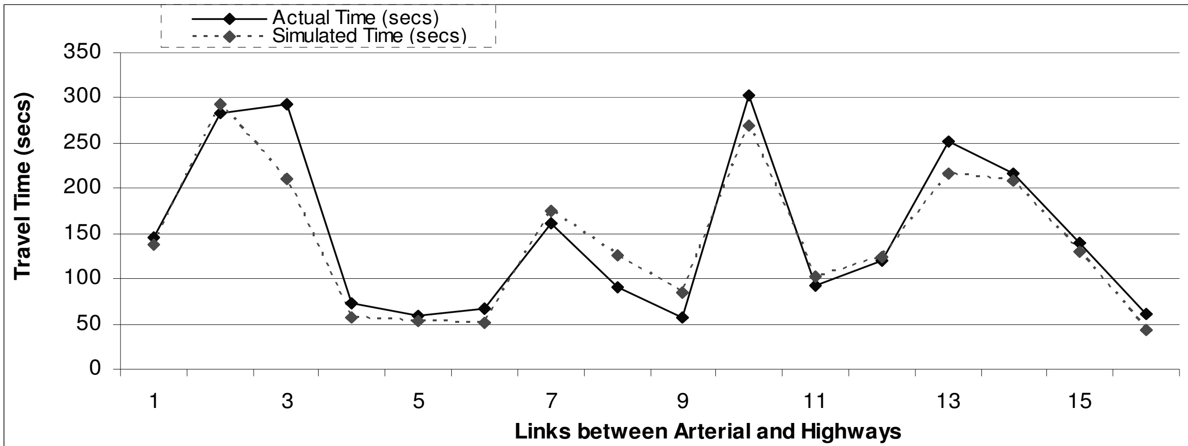

FIGURE 6(a): No Incident - 7/12/2008, tIME: 3:00PM-4:00PM

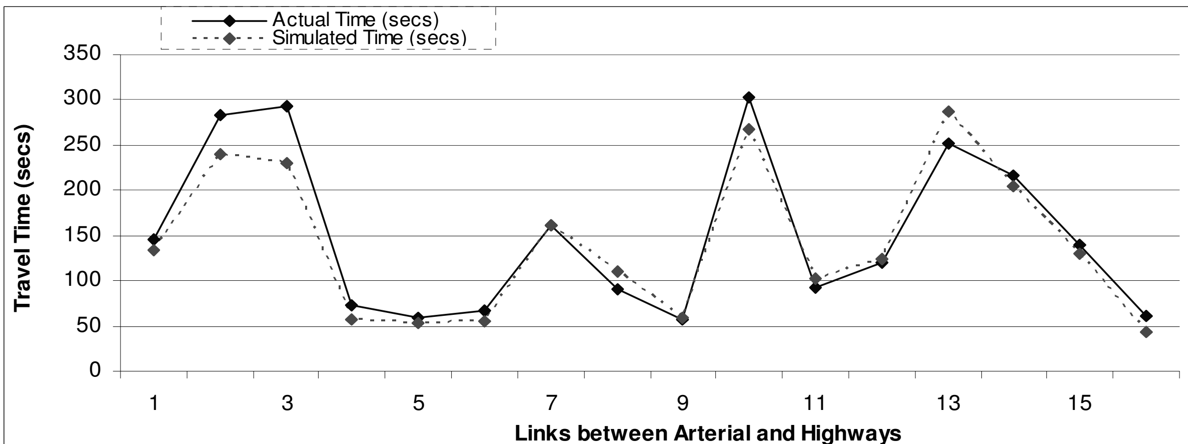

FIGURE 6(b): No Incident - 9/22/2008, Time: 3:00PM-4:00PM

Serial No (X axis)	Links between Arterial and Highways	Serial No (X axis)	Links between Arterial and Highways
1	I-75-JohnR @ 12 Mile[2]	9	11M-12M @ I-75
2	JohnR-Ryan @ 12 Mile	10	Ryan-VanDyke @ M59
3	Ryan-Vdyke @ 12 Mile	11	Rochester-JohnR @ M59
4	12M-13M @ I-75	12	John R-Ryan @ M59
5	13M-14M @ I-75	13	Crooks-Rochester @ M59
6	I-75-Crooks @ LongLake	14	I-75-Crooks Rd M59
7	8M-9M @ I-75	15	I-75-Ryan @ M102B
8	9M-I-696 @ I-75	16	14M-Maple @ I-75

[2] Between I-75 and John R on 12 Mile Road

3.1.2 Incident Calibration

- The inputs for the Incident Calibration are extracted from two sources. One of the source is FCP (Freeway Courtesy Patrol)/ Traffic dot com and the other one is from sub-area O-D Matrix extracted from SEMCOG regional matrix (OD Matrix 2).

- The incidents are identified from trouble codes from FCP. Trouble code 1, 2, 3, 4, 5 and 6 are categorized as Abandoned vehicles, Flat Tire, No Gas, Mechanical Problems, Debris and Accident, respectively.

- The date, time, number of lanes and the lane where the trouble occurred is identified from FCP database. Sensor volume data for five minute intervals corresponding to the same date and time is imported into AIMSUN from the Traffic dot com database. The sensor data creates a 185*185 trip table in AIMSUN when imported into it and it serves as the observed data for the simulation. (OD Matrix 3)

- The trip table generated from the sub-area OD Matrix 3 serves as the simulated data for the Incident simulation.

3.1.2(a) Traffic Volume Calibration:

- The location on I-75 where the trouble has occurred, and the lanes that are affected by it are manually deactivated and then the simulation is run using the OD Matrix 2. After the simulation three sensors were chosen and their volume data for each five minute interval was recorded. This set of data served as the simulated flow data for the Incident simulation.

- The same procedure above is implemented using the OD Matrix 3. This set of volume data per five minute interval served as the observed flow data.

- These two sets of data when plotted showed close resemblance to each other. The figures for traffic flow calibration are shown for each trouble (Figure 7(a)-7(l)).

- The goodness of fit measures for each trouble is also computed and is shown in Table 3 for Traffic flow Calibration.

TROUBLE 1 (Abandoned Vehicles) **Time: 8:35AM-10:00AM**
Date: 01/19/2009

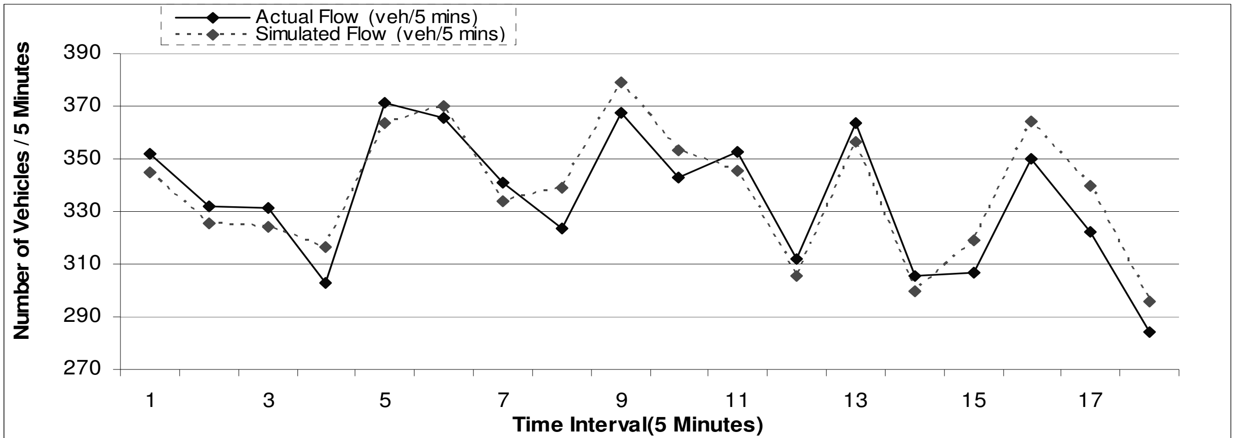

FIGURE 7(a): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075180S (N of I-696 at I-75)

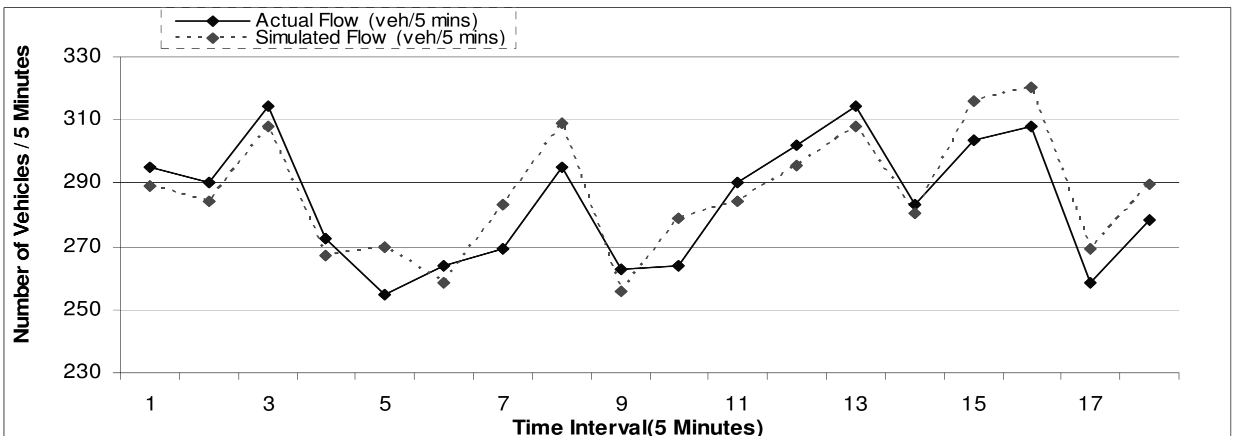

FIGURE 7(b): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075220S (S of 14M at I-75)

TROUBLE 2: (Flat Tire) **Time: 5:40PM-7:05PM**
Date: 01/19/2009

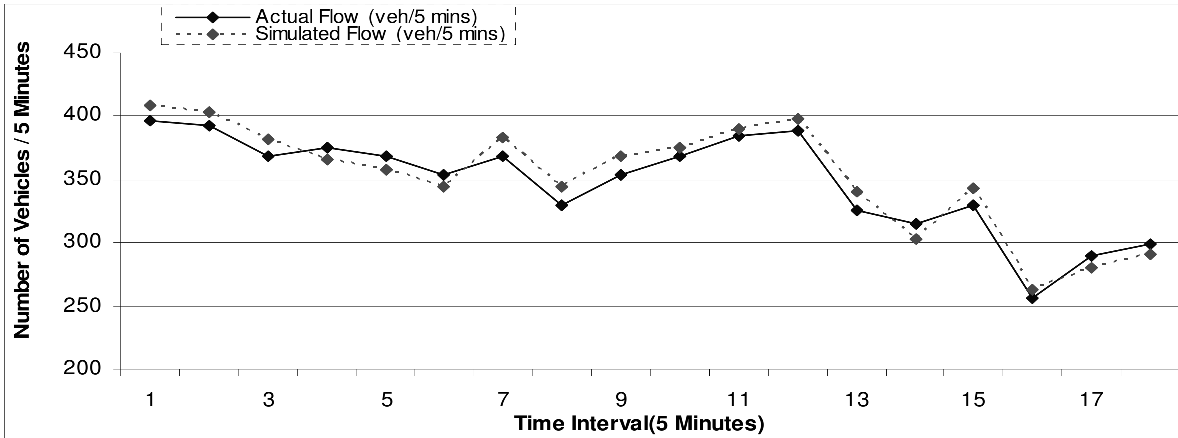

FIGURE 7(c): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075220S (S of 14M at I-75)

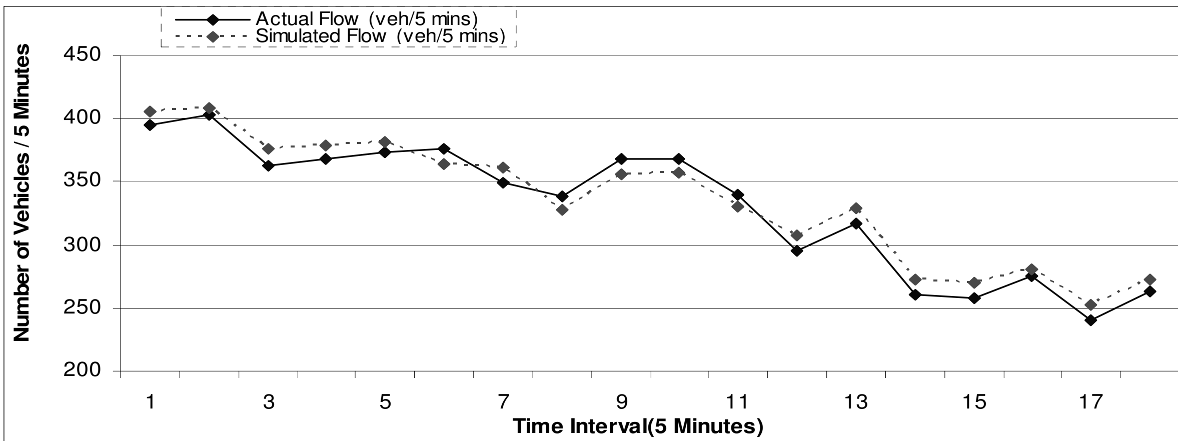

FIGURE 7(d): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075220S (S of 14M at I-75)

TROUBLE 3: No Gas **Time: 3:15PM-4:40PM**
Date: 01/24/2009

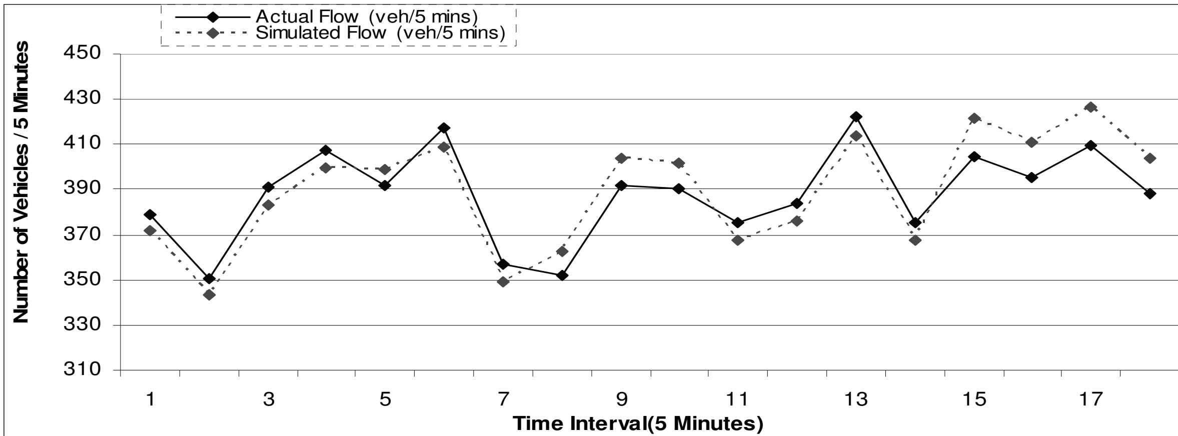

FIGURE 7(e): (Right Lane Closed at NB I-75 @ 13 Mile) - Sensor MI075220N (S of 14M at I-75)

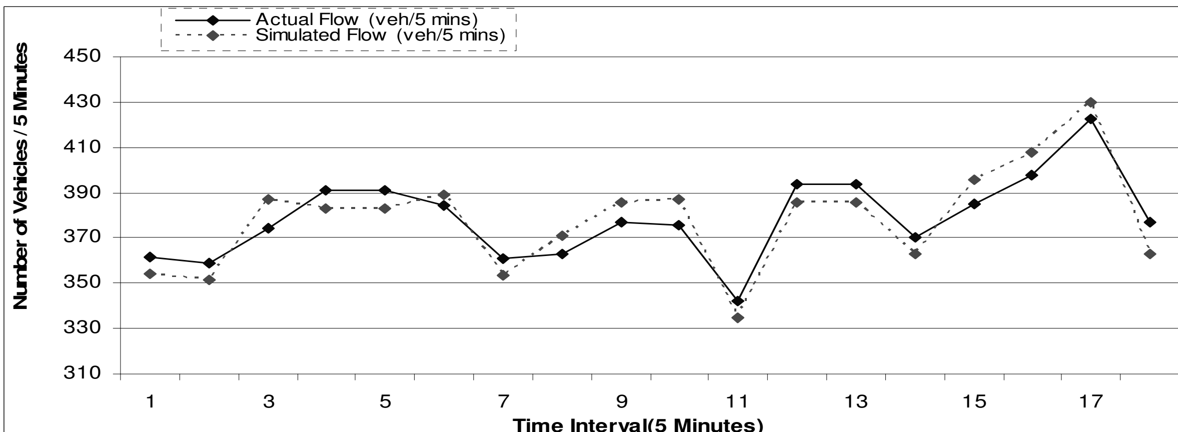

FIGURE 7(f): (Right Lane Closed at NB I-75 @ 13 Mile) - Sensor MI075200N (S of 12M at I-75)

TROUBLE 4: (Mechanical) **Time: 2:25PM-3:50PM**
Date: 01/26/2009

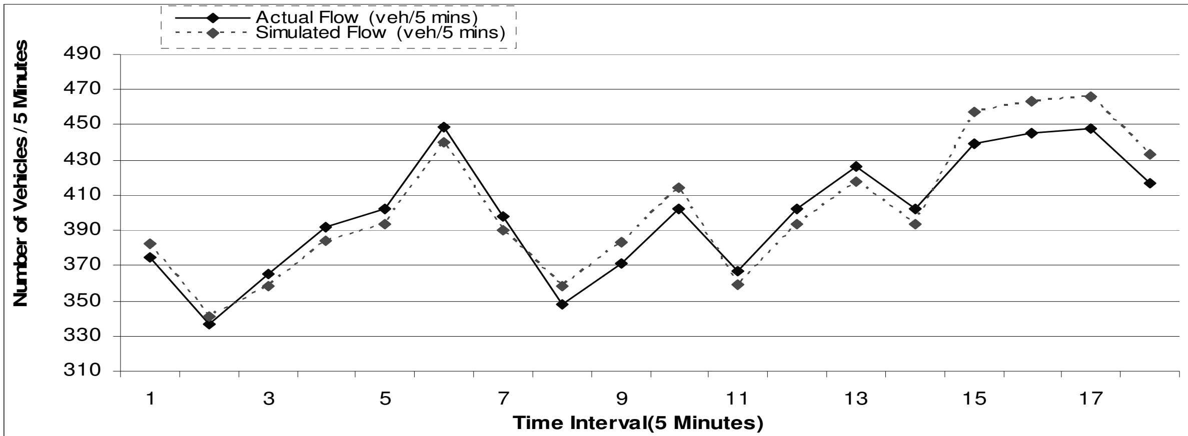

FIGURE 7(g): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075200S (S of 12M at I-75)

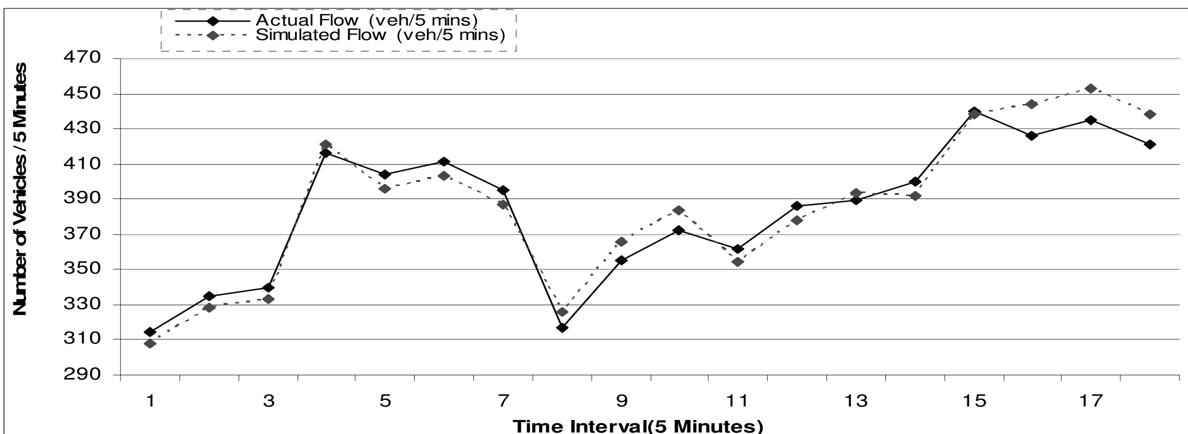

FIGURE 7(h): (Right Lane Closed at SB I-75 @ 12 Mile) - Sensor MI075220S (S of 14M at I-75)

TROUBLE 5: (Debris)

Time: 4:25PM-5:50PM
Date: 02/06/2009

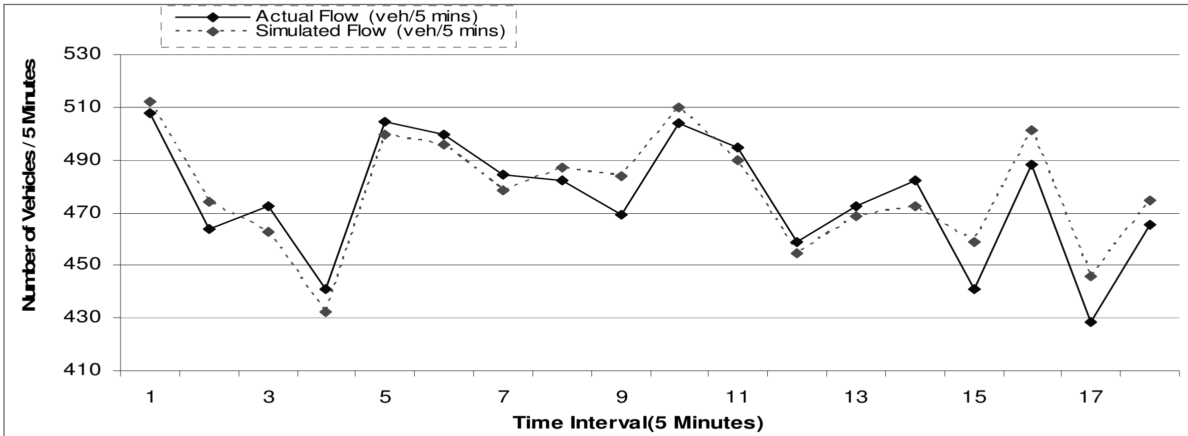

FIGURE 7(i): (Right Lane Closed at SB I-75 @ 14 Mile) - Sensor MI075220S (S of 14M at I-75)

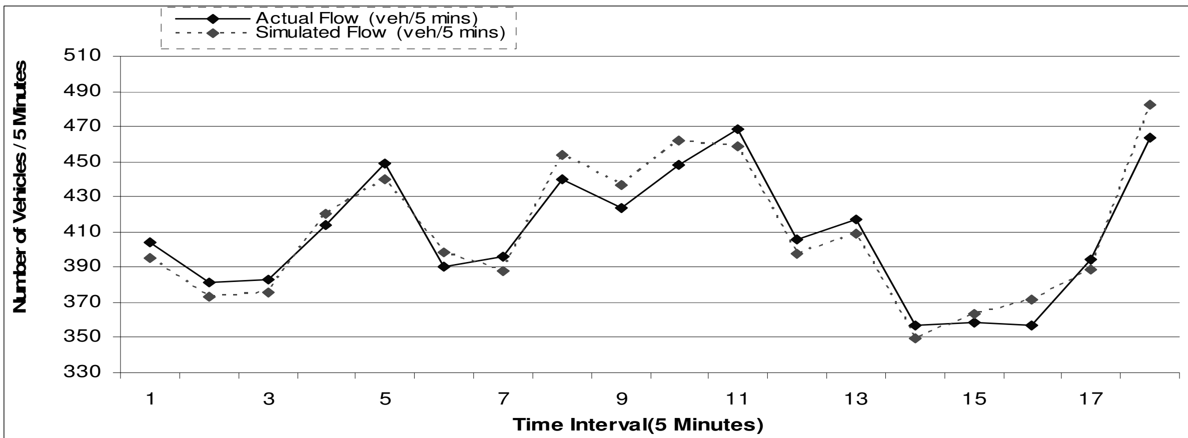

FIGURE 7(j): (Right Lane Closed at SB I-75 @ 14 Mile) - Sensor MI075240S (S of 15M at I-75)

TROUBLE 6: (Accident) **Time: 8:10AM-9:35AM**
Date: 01/13/2009

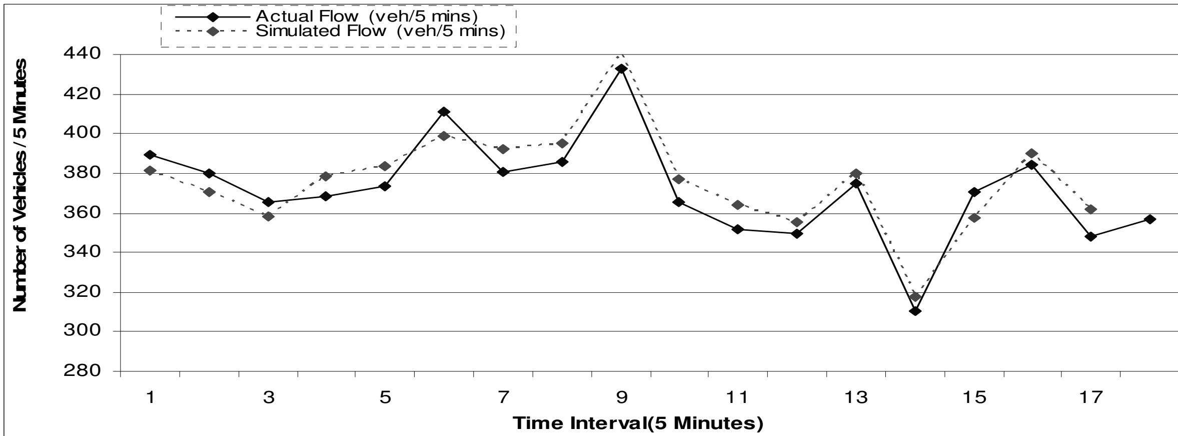

FIGURE 7(k): (Right Lane Closed at SB I-75 @ 13 Mile) - Sensor MI075200S (S of 12M at I-75)

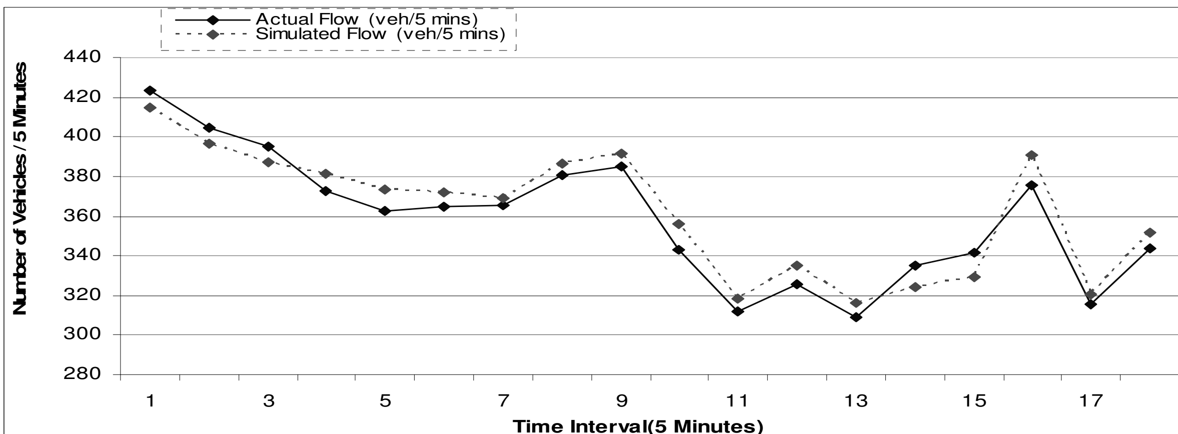

FIGURE 7(l): (Right Lane Closed at SB I-75 @ 13 Mile) - Sensor MI075220S (S of 14M at I-75)

3.1.2(b) Travel Time Calibration:

- The figures for travel time calibration (Figure 8(a)-8(f) are shown under the heading for each trouble.
- The goodness of fit measures for each trouble for travel time calibration is shown in Table 4.
- A composite Root Mean Square Error (RMSE) test was also conducted for the goodness-of-fit between the two sets of volume data and travel time data in the network for I-75. The simulated volume and actual volume are plotted in Figure 9(a) and the simulated Travel time and actual Travel time are plotted in Figure 9(b).
- Both the figures show a total of 384 data points (32 locations with 12 five minute counts at each location). The RMSE value is computed as 0.0001. Further, the two sets of values, when plotted on a graph, formed a linear representation at 45° (Figure 9(a) and 9(b)).

TROUBLE 1 (Abandoned Vehicles) **Time: 8:35AM-10:00AM**
Date: 01/19/2009

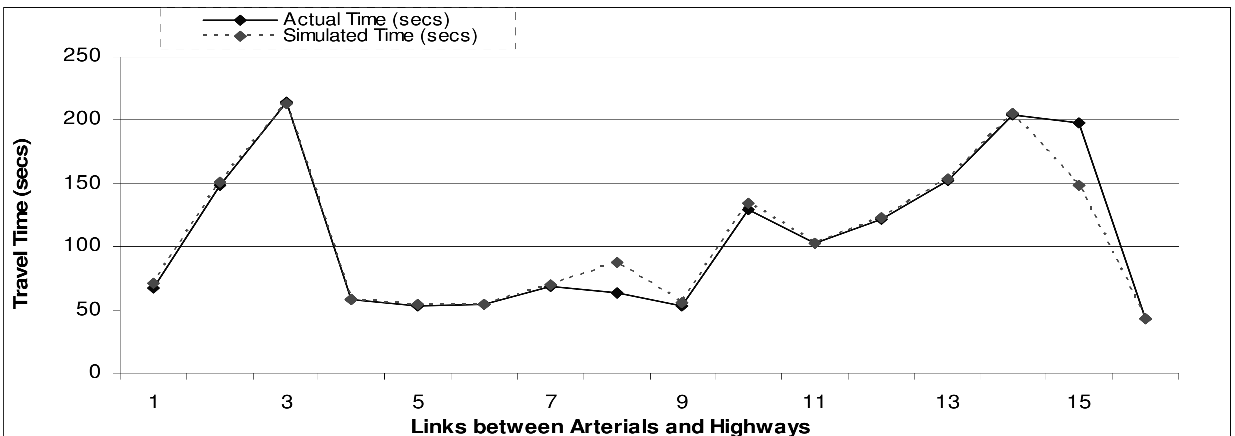

FIGURE 8(a): Right Lane Closed at SB I-75 @ 12 Mile

Serial No (X axis)	Links between Arterial and Highways	Serial No (X axis)	Links between Arterial and Highways
1	I-75-JohnR @ 12 Mile[3]	9	11M-12M @ I-75
2	JohnR-Ryan @ 12 Mile	10	Ryan-VanDyke @ M59
3	Ryan-Vdyke @ 12 Mile	11	Rochester-JohnR @ M59
4	12M-13M @ I-75	12	John R-Ryan @ M59
5	13M-14M @ I-75	13	Crooks-Rochester @ M59
6	I-75-Crooks @ LongLake	14	I-75-Crooks Rd M59
7	8M-9M @ I-75	15	I-75-Ryan @ M102B
8	9M-I-696 @ I-75	16	14M-Maple @ I-75

[3] Between I-75 and John R on 12 Mile Road

TROUBLE 2: (Flat Tire) **Time: 5:40PM-7:05PM**
Date: 01/19/2009

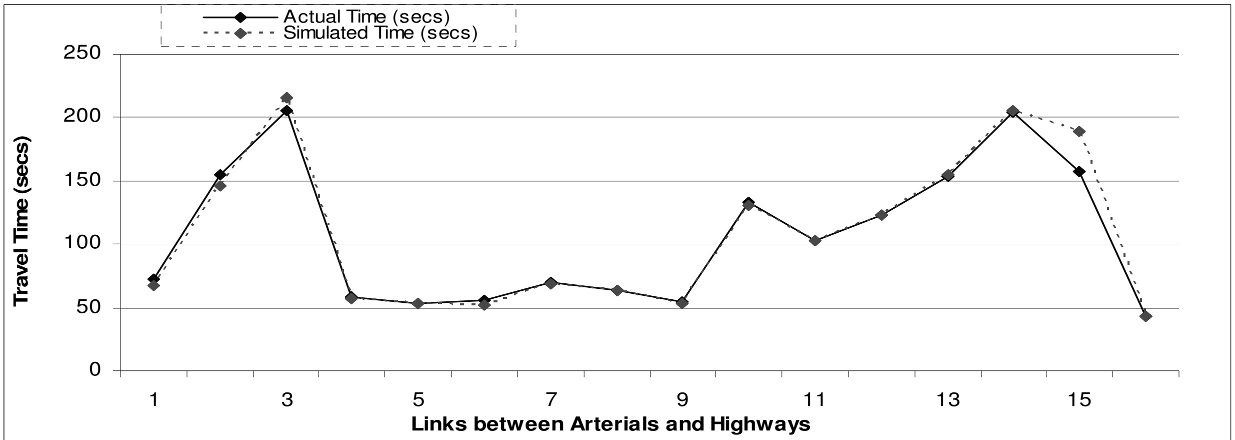

FIGURE 8(b): Right Lane Closed at SB I-75 @ 12 Mile

TROUBLE 3: No Gas **Time: 3:15PM-4:40PM**
Date: 01/24/2009

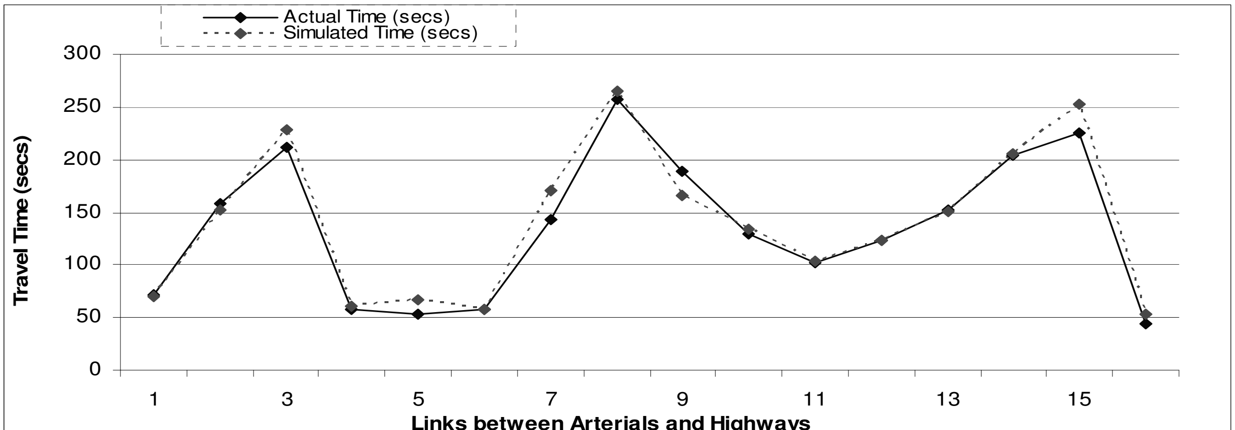

FIGURE 8(c): Right Lane Closed at NB I-75 @ 13 Mile

TROUBLE 4: (Mechanical) **Time: 2:25PM-3:50PM**
Date: 01/26/2009

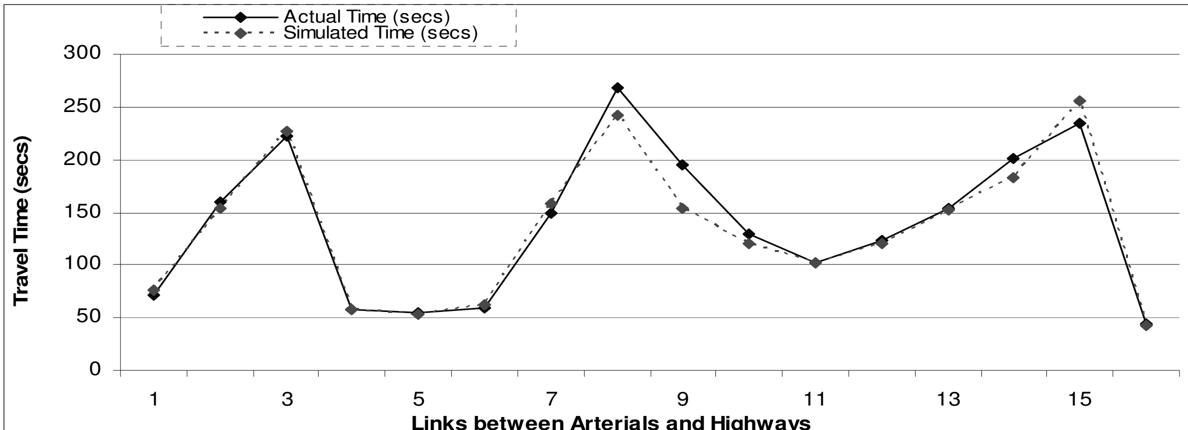

FIGURE 8(d): Right Lane Closed at SB I-75 @ 12 Mile

TROUBLE 5: (Debris) **Time: 4:25PM-5:50PM**
Date: 02/06/2009

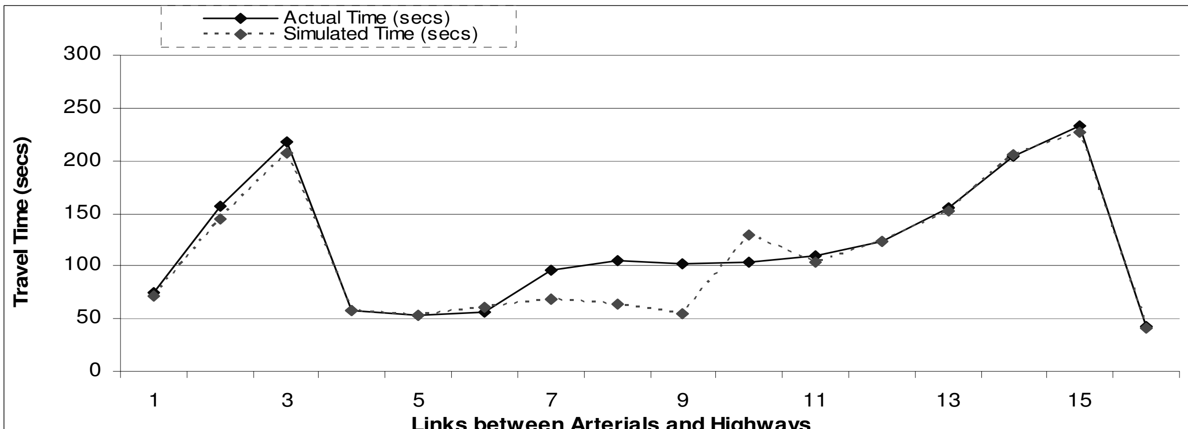

FIGURE 8(e): Right Lane Closed at SB I-75 @ 14 Mile

TROUBLE 6: (Accident) **Time: 8:10AM-9:35AM**
Date: 01/13/2009

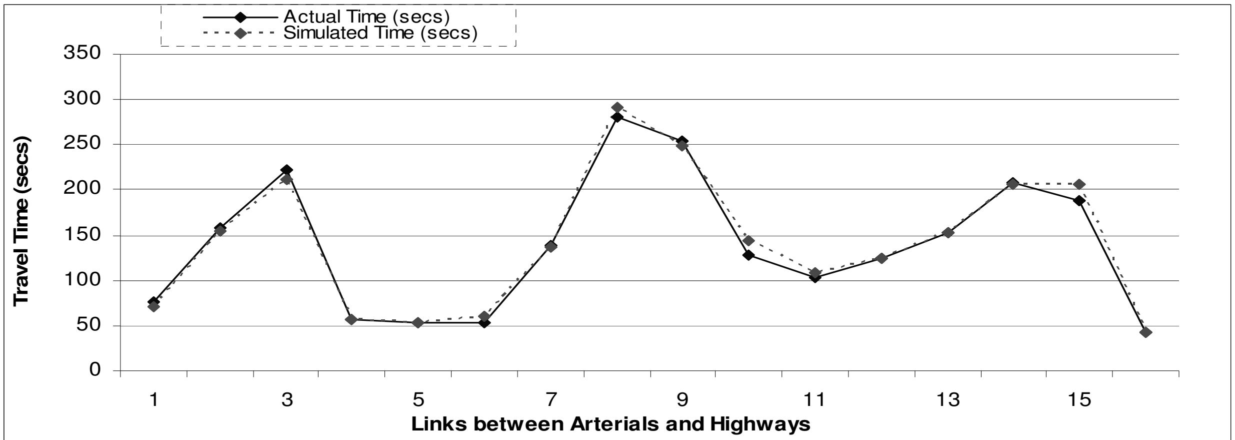

FIGURE 8(f): Right Lane Closed at SB I-75 @ 13 Mile

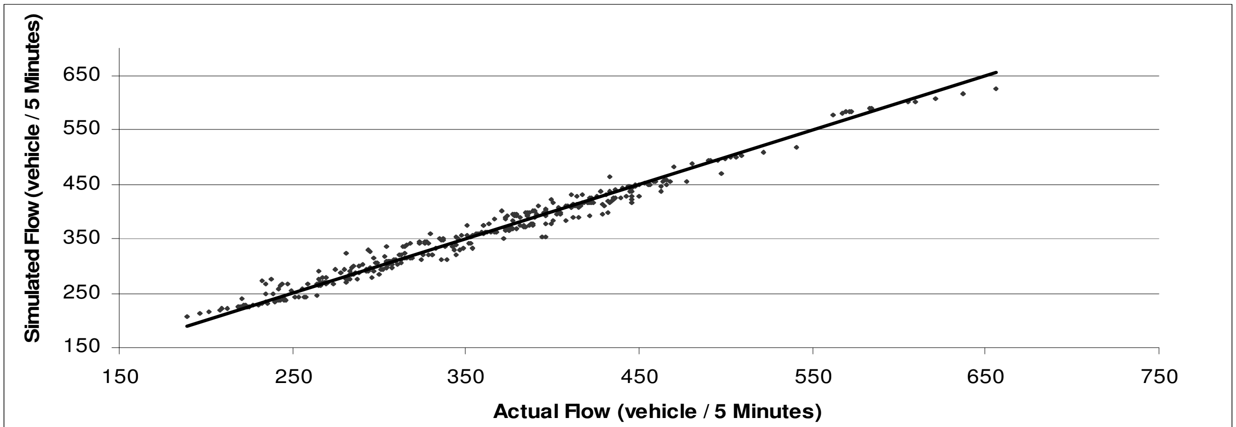

FIGURE 9(a) Actual and Simulated flow on I-75 (4PM -5PM)

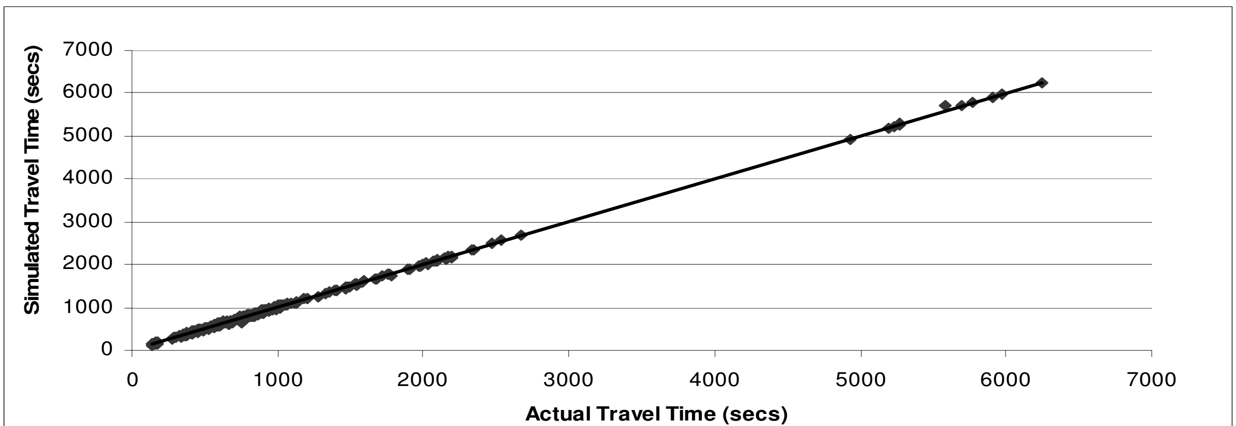

FIGURE 9(b) Actual and Simulated Travel Time on I-75 (4PM -5PM)

TABLE 3 Summary of Results (Traffic Volume Calibration):

With/Without Incident	Types of troubles	Date, Time of the Incident	Location of the Incident	Location of the Sensor	Figure	Root Mean Square Error (RMSE) % Error	Correlation Coefficient (*r*)	Theil's Weight of Large Errors (*Ui*)	Theil's Variance Proportion (*Us*)	Theil's Covariance Proportion (*Uc*)	Theil's Bias Proportion (*Um*)
No Incident	No troubles	7/12/2008, 3PM-6PM	No Incident	S of 12 Mile at I-75	1(a)	0.03	0.85	0.01	0.12	0.89	0.12
				S of 14 Mile at I-75	1(b)	0.07	0.95	0.03	0.05	0.98	0.10
				S of 12 Mile at I-75	1(c)	0.03	0.86	0.02	0.29	0.84	0.02
		9/22/2008, 3PM-6PM	No Incident	S of 12 Mile at I-75	2(a)	0.02	0.95	0.01	0.03	0.98	0.12
				S of 14 Mile at I-75	2(b)	0.02	0.86	0.01	0.23	0.87	0.04
				S of 14 Mile at I-75	2(c)	0.03	0.95	0.01	0.26	0.86	0.02
With Incident	Abandoned Vehicles	1/19/2009, 8:35AM-10:00AM	SB-I-75 @ 12 Mile (Right Lane)	North of I-696 at I-75	4(a)	0.03	0.92	0.02	0.01	0.97	0.14
				S of 14 Mile at I-75	4(b)	0.04	0.88	0.02	0.00	0.98	0.07
	Flat Tire	1/19/2009, 5:40PM-7:05PM	SB-I-75 @ 12 Mile (Right Lane)	S of 12 Mile at I-75	4(c)	0.03	0.97	0.02	0.12	0.80	0.13
				S of 14 Mile at I-75	4(d)	0.03	0.98	0.02	0.06	0.81	0.18
	No Gas	1/24/2009, 3:15PM-4:40PM	NB-I-75 @ 13 Mile (Right Lane)	S of 14 Mile at I-75	4(e)	0.03	0.90	0.01	0.14	0.90	0.04
				S of 12 Mile at I-75	4(f)	0.02	0.92	0.01	0.20	0.86	0.01
	Mechanical Problems	1/26/2009, 2:25PM-3:50PM	SB-I-75 @ 12 Mile (Right Lane)	S of 12 Mile at I-75	4(g)	0.03	0.95	0.01	0.11	0.89	0.09
				S of 14 Mile at I-75	4(h)	0.03	0.97	0.01	0.15	0.89	0.03
	Debris on Road	2/6/2009, 4:25PM-5:50PM	SB-I-75 @ 14 Mile (Right Lane)	S of 14 Mile at I-75	4(i)	0.02	0.91	0.01	0.02	0.98	0.11
				S of 15 Mile at I-75	4(j)	0.02	0.96	0.01	0.10	0.95	0.01
	Accident	1/13/2009, 8:10AM-9:35AM	SB-I-75 @ 13 Mile (Right Lane)	S of 12 Mile at I-75	4(k)	0.03	0.93	0.01	0.02	0.86	0.34
				S of 14 Mile at I-75	4(l)	0.03	0.96	0.01	0.02	0.90	0.26

TABLE 4 Summary of Results (Travel Time Calibration):

With/Without Incident	Types of troubles	Date, Time of the Incident	Location of the Incident	Figure	Root Mean Square Error (RMSE) % Error	Correlation Coefficient (r)	Theil's Weight of Large Errors (Ui)	Theil's Variance Proportion (Us)	Theil's Covariance Proportion (Uc)	Theil's Bias Proportion (Um)
No Incident	No troubles	7/12/2008, 3PM-4PM	No Incident	3(a)	0.21	0.96	0.08	0.16	0.82	0.09
		9/22/2008, 3PM-4PM	No Incident	3(b)	0.15	0.97	0.07	0.10	0.80	0.15
With Incident	Abandoned Vehicles	1/19/2009, 8:35AM-10:00AM	SB-I-75 @ 12 Mile (Right Lane)	5(a)	0.12	0.97	0.06	0.13	0.94	0.00
	Flat Tire	1/19/2009, 5:40PM-7:05PM	SB-I-75 @ 12 Mile (Right Lane)	5(b)	0.06	0.99	0.04	0.19	0.85	0.03
	No Gas	1/24/2009, 3:15PM-4:40PM	NB-I-75 @ 13 Mile (Right Lane)	5(c)	0.11	0.98	0.04	0.03	0.89	0.14
	Mechanical Problems	1/26/2009, 2:25PM-3:50PM	SB-I-75 @ 12 Mile (Right Lane)	5(d)	0.07	0.98	0.05	0.04	0.94	0.07
	Debris on Road	2/6/2009, 4:25PM-5:50PM	SB-I-75 @ 14 Mile (Right Lane)	5(e)	0.18	0.96	0.07	0.01	0.87	0.17
	Accident	1/13/2009, 8:10AM-9:35AM	SB-I-75 @ 13 Mile (Right Lane)	5(f)	0.06	0.99	0.02	0.00	0.98	0.08

3.1.3 Summary of Calibration:

- Model calibration used two sets of independent data sources – Traffic.com sensor data and SEMCOG data and the results displayed a reasonable correspondence between the model output and the observed data.

- A set of statistical tests presented above shows that the model thus calibrated is capable of replicating real time scenarios, both with and without incidents.

- The calibrated model was then used to test the impact of various incident management strategies, as reported in the next section.

3.2 Model Application

The model thus calibrated along with the appropriate parameters was used to test the effectiveness of alternate IMSs on the same network. Two types of IMSs were tested: Lane closure, and Forced turning. These are defined later in the document. Results of the incident management strategies tested in this paper are presented in three scenarios as explained below:

- **No Incident**: Represents the base condition depicting normal traffic flow. Traffic conditions in this case are not affected by the incidents or any IMS, as there are no incidents in the first place.
- **Unguided**: Represents situations where incidents have occurred but no IMS has been deployed. Thus situation represents conditions where drivers essentially use their knowledge of the network, or use their intuition in selecting the shortest path. AIMSUN in this case appears to use a "static" assignment process, and route selection is based upon the shortest path, given an incident (e.g. lane closure, speed change, etc.) has occurred.
- **Guided**: Represents a situation where an appropriate IMS has been deployed during/after the incident, and vehicles are "guided" through the network following a dynamic assignment procedure. Under these conditions, vehicles are "guided" through VMS to the shortest path that is dynamically updated at a pre-specified route choice cycle.

Results for each strategy tested are presented below. Freeway Courtesy Patrol (FCP) and Traffic dot com database are used to collect sensor specific data such as Traffic volume for five minute intervals over the entire incident duration. Freeway Courtesy Patrol records various incidents into six categories, mentioned earlier (Abandoned Vehicle, Flat Tire, No gas, Mechanical Problems, Debris on Road, and Accident).

Incident data recorded by FCP from January 2009 to June 2009 was used. A total of 45 incidents from all the incident categories as stated above were analyzed. The step by step procedure followed for the analysis of each incident is outlined below:

1. Searching the FCP database in identifying the incidents stated above. FCP gives information about the location of the incident, date, clearance time, and the number of lanes closed.

2. Obtaining the freeway volume data during the incidents from archived (sensor) data, using the FCP specific date and clearance time of the incident.

3. Using the volume data to generate an O-D Matrix (OD-Matrix 4) and to produce network performance data under "no-incident" condition, using AIMSUN

4. Using AIMSUN again to regenerate network performance data from the specific incident that resulted in two pieces of information, "unguided" and "guided" condition explained above.

IMS's tested for a multiple number of days and on different locations for different categories of troubles is presented in Table 5a through Table 5f. The second column of Table 5a through Table 5f shows the guidance measures taken on the simulated highway for a specific category of trouble on the day of the incident. Percentage improvement in Travel Time and Delay in guided over unguided scenarios is also calculated.

Tables 5a- 5f show MOE's when Lane closure and 20 percent compliance Force Turning are applied. 20 percent compliance Force turning signifies a total of 20 percent traffic flow on ramps and 80 percent through traffic on I-75. Similarly Tables 6a-6f and Tables 7a-7f show MOE's when Lane closure and 30 percent compliance and 40 percent compliance Force Turning respectively are applied. Tables 8a-8f show MOE's when only Lane closure strategy is applied on the network.

For each IMS tested, two types of performance data are presented; unit travel time and unit delay, both measured in seconds/km/vehicle. In all the cases recorded, both travel time and delay measures are reduced under guided conditions signifying a positive impact of the IMS's in alleviating congestion. Tables 9a-9f show the composite Volume by Capacity ratio in percentage for both guided and unguided scenarios along major freeways and arterials. These tables generally indicate that the result of traffic diversion from I-75 (lane closure or Forced Turning) to alternate facilities is an increase in the (V/C) ratio on the alternate facilities, (Woodward, Telegraph), as expected. Further research is needed to critically analyze the changes in the (V/C) ratios.

Table 5a: Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75, South of Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd.	2009-02-04	3:25PM - 3:45PM	10	20	92.35	94.58	90.784	4.01	54.24	56.40	52.595	6.75[4]
SB I-75 @ 11 Mile Rd.	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-02-27	1:35PM - 2:00PM	7	25	104	106.83	99.7193	6.65	66.63	69.35	62.5569	9.79
SB I-75 @ Crooks Rd. (Right LN)	SB I-75 @ Sq. Lake Rd. WB @ M-59 WB @ M-59 EB @ University Dr. @ Joslyn Ave.	2009-02-09	1:45PM - 2:25PM	13	40	129.6	129.85	119.762	7.77	91.64	91.82	81.7956	10.92

[4] Percentage Improvement of guided scenario compared to that of unguided scenario.

Table 5a (Continued): Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 WB I-696 @ I-75 EB I-696 @ I-75	2009-04-03	7:35AM - 8:10AM	10	35	120.36	120.60	109.20	9.45	82.22	82.48	71.62	13.16
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd. @ Sq. Lake Rd.	2009-04-20	7:05AM - 7:40AM	14	35	117.76	118.13	114.12	3.40	79.74	80.17	76.05	5.14
NB I-75 @ 11 Mile Rd	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-04-14	7:00PM - 7:30PM	16	30	109.84	118.11	97.90	17.11	72.56	80.83	61.49	23.93
NB I-75 @ 16 Mile Rd.	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-02-26	7:50AM - 8:15AM	10	25	102.99	103.50	95.51	7.72	64.96	65.39	57.97	11.35

Table 5b: Flat Tire Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Rochester Rd.	NB I-75 @ I-696 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-12	12:55PM-1:30PM	18	35	119.45	119.26	113.02	5.23	81.54	81.31	74.79	8.02
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. EB WB I-696 @ I-75 EB I-696 @ I-75	2009-06-01	6:00AM-6:40AM	38	40	131.60	127.64	106.98	16.19	93.97	90.01	70.09	22.12
SB I-75 @ Rochester Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ Sq. Lake Rd.	2009-06-20	8:30AM-9:05AM	23	35	116.52	123.59	111.86	9.48	78.53	85.43	73.92	13.48
SB I-75 @ I-696 (Right LN)	SB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB	2009-06-03	3:20PM-3:50PM	12	30	115.68	113.35	96.62	14.76	77.82	75.66	59.48	21.39

Table 5b (Continued): Flat Tire Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 12 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-07-06	6:30PM - 7:00PM	19	30	105.33	108.39	97.44	10.10	67.17	70.05	59.57	14.96
SB I-75 @ 16 Mile Rd. (Left LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB	2009-07-27	7:55AM - 8:30AM	30	35	119.73	118.91	118.63	0.24	82.06	81.41	80.95	0.56

Table 5c: No Gas Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 14 Mile Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ 14 Mile Rd. @ 16 Mile Rd.	2009-02-24	4:20PM - 5:05PM	18	45	124.29	131.22	123.82	5.64	86.72	93.35	85.83	8.05
SB I-75, Near 11 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-04	1:35PM - 2:05PM	9	30	112.89	118.42	107.81	8.96	75.68	81.32	70.62	13.16
SB I-75, Near 9 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ I-696	2009-04-27	8:45PM - 9:10PM	9	25	98.40	99.19	90.53	8.73	60.1393	60.92	52.96	13.07

Table 5d: Mechanical Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 11 Mile Rd. (Right LN)	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-02-05	1:40PM - 2:10PM	4	30	106.76	109.98	100.22	8.87	68.55	71.86	62.16	13.50
NB I-75 @ Rochester Rd. (Left LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd WB	2009-04-06	5:20PM - 5:45PM	9	25	104.10	101.98	101.31	0.66	65.83	63.73	62.94	1.25
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB M-59 @ I-75 WB M-59 @ I-75	2009-07-13	2:05PM - 2:45PM	32	40	126.50	129.20	125.09	3.18	88.67	91.34	87.05	4.69
SB I-75 @ 13 Mile Rd. (Right LN)	SB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-07-15	7:15AM - 7:50AM	31	35	116.70	120.23	114.81	4.51	78.76	82.43	76.94	6.66

Table 5e: Debris Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 11 Mile Rd. (LEFT, CENTER LNS)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ Rochester Rd.	2009-06-24	11:35AM-11:55AM	6	20	98.13	95.28	86.22	9.51	60.01	57.05	48.71	14.61
NB I-75 @ 16 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-07-21	12:55PM-1:15PM	6	20	90.92	94.00	90.15	4.09	52.86	56.11	51.96	7.40
NB I-75 @ Rochester Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ I-696	2009-07-20	8:00PM-8:30PM	6	30	107.05	112.01	96.68	13.69	68.98	74.11	59.17	20.16
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12M Rd. @ 14M Rd. EB @ I-696	2009-06-30	5:50PM-6:20PM	3	30	108.72	111.94	96.41	13.87	70.94	74.14	59.08	20.32

Table 5f: Accident Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 16 Mile Rd. @ Crooks Rd.	2009-01-06	5:35PM - 6:20PM	30	45	130.94	137.45	130.18	5.28	92.94	99.45	92.20	7.29
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ I-696	2009-06-04	3:05PM - 3:50PM	7	45	136.70	138.01	111.71	19.06	98.88	100.41	74.83	25.48
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Crooks Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB I-696 @ I-75 WB I-696 @ I-75	2009-04-30	5:25PM - 6:10PM	26	45	130.79	138.94	128.42	7.57	92.69	100.50	90.09	10.36
NB I-75 @ 13 Mile Rd. (Left LN)	NB I-75 @ I-696 @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-30	7:50AM - 8:20AM	15	30	107.84	111.22	103.26	7.16	69.63	73.13	64.90	11.26

Table 5f (Continued): Accident Category - Guided case over Unguided case (Lane closure & 20% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 12 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-01-10	10:10AM-10:40AM	15	30	113.61	108.93	97.94	10.09	75.79	71.15	60.52	14.94
SB I-75 @ I-696 (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-19	8:25AM-9:25AM	56	60	153.69	160.69	124.14	22.74	115.64	122.92	87.37	28.92

Table 6a: Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75, South of Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd.	2009-02-04	3:25PM - 3:45PM	10	20	92.35	94.58	90.78	4.01	54.24	56.40	52.60	6.75
SB I-75 @ 11 Mile Rd.	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-02-27	1:35PM - 2:00PM	7	25	104	106.83	100.45	5.97	66.63	69.35	63.28	8.75
SB I-75 @ Crooks Rd. (Right LN)	SB I-75 @ Sq. Lake Rd. WB @ M-59 WB @ M-59 EB @ University Dr. @ Joslyn Ave.	2009-02-09	1:45PM - 2:25PM	13	40	129.60	129.85	123.65	4.77	91.64	91.82	85.58	6.80

Table 6a (Continued): Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 WB I-696 @ I-75 EB I-696 @ I-75	2009-04-03	7:35AM - 8:10AM	10	35	120.36	120.60	107.68	10.71	82.22	82.48	70.06	15.06
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd. @ Sq. Lake Rd.	2009-04-20	7:05AM - 7:40AM	14	35	117.76	118.13	114.12	3.40	79.74	80.17	76.05	5.14
NB I-75 @ 11 Mile Rd	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-04-14	7:00PM - 7:30PM	16	30	109.84	118.11	103.69	12.21	72.56	80.83	66.96	17.16
NB I-75 @ 16 Mile Rd.	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-02-26	7:50AM - 8:15AM	10	25	102.99	103.50	93.86	9.31	64.96	65.39	56.34	13.84

Table 6b: Flat Tire Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Rochester Rd.	NB I-75 @ I-696 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-12	12:55PM-1:30PM	18	35	119.45	119.26	113.02	5.23	81.54	81.31	74.79	8.02
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. EB WB I-696 @ I-75 EB I-696 @ I-75	2009-06-01	6:00AM-6:40AM	38	40	131.60	127.64	109.08	14.54	93.97	90.01	72.15	19.83
SB I-75 @ Rochester Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ Sq. Lake Rd.	2009-06-20	8:30AM-9:05AM	23	35	116.52	123.59	112.84	8.69	78.53	85.43	74.89	12.34
SB I-75 @ I-696 (Right LN)	SB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB	2009-06-03	3:20PM-3:50PM	12	30	115.68	113.35	98.33	13.25	77.82	75.66	61.09	19.26

Table 6b (Continued): Flat Tire Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 12 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-07-06	6:30PM - 7:00PM	19	30	105.33	108.39	98.72	8.92	67.17	70.05	60.83	13.17
SB I-75 @ 16 Mile Rd. (Left LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB	2009-07-27	7:55AM - 8:30AM	30	35	119.73	118.91	117.46	1.22	82.06	81.41	79.71	2.08

Table 6c: No Gas Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 14 Mile Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ 14 Mile Rd. @ 16 Mile Rd.	2009-02-24	4:20PM - 5:05PM	18	45	124.29	131.22	124.64	5.02	86.72	93.35	86.64	7.18
SB I-75, Near 11 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-04	1:35PM - 2:05PM	9	30	112.89	118.42	107.64	9.10	75.68	81.32	70.44	13.39
SB I-75, Near 9 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ I-696	2009-04-27	8:45PM - 9:10PM	9	25	98.40	99.19	89.53	9.74	60.14	60.92	51.98	14.68

Table 6d: Mechanical Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 11 Mile Rd. (Right LN)	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-02-05	1:40PM - 2:10PM	4	30	106.76	109.98	101.99	7.27	68.55	71.86	64.01	10.93
NB I-75 @ Rochester Rd. (Left LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd WB	2009-04-06	5:20PM - 5:45PM	9	25	104.10	101.98	98.41	3.51	65.83	63.73	60.03	5.81
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB M-59 @ I-75 WB M-59 @ I-75	2009-07-13	2:05PM - 2:45PM	32	40	126.50	129.20	123.33	4.54	88.67	91.34	85.42	6.47
SB I-75 @ 13 Mile Rd. (Right LN)	SB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-07-15	7:15AM - 7:50AM	31	35	116.70	120.23	115.07	4.29	78.76	82.43	77.12	6.44

Table 6e: Debris Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 11 Mile Rd. (LEFT, CENTER LNS)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ Rochester Rd.	2009-06-24	11:35AM-11:55AM	6	20	98.13	95.28	87.90	7.75	60.01	57.05	50.30	11.83
NB I-75 @ 16 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-07-21	12:55PM-1:15PM	6	20	90.92	94.00	91.37	2.80	52.86	56.11	53.33	4.95
NB I-75 @ Rochester Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ I-696	2009-07-20	8:00PM-8:30PM	6	30	107.05	112.01	97.50	12.95	68.98	74.11	59.87	19.22
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12M Rd. @ 14M Rd EB @ I-696	2009-06-30	5:50PM-6:20PM	3	30	108.72	111.94	97.15	13.21	70.94	74.14	59.45	19.81

Table 6f: Accident Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 16 Mile Rd. @ Crooks Rd.	2009-01-06	5:35PM - 6:20PM	30	45	130.94	137.45	130.56	5.01	92.94	99.45	92.52	6.97
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ I-696	2009-06-04	3:05PM - 3:50PM	7	45	136.70	138.01	116.71	15.43	98.88	100.41	79.65	20.67
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Crooks Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB I-696 @ I-75 WB I-696 @ I-75	2009-04-30	5:25PM - 6:10PM	26	45	130.79	138.94	128.08	7.81	92.69	100.50	89.84	10.61
NB I-75 @ 13 Mile Rd. (Left LN)	NB I-75 @ I-696 @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-30	7:50AM - 8:20AM	15	30	107.84	111.22	102.73	7.63	69.63	73.13	64.36	12.00

Table 6f (Continued): Accident Category - Guided case over Unguided case (Lane closure & 30% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 12 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-01-10	10:10AM-10:40AM	15	30	113.61	108.93	96.07	11.81	75.79	71.15	58.74	17.44
SB I-75 @ I-696 (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-19	8:25AM-9:25AM	56	60	153.69	160.69	133.44	16.96	115.64	122.92	96.59	21.42

Table 7a: Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75, South of Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd.	2009-02-04	3:25PM - 3:45PM	10	20	92.35	94.58	90.85	3.94	54.24	56.40	52.63	6.68
SB I-75 @ 11 Mile Rd.	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-02-27	1:35PM - 2:00PM	7	25	104.00	106.83	101.93	4.58	66.63	69.35	64.71	6.69
SB I-75 @ Crooks Rd. (Right LN)	SB I-75 @ Sq. Lake Rd. WB @ M-59 WB @ M-59 EB @ University Dr. @ Joslyn Ave.	2009-02-09	1:45PM - 2:25PM	13	40	129.60	129.85	120.80	6.97	91.64	91.82	82.87	9.76

Table 7a (Continued): Abandoned Vehicles Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 WB I-696 @ I-75 EB I-696 @ I-75	2009-04-03	7:35AM - 8:10AM	10	35	120.36	120.60	109.69	9.04	82.22	82.48	72.07	12.61
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. EB @ 16 Mile Rd. WB @ Crooks Rd. @ Sq. Lake Rd.	2009-04-20	7:05AM - 7:40AM	14	35	117.76	118.13	118.84	-0.60	79.74	80.17	80.85	-0.85
NB I-75 @ 11 Mile Rd	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-04-14	7:00PM - 7:30PM	16	30	109.84	118.11	104.49	11.53	72.56	80.83	68.61	15.12
NB I-75 @ 16 Mile Rd.	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-02-26	7:50AM - 8:15AM	10	25	102.99	103.50	95.37	7.86	64.96	65.39	57.76	11.68

Table 7b: Flat Tire Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Rochester Rd.	NB I-75 @ I-696 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-12	12:55PM-1:30PM	18	35	119.45	119.26	104.93	12.02	81.54	81.31	67.21	17.34
NB I-75 @ 14 Mile Rd. (Right LN)	NB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. EB WB I-696 @ I-75 EB I-696 @ I-75	2009-06-01	6:00AM-6:40AM	38	40	131.60	127.64	110.06	13.77	93.97	90.01	73.03	18.86
SB I-75 @ Rochester Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ Sq. Lake Rd.	2009-06-20	8:30AM-9:05AM	23	35	116.52	123.59	110.60	10.51	78.53	85.43	72.64	14.97
SB I-75 @ I-696 (Right LN)	SB I-75 @ I-696 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB	2009-06-03	3:20PM-3:50PM	12	30	115.68	113.35	101.68	10.30	77.82	75.66	64.45	14.82

Table 7b (Continued): Flat Tire Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 12 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-07-06	6:30PM - 7:00PM	19	30	105.33	108.39	99.04	8.63	67.17	70.05	61.11	12.76
SB I-75 @ 16 Mile Rd. (Left LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB	2009-07-27	7:55AM - 8:30AM	30	35	119.73	118.91	117.79	0.95	82.06	81.41	80.09	1.61

Table 7c: No Gas Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 14 Mile Rd. (Right LN)	SB I-75 @ Rochester Rd. @ Crooks Rd. @ 14 Mile Rd. @ 16 Mile Rd.	2009-02-24	4:20PM - 5:05PM	18	45	124.29	131.22	123.68	5.75	86.72	93.35	85.72	8.17
SB I-75, Near 11 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-04	1:35PM - 2:05PM	9	30	112.89	118.42	107.79	8.98	75.68	81.32	70.58	13.21
SB I-75, Near 9 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ I-696	2009-04-27	8:45PM - 9:10PM	9	25	98.40	99.19	91.77	7.48	60.14	60.92	53.98	1.28

Table 7d: Mechanical Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 11 Mile Rd. (Right LN)	NB I-75, South of I-696 EB I-696 @ I-75 WB I-696 @ I-75	2009-02-05	1:40PM - 2:10PM	4	30	106.76	109.98	102.82	6.51	68.55	71.86	64.80	9.82
NB I-75 @ Rochester Rd. (Left LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd WB	2009-04-06	5:20PM - 5:45PM	9	25	104.10	101.98	101.36	0.61	65.83	63.73	62.99	1.17
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB M-59 @ I-75 WB M-59 @ I-75	2009-07-13	2:05PM - 2:45PM	32	40	126.50	129.20	123.77	4.20	88.67	91.34	85.83	6.02
SB I-75 @ 13 Mile Rd. (Right LN)	SB I-75 @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-07-15	7:15AM - 7:50AM	31	35	116.70	120.23	116.24	3.32	78.76	82.43	78.28	5.04

Table 7e: Debris Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 11 Mile Rd. (LEFT, CENTER LNS)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ Rochester Rd.	2009-06-24	11:35AM-11:55AM	6	20	98.13	95.28	88.92	6.67	60.01	57.05	51.29	10.09
NB I-75 @ 16 Mile Rd. (Right LN)	NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ 16 Mile Rd.	2009-07-21	12:55PM-1:15PM	6	20	90.92	94.00	90.15	4.09	52.86	56.11	51.96	7.40
NB I-75 @ Rochester Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ I-696	2009-07-20	8:00PM-8:30PM	6	30	107.05	112.01	98.22	12.31	68.98	74.11	60.63	18.19
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12M Rd. @ 14M Rd EB @ I-696	2009-06-30	5:50PM-6:20PM	3	30	108.72	111.94	97.99	12.46	70.94	74.14	60.65	18.20

Table 7f: Accident Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Sq. Lake Rd. (Right LN)	NB I-75 @ 14 Mile Rd. EB @ 14 Mile Rd. WB @ 16 Mile Rd. @ Crooks Rd.	2009-01-06	5:35PM - 6:20PM	30	45	130.94	137.45	130.18	5.28	92.94	99.45	92.20	7.29
NB I-75 @ 14 Mile Rd. (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 NB I-75 @ 12 Mile Rd. @ I-696	2009-06-04	3:05PM - 3:50PM	7	45	136.70	138.01	120.54	12.66	98.88	100.41	83.27	17.07
SB I-75 @ 16 Mile Rd. (Right LN)	SB I-75 @ 16 Mile Rd. @ Crooks Rd. @ Sq. Lake Rd. @ M-59 WB @ M-59 EB EB I-696 @ I-75 WB I-696 @ I-75	2009-04-30	5:25PM - 6:10PM	26	45	130.79	138.94	128.42	7.57	92.69	100.50	90.09	10.36
NB I-75 @ 13 Mile Rd. (Left LN)	NB I-75 @ I-696 @ 12 Mile Rd. WB I-696 @ I-75 EB I-696 @ I-75	2009-06-30	7:50AM - 8:20AM	15	30	107.84	111.22	103.26	7.16	69.63	73.13	64.90	11.26

Table 7f (Continued): Accident Category - Guided case over Unguided case (Lane closure & 40% Compliance FT)

LOCATION	GUIDANCE MEASURES	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
						NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 12 Mile Rd. (Left LN)	SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd. @ 16 Mile Rd.	2009-01-10	10:10AM-10:40AM	15	30	113.61	108.93	97.94	10.09	75.79	71.15	60.52	14.94
SB I-75 @ I-696 (Right LN)	WB I-696 @ I-75 EB I-696 @ I-75 SB I-75 @ 12 Mile Rd. @ 14 Mile Rd. WB @ 14 Mile Rd. EB @ Rochester Rd.	2009-03-19	8:25AM-9:25AM	56	60	153.69	160.69	138.12	14.05	115.64	122.92	101.05	17.79

Table 8a: Abandoned Vehicles Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75, South of Sq. Lake Rd. (Right LN)	2009-02-04	3:25PM-3:45PM	10	20	92.35	94.58	90.78	4.01	54.24	56.40	52.60	6.75
SB I-75 @ 11 Mile Rd.	2009-02-27	1:35PM-2:00PM	7	25	104.00	106.83	104.98	1.73	66.63	69.35	67.52	2.64
SB I-75 @ Crooks Rd. (Right LN)	2009-02-09	1:45PM-2:25PM	13	40	129.60	129.85	118.39	8.83	91.64	91.82	80.34	12.51
NB I-75 @ 14 Mile Rd. (Right LN)	2009-04-03	7:35AM-8:10AM	10	35	120.36	120.60	118.29	1.92	82.22	82.48	80.23	2.72
SB I-75 @ 16 Mile Rd. (Right LN)	2009-04-20	7:05AM-7:40AM	14	35	117.76	118.13	112.72	4.58	79.74	80.17	74.65	6.88
NB I-75 @ 11 Mile Rd	2009-04-14	7:00PM-7:30PM	16	30	109.84	118.11	113.93	3.54	72.56	80.83	76.38	5.50
NB I-75 @ 16 Mile Rd.	2009-02-26	7:50AM-8:15AM	10	25	102.99	103.50	104.21	-0.69	64.96	65.39	66.03	-0.98

Table 8a (Continued): Abandoned Vehicles Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km/veh)				DELAY TIME (sec/km/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75, South of Sq. Lake Rd. (Right LN)	2009-02-12	8:50AM-9:25AM	6	35	122.90	128.39	119.27	7.10	85.55	91.13	82.06	9.95
I-75 NB at Crooks Rd	2009-06-08	5:30PM-6:15PM	14	40	131.02	134.73	120.69	10.43	93.30	97.00	82.93	14.51

Table 8b: Flat Tire Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Rochester Rd.	2009-06-12	12:55PM-1:30PM	18	35	119.45	119.26	113.02	5.23	81.54	81.31	74.79	8.02
NB I-75 @ 14 Mile Rd. (Right LN)	2009-06-01	6:00AM-6:40AM	38	40	131.60	127.64	125.59	1.61	93.97	90.01	87.92	2.32
SB I-75 @ Rochester Rd. (Right LN)	2009-06-20	8:30AM-9:05AM	23	35	116.52	123.59	113.35	8.28	78.53	85.43	75.21	11.97
SB I-75 @ I-696 (Right LN)	2009-06-03	3:20PM-3:50PM	12	30	115.68	113.35	106.28	6.24	77.82	75.66	68.56	9.38
NB I-75 @ 12 Mile Rd. (Right LN)	2009-07-06	6:30PM-7:00PM	19	30	105.33	108.39	102.59	5.35	67.17	70.05	64.44	8.00
SB I-75 @ 16 Mile Rd. (Left LN)	2009-07-27	7:55AM-8:30AM	30	35	119.73	118.91	114.88	3.39	82.06	81.41	77.11	5.28
NB I-75 @ Rochester Rd	2009-06-06	3:00PM-3:35PM	17	35	115.802	115.97	114.40	1.35	77.81	78.14	76.50	2.10
I-75 NB at Rochester	2009-07-16	2:00PM-2:35PM	15	35	121.084	125.82	118.18	6.07	82.51	88.15	80.54	8.64

Table 8c: No Gas Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 14 Mile Rd. (Right LN)	2009-02-24	4:20PM-5:05PM	18	45	124.29	131.22	125.07	4.69	86.72	93.35	87.40	6.37
SB I-75, Near 11 Mile Rd. (Left LN)	2009-03-04	1:35PM-2:05PM	9	30	112.89	118.42	109.00	7.96	75.68	81.32	71.51	12.07
SB I-75, Near 9 Mile Rd. (Right LN)	2009-04-27	8:45PM-9:10PM	9	25	98.40	99.19	99.61	-0.43	60.14	60.92	61.32	-0.65
SB I-75 @ 14 Mile Rd. (Right LN)	2009-06-08	12:50PM-1:40PM	21	50	141.94	142.02	141.60	0.30	104.02	104.30	103.66	0.61
I-75 NB at I-696 (Right LN)	2009-03-27	3:10PM-3:40PM	6	30	115.05	121.36	110.10	9.27	75.93	83.96	72.96	13.10

Table 8d: Mechanical Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ 11 Mile Rd. (Right LN)	2009-02-05	1:40PM-2:10PM	4	30	106.76	109.98	105.57	4.01	68.55	71.86	67.28	6.38
NB I-75 @ Rochester Rd. (Left LN)	2009-04-06	5:20PM-5:45PM	9	25	104.10	101.98	99.47	2.46	65.83	63.73	61.24	3.90
SB I-75 @ 16 Mile Rd. (Right LN)	2009-07-13	2:05PM-2:45PM	32	40	126.50	129.20	121.61	5.88	88.67	91.34	83.68	8.38
SB I-75 @ 13 Mile Rd. (Right LN)	2009-07-15	7:15AM-7:50AM	31	35	116.70	120.23	113.32	5.75	78.76	82.43	75.43	8.49
NB I-75 @ 11 Mile Rd. (Right LN)	2009-06-06	10:05PM-10:45PM	1	40	127.09	130.64	122.20	6.46	89.38	92.95	84.26	9.35
I-75 NB at 14 Mile Rd (Right LN and Left Ramp)	2009-04-07	10:50AM-11:25AM	8	35	118.39	122.21	117.94	3.49	80.24	83.84	79.86	4.74

Table 8e: Debris Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
SB I-75 @ 11 Mile Rd. (LEFT, CENTER LNS)	2009-06-24	11:35AM-11:55AM	6	20	98.13	95.28	94.10	1.24	60.01	57.05	56.14	1.60
NB I-75 @ 16 Mile Rd. (Right LN)	2009-07-21	12:55PM-1:15PM	6	20	90.92	94.00	92.30	1.80	52.86	56.11	54.25	3.32
NB I-75 @ Rochester Rd. (Right LN)	2009-07-20	8:00PM-8:30PM	6	30	107.05	112.01	104.70	6.53	68.98	74.11	66.72	9.97
NB I-75 @ 14 Mile Rd. (Right LN)	2009-06-30	5:50PM-6:20PM	3	30	108.72	111.94	106.06	5.25	70.94	74.14	68.18	8.04
SB I-75 @ 11 Mile Rd. (LEFT, CENTER LNS)	2009-04-04	10:55AM-11:15AM	2	20	99.28	100.87	96.40	4.43	61.66	63.13	58.91	6.67
I-75 SB at Rochester (Right LN and Center Right LN)	2009-06-18	11:15AM-11:45AM	5	30	108.84	110.34	105.90	4.02	70.72	72.20	67.80	6.10

Table 8f: Accident Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Sq. Lake Rd. (Right LN)	2009-01-06	5:35PM-6:20PM	30	45	130.94	137.45	128.59	6.44	92.94	99.45	90.48	9.01
NB I-75 @ 14 Mile Rd. (Right LN)	2009-06-04	3:05PM-3:50PM	7	45	136.70	138.01	130.39	5.52	98.88	100.41	92.76	7.62
SB I-75 @ 16 Mile Rd. (Right LN)	2009-04-30	5:25PM-6:10PM	26	45	130.79	138.94	130.03	6.41	92.69	100.50	91.69	8.77
NB I-75 @ 13 Mile Rd. (Left LN)	2009-06-30	7:50AM-8:20AM	15	30	107.84	111.22	105.47	5.18	69.63	73.13	66.62	8.91
SB I-75 @ 12 Mile Rd. (Left LN)	2009-01-10	10:10AM-10:40AM	15	30	113.61	108.93	105.27	3.37	75.79	71.15	67.43	5.23
SB I-75 @ I-696 (Right LN)	2009-03-19	8:25AM-9:25AM	56	60	153.69	160.69	158.88	1.13	115.64	122.92	121.06	1.51

Table 8f (Continued): Accident Category - Guided case over Unguided case (Lane closure only)

LOCATION	DATE	TIME	FCP CLEARTIME (mins)	SIM DURATION (min)	TRAVEL TIME (sec/km)				DELAY TIME (sec/veh)			
					NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE	NO INCIDENT	UNGUIDED	GUIDED_N	% IMPROVE
NB I-75 @ Sq. Lake Rd. (Right LN)	2009-06-09	5:50PM-6:40PM	22	50	141.88	148.05	141.85	4.19	104.40	110.49	104.33	5.58
I-75 SB at I-696 (Right LN)	2009-04-16	3:45PM-4:25PM	10	40	126.73	128.40	122.90	4.29	89.01	90.68	85.17	6.08

Table 9a: (Abandoned Vehicle: SB I-75 @ Crooks Rd (Right Lane closed)), Date: 02/09/2009, Time: 1:45PM-2:25PM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	51.37	27.04	3.71	31.69	22.37
	Long Lake-16 Mile Rd	46.72	26.45	1.11		
	16 Mile Rd-14 Mile Rd	20.87	25.70	1.88		
	14M-12M	25.88	27.66	1.02		
	12M-I-696	8.58	6.45	1.00		
	I-696-8M	15.60	15.31	2.51		
Woodward Ave	M-59-SqLk	51.66	55.91	1.45	36.27	36.07
	SqLk-LongLk	42.55	32.19	0.84		
	LongLk-16M	34.11	32.08	0.98		
	16M-14M	40.05	40.84	1.17		
	14M-12M	39.08	35.96	1.21		
	12M-I-696	23.36	26.33	1.20		
	I-696-8M	20.72	22.62	1.15		
Telegraph Rd	M-59-SqLk	54.89	60.09	1.59	43.16	42.16
	SqLk-LongLk	44.62	44.20	0.83		
	LongLk-16M	41.54	35.97	0.94		
	16M-14M	36.81	29.67	0.88		
	14M-12M	52.71	52.38	1.02		
	12M-I-696	40.75	39.05	0.39		
	I-696-8M	31.77	30.17	1.90		
16 Mile Rd	Telgh-WdWd	130.65	95.61	1.65	69.86	53.82
	WdWd-I-75	47.81	45.75	1.71		
	I-75-Ryan	49.89	32.54	2.26		
	Ryan-Vdyke	53.66	47.40	1.06		

Table 9b: (Flat Tire: SB I-75 @ I-696 (Right Lane closed)), Date: 06/03/2009, Time: 3:20PM-3:50PM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	42.51	37.79	3.71	55.89	46.33
	Long Lake-16 Mile Rd	44.52	36.38	1.11		
	16 Mile Rd-14 Mile Rd	49.21	40.41	1.88		
	14M-12M	79.23	58.99	1.02		
	12M-I-696	66.49	48.75	1.00		
	I-696-8M	72.01	61.70	2.51		
Woodward Ave	M-59-SqLk	54.97	51.29	1.45	36.51	34.44
	SqLk-LongLk	40.70	39.89	0.84		
	LongLk-16M	38.00	33.19	0.98		
	16M-14M	39.83	37.44	1.17		
	14M-12M	36.98	34.94	1.21		
	12M-I-696	22.84	21.62	1.20		
	I-696-8M	19.21	20.00	1.15		
Telegraph Rd	M-59-SqLk	54.98	58.66	1.59	42.06	40.70
	SqLk-LongLk	42.75	42.48	0.83		
	LongLk-16M	38.42	34.37	0.94		
	16M-14M	46.14	31.42	0.88		
	14M-12M	51.27	52.78	1.02		
	12M-I-696	36.07	35.59	0.39		
	I-696-8M	27.06	26.78	1.90		
16 Mile Rd	Telgh-WdWd	151.20	94.83	1.65	74.06	53.99
	WdWd-I-75	46.49	45.15	1.71		
	I-75-Ryan	47.97	33.28	2.26		
	Ryan-Vdyke	54.47	49.08	1.06		

Table 9c: (No Gas: SB I-75 @ 11 Mile Rd (Left Lane closed)), Date: 03/04/2009, Time: 1:35PM-2:05PM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	53.26	49.11	3.71	53.34	39.34
	Long Lake-16 Mile Rd	57.55	53.97	1.11		
	16 Mile Rd-14 Mile Rd	66.54	41.49	1.88		
	14M-12M	87.85	41.67	1.02		
	12M-I-696	56.36	35.69	1.00		
	I-696-8M	26.42	17.28	2.51		
Woodward Ave	M-59-SqLk	51.32	52.78	1.45	37.72	37.99
	SqLk-LongLk	39.61	37.52	0.84		
	LongLk-16M	36.08	38.66	0.98		
	16M-14M	48.97	49.55	1.17		
	14M-12M	41.64	40.20	1.21		
	12M-I-696	22.85	23.09	1.20		
	I-696-8M	20.38	20.42	1.15		
Telegraph Rd	M-59-SqLk	69.22	75.74	1.59	43.79	43.47
	SqLk-LongLk	43.90	39.33	0.83		
	LongLk-16M	34.20	27.29	0.94		
	16M-14M	33.44	31.07	0.88		
	14M-12M	55.22	54.24	1.02		
	12M-I-696	36.08	36.52	0.39		
	I-696-8M	27.33	27.53	1.90		
16 Mile Rd	Telgh-WdWd	151.17	84.65	1.65	72.65	47.02
	WdWd-I-75	48.26	45.02	1.71		
	I-75-Ryan	43.92	26.09	2.26		
	Ryan-Vdyke	51.41	36.46	1.06		

Table 9d: (Mechanical: NB I-75 @ 11 Mile Rd (Right Lane closed)), Date: 02/05/2009, Time: 1:40PM-2:10PM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	24.95	13.62	3.20	40.00	32.70
	Long Lake-16 Mile Rd	46.37	33.66	1.01		
	16 Mile Rd-14 Mile Rd	44.01	36.29	1.88		
	14M-12M	57.34	49.29	1.02		
	12M-I-696	32.31	33.38	1.00		
	I-696-8M	49.89	47.32	2.43		
Woodward Ave	M-59-SqLk	36.72	40.25	1.43	55.76	48.43
	SqLk-LongLk	22.06	17.99	0.85		
	LongLk-16M	32.53	28.20	0.98		
	16M-14M	42.24	42.64	1.14		
	14M-12M	35.72	30.13	1.02		
	12M-I-696	72.72	50.38	1.20		
	I-696-8M	149.14	128.09	1.01		
Telegraph Rd	M-59-SqLk	32.47	30.48	1.59	63.13	56.33
	SqLk-LongLk	45.67	39.33	0.63		
	LongLk-16M	62.42	44.04	0.94		
	16M-14M	82.35	54.86	0.48		
	14M-12M	72.87	55.57	1.02		
	12M-I-696	75.09	71.16	0.39		
	I-696-8M	82.29	87.32	1.91		
16 Mile Rd	Telgh-WdWd	150.18	91.95	1.65	71.91	50.58
	WdWd-I-75	42.95	42.80	1.71		
	I-75-Ryan	47.33	31.04	2.26		
	Ryan-Vdyke	49.62	40.62	1.06		

Table 9e: (Debris: NB I-75 @ Rochester Rd (Right Lane closed)), Date: 07/20/2009, Time: 8:00AM-8:30AM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	29.52	18.47	3.20	50.89	40.73
	Long Lake-16 Mile Rd	42.83	29.18	1.01		
	16 Mile Rd-14 Mile Rd	41.34	32.75	1.88		
	14M-12M	67.37	55.80	1.02		
	12M-I-696	64.64	52.07	1.00		
	I-696-8M	77.10	69.94	2.43		
Woodward Ave	M-59-SqLk	39.15	40.20	1.43	57.94	48.61
	SqLk-LongLk	27.03	21.16	0.85		
	LongLk-16M	35.11	28.61	0.98		
	16M-14M	44.61	41.25	1.14		
	14M-12M	38.27	33.89	1.02		
	12M-I-696	73.31	48.01	1.20		
	I-696-8M	149.57	126.99	1.01		
Telegraph Rd	M-59-SqLk	31.46	30.56	1.59	61.83	56.44
	SqLk-LongLk	44.45	37.43	0.63		
	LongLk-16M	70.56	44.37	0.94		
	16M-14M	72.22	62.75	0.48		
	14M-12M	62.12	58.35	1.02		
	12M-I-696	74.75	68.47	0.39		
	I-696-8M	83.20	85.17	1.91		
16 Mile Rd	Telgh-WdWd	149.20	89.61	1.65	73.81	51.70
	WdWd-I-75	44.41	45.11	1.71		
	I-75-Ryan	49.24	32.79	2.26		
	Ryan-Vdyke	56.64	43.83	1.06		

Table 9f: (Accident: NB I-75 @ 14 Mile Rd (Right Lane closed)), Date: 06/04/2009, Time: 3:05PM-3:50PM

Freeways & Arterials	Links	V/C (Guided)	V/C (Unguided)	Length (miles)	Composite (V/C) (guided)	Composite (V/C) (unguided)
I-75	M-59-Long Lake	16.89	13.36	3.20	42.02	30.23
	Long Lake-16 Mile Rd	22.90	13.79	1.01		
	16 Mile Rd-14 Mile Rd	35.85	16.01	1.88		
	14M-12M	58.74	30.35	1.02		
	12M-I-696	73.13	45.76	1.00		
	I-696-8M	67.91	63.77	2.43		
Woodward Ave	M-59-SqLk	38.76	40.12	1.43	58.22	46.39
	SqLk-LongLk	29.92	18.86	0.85		
	LongLk-16M	46.75	32.76	0.98		
	16M-14M	51.52	45.95	1.14		
	14M-12M	37.40	32.40	1.02		
	12M-I-696	62.08	41.58	1.20		
	I-696-8M	144.82	112.03	1.01		
Telegraph Rd	M-59-SqLk	35.89	31.49	1.59	68.86	54.38
	SqLk-LongLk	51.97	34.17	0.63		
	LongLk-16M	74.39	38.20	0.94		
	16M-14M	87.36	54.19	0.48		
	14M-12M	76.70	50.60	1.02		
	12M-I-696	68.49	62.54	0.39		
	I-696-8M	90.42	88.52	1.91		
16 Mile Rd	Telgh-WdWd	119.91	92.16	1.65	69.85	55.42
	WdWd-I-75	50.22	49.63	1.71		
	I-75-Ryan	54.51	34.80	2.26		
	Ryan-Vdyke	56.57	51.73	1.06		

4. CONCLUSIONS

The purpose of this project is to explore the use of microsimulation (AIMSUN) for testing the impact of alternate incident management strategies on an urban transportation network. The primary focus of the project is to develop, a framework for testing various IMS's on the network. Results of testing the framework through calibration and application of the model are also presented. An analytic framework is initially presented in conceptual form that incorporates various policy and operational considerations associated with the deployment of different IMSs. For testing of the framework, the authors use an actual network in the Detroit metropolitan area, where the freeways are instrumented with sensors and detectors as a part of MDOT's Intelligent Transportation System program. Two types of strategies are simulated: Lane Closure, and Forced Turning. Conclusions of the study are:

- The framework presented is conceptually sound and robust, and it incorporates five critical steps that lend themselves to testing of various policy options, as well as operational changes reflecting different IMSs.
- Model Calibration demonstrated with two sets of independent data sources collected from sensors in the freeway system appears to reflect a reasonable correspondence between the model output and observed data.
- Model application to test two IMSs shows that the model output is sensitive to the operational changes associated with the strategies tested, and that the trends observed in the model output appear to be logical and reasonable
- In virtually all the cases analyzed, the unit travel time for "unguided" condition is higher than that of "no-incident" condition, and the same for "guided" condition is lower than the "unguided" condition. In some cases, the unit travel time for "guided" condition is lower than that for "no-incident" condition. Similar results were obtained for the unit delay MOE.
- Even though the testing of the framework shows positive results relative to calibration and application, the authors recommend additional testing with a larger network, and with additional IMSs if possible, before the micro-simulation model can be used as a tool for assessing the impact of IMSs.
- A comparative analysis of (V/C) ratio on the subject freeway (I-75) and alternate arterials resulting from traffic diversion shows reasonable trends. For 'guided' conditions, the (V/C) ratios on alternate arterials (Telegraph, Woodward) resulting from traffic diversion from I-75 increased to varying degrees.

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