

5-2014

# DEVELOPING A SOUTH CAROLINA TRAFFIC INCIDENT MANAGEMENT PLAN ALONG THE I-26 CORRIDOR BETWEEN COLUMBIA AND CHARLESTON

Laura Rowe

Clemson University, [lrowe@g.clemson.edu](mailto:lrowe@g.clemson.edu)

Follow this and additional works at: [https://tigerprints.clemson.edu/all\\_theses](https://tigerprints.clemson.edu/all_theses)



Part of the [Civil Engineering Commons](#)

---

## Recommended Citation

Rowe, Laura, "DEVELOPING A SOUTH CAROLINA TRAFFIC INCIDENT MANAGEMENT PLAN ALONG THE I-26 CORRIDOR BETWEEN COLUMBIA AND CHARLESTON" (2014). *All Theses*. 1865.

[https://tigerprints.clemson.edu/all\\_theses/1865](https://tigerprints.clemson.edu/all_theses/1865)

This Thesis is brought to you for free and open access by the Theses at TigerPrints. It has been accepted for inclusion in All Theses by an authorized administrator of TigerPrints. For more information, please contact [kokeefe@clemson.edu](mailto:kokeefe@clemson.edu).

DEVELOPING A SOUTH CAROLINA TRAFFIC INCIDENT MANAGEMENT PLAN  
ALONG THE I-26 CORRIDOR BETWEEN COLUMBIA AND CHARLESTON

---

A Thesis Presented to the Graduate School of Clemson University

---

In Partial Fulfillment of the Requirements for the  
Degree Master of Science Transportation Engineering

---

By

Laura Nicole Rowe

May 2014

---

Accepted by:

Dr. Jennifer Ogle, Committee Chair

Dr. Ronnie Chowdhury

Dr. Wayne Sarasua

## **ABSTRACT**

Traffic Incident Management (TIM) programs are used in many states across the nation to efficiently clear interstate incidents and alleviate congestion in response to incidents. The overarching goal of this research is to maintain safety of the motoring public and incident responders while reducing congestion, secondary collisions, and traffic delays from incidents that occur on South Carolina highways.

To reduce incident clearance times along the I-26 corridor between Columbia and Charleston through the implementation of a Traffic Incident Management (TIM) Program, several objectives for this thesis were established to move toward the goal, including; defining gaps between national TIM best-practices and SC TIM practices recommending programmatic changes to address gaps based on best-practices literature, developing training materials to address programmatic changes as needed, and assessing existing performance measurement metrics and suggest improvements to better evaluate changes in program effectiveness.

The nationally recommended best practices were compared to the current South Carolina practices. Gaps were observed and SCDOT expressed interest in developing towing, coroner, HAZMAT, and crash investigation procedures. Successful programs involving these groups of responders were evaluated, including implementation costs and challenges. Several successful national programs, as well as those in Florida, Georgia, and numerous other states were included in this step. This specifically included incentive based towing programs, fatality removal programs, HAZMAT training procedures, and crash investigation technologies. It is recommended that these programs be considered and investigated further when implementing

a SC TIM plan. It was however noted that while basic HAZMAT training is necessary, a large or full-scale program may not be cost effective.

After analyzing the data, areas where data collection could be improved were determined. It is recommended that responders more consistently collect on-scene arrival time for all agencies. Additionally, due to the high number of incidents that seem to be timing out and recording recovery times that are too long, it is recommended that improvements to the data collection process be made.

TABLE OF CONTENTS	Page
ABSTRACT .....	ii
LIST OF FIGURES .....	vi
LIST OF TABLES .....	vii
CHAPTER 1: INTRODUCTION .....	1
Goals and Objectives .....	2
CHAPTER 2: LITERATURE REVIEW.....	5
Incident Command System.....	5
Best TIM Practices .....	10
Training Materials.....	19
Performance Measures .....	20
CHAPTER 3: METHODS .....	22
Defining Gaps .....	22
Recommending Programmatic Changes .....	22
Developing Training Materials .....	22
Assessing Existing Metrics .....	24
CHAPTER 4: RESULTS .....	26
Defining Gaps .....	26
Recommending Programmatic Changes .....	30

TABLE OF CONTENTS (Continued)	Page
Towing .....	30
Coroner.....	34
HAZMAT.....	35
Crash Investigation .....	37
Developing Training Materials .....	38
Assessing Existing Metrics .....	38
CHAPTER 5: CONCLUSION & RECOMMENDATIONS.....	50
Conclusions.....	50
Recommendations.....	51
REFERENCES .....	52
APPENDICES.....	54
Appendix A: Tim Training .....	55
Appendix B: TIM Manual .....	73

**LIST OF FIGURES**

Figure 1: ICS Organization Functions and Responsibilities..... 7

Figure 2: Incident Types in SC (2012-2013) ..... 39

Figure 3: Incident Severity on I-26 (2012-2013)..... 46

Figure 4: Incident Response Severity Matrix (Source: I95 Coalition) ..... 47

## LIST OF TABLES

Table 1: Detection and Verification Strategies.....	11
Table 2: Traveler Information Strategies.....	12
Table 3: Response Strategies.....	14
Table 4: Scene Management and Traffic Control Strategies.....	15
Table 5: Quick Clearance and Recovery Strategies .....	18
Table 6: SC Detection and Verification Practices .....	27
Table 7: SC Traveler Information Practices .....	27
Table 8: SC Response Strategies.....	28
Table 9: SC Scene Management and Traffic Control Strategies .....	29
Table 10: SC Quick Clearance and Recovery Strategies .....	30
Table 11: Towing Incentive Programs .....	31
Table 12: Incident Types and Time Distributions (2012-2013) [incidents] .....	40
Table 13: Statewide Recovery Time (2012-2013) [minutes] .....	42
Table 14: I-26 Recovery Time (2012-2013) [minutes].....	43
Table 15: I-26 Recovery Times by County/Troop (2012-2013) [minutes].....	44
Table 16: Recovery Time by Severity (2012-2013) [minutes] .....	47
Table 17: Incidents Missing Time Data (2012-2013).....	48



## CHAPTER 1: INTRODUCTION

Traffic Incident Management (TIM) programs are used in many states across the nation to efficiently clear interstate incidents and alleviate congestion in response to incidents. Although DOTs are building and renewing interstates at rates commensurate with funding levels, traffic volumes continually approach capacity. When incidents occur under these conditions, they result in undesirable congestion and increase the probability of secondary crashes. These incidents can range from a simple need for motorist assistance to stretches of the interstate rendered useless by storm debris.

Mediation of interstate incidents and their clearance involve SCDOT, SCHP, and other public agencies, both state and local, and private entities such as towing and hazardous spill cleanup services. It is essential that all of these partners work effectively and efficiently to achieve the goal of roadway clearance in the shortest period of time possible. Formal TIM programs aid in reducing incident times, improving incident response practices, increasing inter-agency communication, and decreasing delay. By creating an outlined response program, along with detailed training materials, responders are knowledgeable on incident procedures and can efficiently respond in real-world situations. Such programs have proven effective, including a 69% decrease in incident duration in Georgia due to their incentive based towing program and a 23% reduction in incident duration in Maryland due to their Coordinated Highways Action Response Team (CHART) (1). Because of the many positive implications of TIM plans, South Carolina has chosen to fund the development and implementation of a plan for the I-26 corridor. The I-26 corridor from Columbia to Charleston has been chosen due to the existence of some components of TIM programs related to hurricane evacuation plans. This has increased

the coordination of the various parties along the corridor and has helped establish an existing Incident Command System – the backbone of any TIM plan. This development will then be adapted and implemented in a similar fashion along the rest of I-26 and on other interstate facilities across the state.

Currently, there are over 20,000 incidents along I-26 each year with a total recovery time of almost 30,000 hours plaguing the I-26 corridor, especially in urban areas such as Columbia and surrounding cities. The goal in implementing a TIM plan in these locations is to reduce these times and clear incidents as quickly and efficient as possible; thereby reducing potential for secondary crashes, reducing delay, and ultimately benefitting all road users. Proactive TIM programs result in observed reductions in recovery times, which is the time between incident detection and returning to “normal” conditions. Several protocols of responding agencies were investigated to determine areas where reductions to these times could be achieved. This included towing, coroner response, HAZMAT response, and crash investigation procedures. South Carolina aims to improve these programs individually and therefore improve overall incident response.

### ***Goals and Objectives***

The overarching goal of this research is to:

***Maintain safety of the motoring public and those incident responders while reducing congestion, secondary collisions, and traffic delays from incidents that occur on South Carolina highways.***

Safe, quick clearance of traffic incidents depends on strong, coordinated and cooperative multi-agency operations. The objectives of this research project were:

- 1) Expand Incident Command System (ICS)/Incident Action Plan(IAP) documentation and implementation to ensure compliance with national requirement and to incorporate TIM best practices for day-to-day incidents on interstates
- 2) Ensure plan effectiveness through training, field testing, refinement, and evaluation
- 3) Increase awareness of ICS/IAP across the state and gain momentum for statewide implementation

To reduce incident clearance times along the I-26 corridor between Columbia and Charleston through the implementation of a Traffic Incident Management (TIM) Program, several objectives for this thesis were established to move toward the goal:

- 1) Define gaps between national TIM best-practices and SC TIM practices
- 2) Recommend programmatic changes to address gaps based on best-practices literature
- 3) Develop training materials to address programmatic changes as needed
- 4) Assess existing performance measurement metrics and suggest improvements to better evaluate changes in program effectiveness

To achieve these objectives, the nationally recommended best practices in TIM plans were first compiled. Using these as a guide, fact-finding meetings were held with stakeholder

groups to identify gaps between the best practices and the current SC practices. Then, the magnitudes of these gaps were determined and a baseline was set for future evaluation. Also, the current state of data collection was assessed for future performance measurement. Lastly, TIM training, tabletop exercises, and associated documentation were created to support the identified gaps.

The following document describes this process in detail. In chapter 2, the literature review of traffic incident management plans can be found. Following that, chapter 3 outlines the methods used to achieve each objective. Chapter 4 presents the results of these methods, including data analysis. Lastly, chapter 5 contains conclusions and recommended programs based on the preceding research.

There are several aspects of this research that will not be covered in this thesis. Previous research has already been conducted on SC incident detection practices. Additionally, future research will be done involving traffic modeling, incident re-routing, and the benefit-cost analysis of implementing TIM practices.

## **CHAPTER 2: LITERATURE REVIEW**

There are many national and state recommendations for implementing and operating a traffic incident management plan. In this chapter, several of those are discussed. This includes protocols set by the National Incident Management System (NIMS) on incident command systems, such as transfer of command, command structure, communications processes, and implementation strategies (2). Along with these protocols, the numerous FHWA best practices are outlined. Lastly, methods to implement these through training materials, as well as performance measures for determining effectiveness are discussed. All of these protocols and recommendations were considered when developing the South Carolina TIM plan and served as a baseline of the potential for improvement to SC incident clearance procedures.

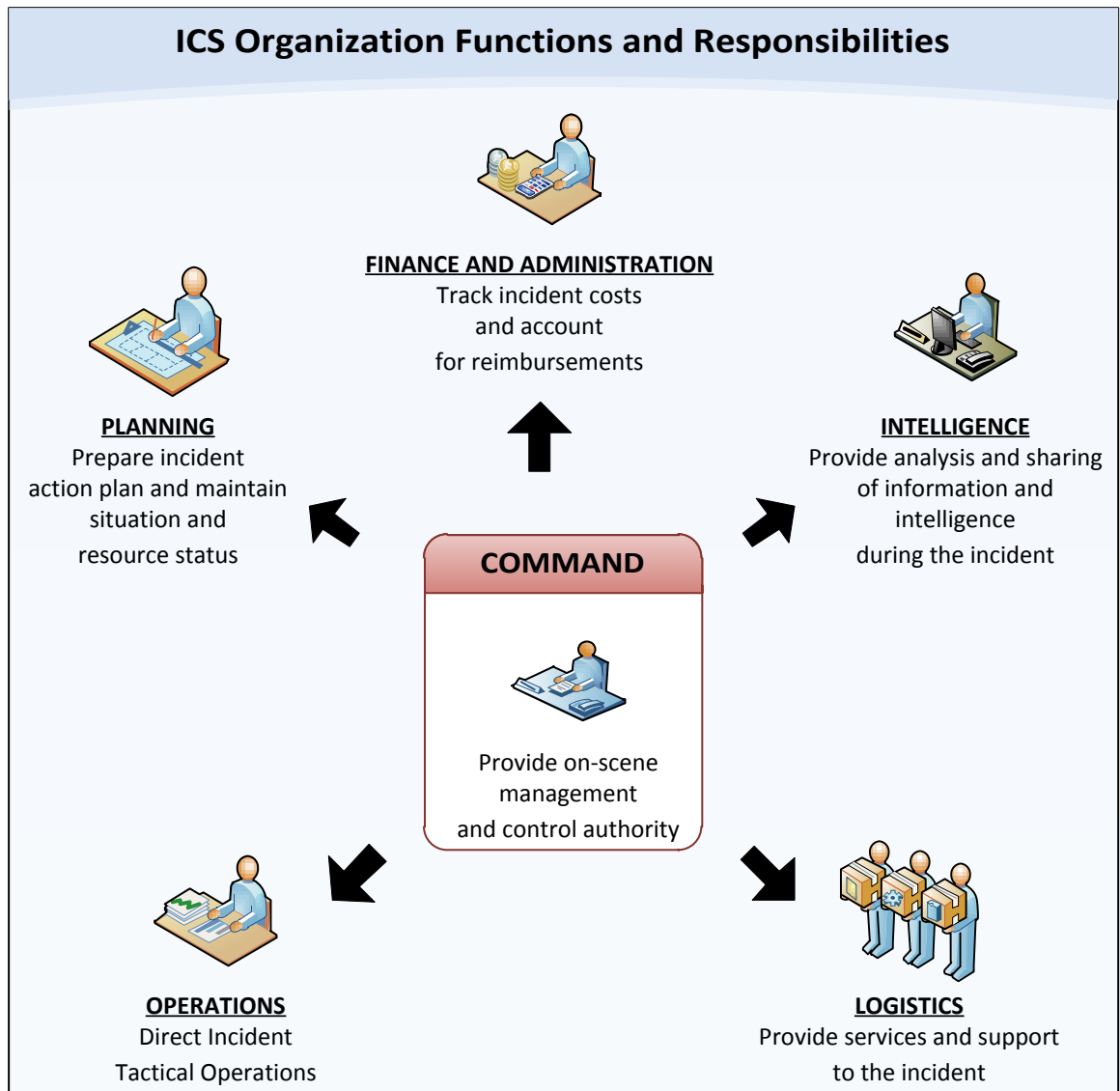
### ***Incident Command System***

The National Incident Management System (NIMS) was created in 2005 by the Homeland Security Presidential Directive 5 to provide a “a consistent nationwide template to enable Federal, State, tribal, and local governments, nongovernmental organizations (NGOs), and the private sector to work together to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity” (2). The successful implementation of the NIMS is largely dependent upon the effective communication of the Incident Command System (ICS) protocol. ICS is “designed to enable effective, efficient incident management by integrating a combination of facilities, equipment, personnel, procedures and communications operating within a common organizational structure” (3). This protocol provides both structure and flexibility with regard to the size of the response team, severity of the incident, and the incident duration. Use of ICS has increased with the realization

of its many benefits, including: facilitating a more consistent response, defining responder roles and responsibilities, establishing a clear decision-making process, minimizing redundancy in roles, and providing effective communication (4).

Defining response roles and processes allow adequate response to incidents, and specifically permit the seamless transfer of command. This transfer is done most successfully with an established unified command (UC) structure. A defined UC structure is derived from an Incident Action Plan (IAP) and allows “agencies with incident responsibilities to work within an established set of common objectives and strategies that can include: agency assignments, incident priorities, assignment of agency objectives, communications protocols, knowledge of duties within agency responsibilities, and acquisition and allocation of materials and resources” (5).

The Incident Commander or the UC must fulfill the 5 major functions of an ICS organization: Command, Operations, Planning, Logistics, and Finance and Administration. *Figure 1* depicts the priority of each function and its responsibilities, which can be self-performed or delegated to others within a reasonable span of control.



*Figure 1: ICS Organization Functions and Responsibilities*

In addition to a command structure, an interoperable communication process and architecture, which allow all responding agencies to communicate with one another, must be employed. Integrated communication must be planned and established prior to an incident, just as unified command is. Incorporating an effective communication plan in the incident action plan permits efficient deployment of personnel and resources to an incident scene.

A comprehensive resource management system is needed to alleviate confusion regarding available resources during an incident and run a successful ICS organization. It is important to maintain an accurate and up-to-date list of personnel, teams, equipment, supplies, facilities, and readiness statuses. Within each jurisdictional and individual functional area, effective accountability must be maintained to manage information and intelligence. This process must be established across agencies and all stages of the incident for gathering, analyzing, assessing, sharing, and managing incident-related information for benchmarking and process improvement.

Developed out of necessity for fire and rescue services in the 1970s and nationally mandated in 2005, ICS protocol models tactical incident response for a range of incidents, from a minor crash to a national security threat. Proper implementation and use is dependent upon predefined objectives, explicit and flexible chain of command, and clear communication. It is also important to maintain an adequate rate of growth and organization size that both support necessary activities and do not exceed the necessary resources.

To begin implementation of ICS, it is important that agencies evaluate their strengths and weaknesses and use these self-assessments to develop an ICS program adapted to their needs.

Five core areas for improvement, as laid out in NCHRP Report 525 Volume 6 (6), are:

- Develop an approach to emergency response on an integrated, comprehensive, all-emergency/hazard/discipline basis;
- Develop a structured emergency response process with joint protocols and procedures with full regard to the range of objectives with minimizing traffic disruption;



- Examine technology opportunities and cost-effectiveness to introduce new technology to improve efficiency, effectiveness, and safety;
- Measure performance in the field to provide the basis for continuous improvement; and
- Formalize emergency response operations as a program with appropriate policies, authorization, organization structure, and resources.

Self-assessment by involved agencies requires all personnel rank their level of confidence in each applicable strategy based on the following scale: understood (respondent understands the issue and is aware that little progress has been made to date), start-up (respondent understands the issue and believes that a deliberate effort is underway to respond to the issue), and in-place (deliberate effort has been underway for some time and the issues are substantially dealt with) (7). These surveys can be used by agencies to determine areas in each division that need to be worked on. Implementing and enforcing an ICS program is mostly staff and training intensive. Efficiently improving a program requires a clear understanding of what each member of a team knows so training can be customized for improvement. Outside of training, a performance monitoring plan must also be established to track improvement and progress towards goals and objectives. Improvement metrics can be derived from local or national agencies.

The above outline strategies support implementing an ICS system, but without field agents willing to adopt and execute such strategies, incident response efforts will fail. To help ensure successful improvement, suggested strategies include: developing of joint interagency strategy plans and coordinated resourcing, developing functional flexibility into TMC equipment and operations, providing combined trainings for interagency communications, negotiating clearance time targets amongst all responders for clear expectations/objectives, and developing

a regular reporting mechanism to gauge performance improvement and interagency cooperation.

### ***Best TIM Practices***

Non-recurring traffic incidents cause one quarter of all traffic congestion in the United States (8) . The impact of such congestion can be eased with the implementation of a traffic incident management (TIM) plan. Additionally, TIM plans not only relieve congestion, but also have led to economic savings, energy conservation, environmental benefits, and improved health and safety (1) . The five functional areas of TIM activities (9) are: Detection and Verification, Traveler Information, Response, Scene Management and Traffic Control, and Quick Clearance and Recovery. In the following paragraphs, both the challenges and their solutions in each of these areas will be addressed.

When it comes to the detection and verification of incidents, many states face challenges regarding the notification of responders. Typical issues include inconsistent notification, inaccurate incident reports, dispatcher overload, and slow detection. These issues have been combatted with the implementation of field verification, closed circuit television cameras (CCTV), frequent/enhanced roadway reference markers, enhanced 9-1-1/automated positioning systems, motorist aid call boxes, and automated collision notification systems. Field verification requires the first personnel dispatched to the scene assessing the incident and determining the appropriate response. CCTV cameras provide a way to monitor traffic through the use of limited-access video images. They can provide field verification, but have limited incident detection capabilities. Roadway reference markers, also referred to as “mile markers”, make certain that motorists can accurately report incident locations. Enhanced 9-1-1 and

Automated Positioning Systems can automatically determine the location of the caller and provides a physical address to the dispatcher, and can even route the call to the appropriate dispatcher. Motorist aid call boxes are communication devices permanently mounted on the roadside for incident reporting, typically at bridges, tunnels, or remote areas. Automated Collision Notification Systems (ACNSs) detect incidents, typically in remote areas, through automatic or motorist initiated activation of an alarm. The incident location is then verified via the transmission of location data, most commonly through GPS. These issues and the solutions that correspond with them can be seen in Table 1 (9).

Table 1: Detection and Verification Strategies

DETECTION AND VERIFICATION STRATEGIES	Inconsistent Notification	Inaccurate Incident Reports	Dispatcher Overload	Slow Detection	EXAMPLE APPLICATIONS
Field Verification by On-Site Responders		●			NY (Hudson Valley Region)
Closed-Circuit Television Cameras		●			76+ U.S. Metropolitan Areas, MD
Frequent/Enhanced Roadway Reference Markers		●			FL, NJ/PA (Delaware Valley Region), OH, TN
Enhanced 9-1-1/Automated Positioning Systems		●	●		TX (San Antonio)
Motorist Aid Call Boxes				●	27+ U.S. Metropolitan Areas, GA
Automated Collision Notification Systems				●	16+ U.S. Metropolitan Areas, NY (Erie Co.)

In a TIM system, it is imperative that roadway users are kept informed of changing conditions. This is often difficult to do when states have inaccurate traveler information and inconsistent changeable message sign (CMS) use. Issues, such as these, can be alleviated through the use of 5-1-1 systems, traveler information websites, media partnerships, CMS, and standard CMS message sets/use protocol. The national number for traffic and travel

information, 5-1-1 provides information on routes and roadways, including incidents, roadway blockages, weather, and transit. Traveler information websites allow transportation agencies to communicate real-time traffic, construction, and other transportation related data. Media partnerships ensure that traffic information is shared over AM and FM radio and television channels. Dynamic/Changeable Message Signs (DMS/CMS) are electronic signs with changeable messages that provide real time advanced warning or rerouting on roadsides. Standard CMS message sets ensure that appropriate messages are posted, make posting messages more efficient for personnel, and make certain that driver expectation is not violated. The strategies and issues surrounding traveler information can be seen in Table 2 (9).

Table 2: Traveler Information Strategies

TRAVELER INFORMATION STRATEGIES	Inaccurate Traveler Information	Inconsistent DMS Use	EXAMPLE APPLICATIONS
<b>5-1-1 Systems</b>	●		<b>33+ States</b>
Traveler Information Websites	●		<b>39+ States</b>
Media Partnerships	●		<b>53+ U.S. Metropolitan Areas</b>
Dynamic Message Signs	●		<b>81+ U.S. Metropolitan Areas, CA (Stockton)</b>
Standardized DMS Message Sets/Use Protocol		●	<b>73+ U.S. Metropolitan Areas, TX (Austin, San Antonio)</b>

Response is defined as the “activation of a ‘planned’ strategy for the safe and rapid deployment of the most appropriate personnel and resources to the incident scene” (9). Difficulties in achieving this goal are caused by under/over-response and difficult scene access. These can be overcome through personnel/equipment resource lists, towing and recovery vehicle identification guide, instant tow dispatch procedures, towing and recovery zone-based

contracts, enhanced computer aided dispatch (E-CAD), dual/optimized dispatch procedures, motorcycle patrol, and equipment staging areas/pre-positioned equipment.

Personnel/equipment lists reduce indirect communication and unnecessary calls by compiling the protocols and contact information required in different response scenarios. Towing and recovery vehicle identification guides are laminated 8.5 by 11 inch cards that can be carried by responders to ensure that the necessary information is provided when towing response is requested. Instant Tow Dispatch Procedures eliminate the on scene verification process by initiating response from recovery and law enforcement personnel at the same time. Towing and recovery zone-based contracts require that a single private towing agency is assigned to respond to incidents in a predefined geographic area. This also facilitates a high level of knowledge among tow responders of their towing zone and its typical incident types. Enhanced Computer Aided Dispatch (E-CAD) are continuously updated systems that use automatic vehicle location technologies to locate, route, and dispatch the closest emergency vehicles to incident scenes. Dual/optimized dispatch procedures dispatch units in both directions and the first unit to locate the incident provides response. This is used in areas with high traffic volumes, long distances between interchanges or crossovers, or when the location or direction of an incident has not been verified. Motorcycle patrols are beneficial in congested areas, as they allow for better maneuverability than larger response vehicles. Equipment staging areas/pre-positioned equipment allows for organizing of equipment and designation of its use; thereby decreasing lost time from slow mobilization and intermittent arrival. These difficulties and solutions can be seen in Table 3 (9) below.

Table 3: Response Strategies

RESPONSE STRATEGIES	Achieving Optimum Response	Difficult Scene Access	EXAMPLE APPLICATIONS
Personnel/Equipment Resource Lists	●		75+ U.S. Metropolitan Areas
Towing and Recovery Vehicle Identification Guide	●		NJ/PA (Delaware Valley Region), TX (Austin)
Instant Tow Dispatch Procedures		●	WA (Seattle)
Towing and Recovery Zone-Based Contracts		●	TX (Houston)
Enhanced Computer-Aided Dispatch		●	43+ Agencies in U.S. Metropolitan Areas, CA (Los Angeles), NM (Albuquerque), TN (Sequatchie Co.)
Dual/Optimized Dispatch Procedures		●	NJ
Motorcycle Patrols		●	All or Nearly U.S. Metropolitan Areas
Equipment Staging Areas/Pre-positioned		●	TN, WI

Scene Management “occurs after responding agencies have arrived at the scene” (9) and increases in complexity as the severity of the incident increases. Challenges faced when managing a scene include: confusion over authority/roles, difficult on-scene maneuverability, responder safety, secondary incidents, and excess delay. Common solutions to these challenges that have been adopted are incident command systems, response vehicle parking plans, high visibility safety apparel/vehicle markings, on-scene emergency lighting procedures, move-over laws, on-site traffic management teams, end of queue advanced warning systems, and alternate route plans. The Incident Command System (ICS) is a federal protocol that creates consistency in TIM protocols by defining command, communication, and resources. It relies on the concept of unified command, whereby management responsibility is shared among agencies. Response Vehicle Parking Plans preserve maneuverability, safety, and traffic flow at the incident scene through guidelines and policies about how and where vehicles should park so travel lanes can be gradually reopened. High-visibility safety apparel/vehicle markings improve on-scene safety of

responders by increasing visibility of responders through retroreflective and contour markings. On-scene emergency lighting procedures set guidelines for emergency lighting use to improve visibility and safety and reduce distraction and harm to other road users. Move-over laws require drivers approaching an incident scene to either change lanes when possible and/or reduce their speed. On-scene traffic management teams rapidly deploy traffic control devices at incident scenes to improve safety and reduce risk of secondary incidents. End-of-queue Advanced Warning Systems can be static, arrow board, or changeable message signs and warn approaching motorists of downstream traffic queues. Alternate route plans can reduce traffic demand at the incident scene by rerouting traffic around the location. Challenges and solutions to scene management outlined here can be seen in Table 4 (9).

Table 4: Scene Management and Traffic Control Strategies

SCENE MANAGEMENT AND TRAFFIC CONTROL STRATEGIES	Confusion over Authority/Roles	Difficult On-Scene Maneuverability	Responder Safety	Secondary Incidents	Excess Delay	EXAMPLE APPLICATIONS
Incident Command System	●					58+ U.S. Metropolitan Areas, WA
Response Vehicle Parking Plans		●				AZ (Phoenix), CO (Lakewood), IA, MI (Farmington), TX (Lancaster)
High-Visibility Safety Apparel/Vehicle Markings			●			CO (Eagle)
On-scene Emergency Lighting Procedures			●			TX (Austin, San Antonio)
Safe, Quick Clearance Laws—Move Over			●			47 States, including CA, FL, GA, IN, TN
Effective Traffic Control Through On-Site Traffic Management Teams			●	●		CA (Stockton), FL (Southeast), NJ
End-of-Queue Advance Warning Systems				●		CA (Bishop, Los Angeles, Redding, Stockton), NJ (Camden), TN (Chattanooga), UT (Salt Lake City)
Alternate Route Plans				●		62+ U.S. Metropolitan Areas, CA (Anaheim), FL (Northeast), ME/NH, NJ/PA (Delaware Valley Region), WI

Clearance and recovery are the final stages of the TIM process and essential to returning the roadway back to normal conditions. This process is made more difficult when faced with abandoned vehicle hazards, lengthy minor incident clearance, lengthy major incident clearance, liability concerns. Difficulties, such as these, can be resolved through abandoned vehicle legislation, driver removal laws, service patrols, vehicle mounted push bumpers, incident investigation sites, authority removal laws, quick clearance/open roads policies, non-cargo vehicle fluid discharge policies, fatality certification/removal policy, expedited crash investigation, quick clearance using fire apparatus, towing and recovery quick clearance incentives, and major incident response teams. Abandoned vehicle legislation/policy that does not distinguish removal actions by response personnel of abandoned vehicles reduces time to clear minor incidents and the risk of struck-by incidents. Driver Removal laws speed the clearance of PDO incidents by encouraging or requiring involved drivers to move their vehicle(s) out of the travel lanes if they can do so safely. Service patrols can serve a variety of locations and hours, and can verify incidents, provide scene protection, request response, and provide traffic control. Vehicle-mounted push bumpers are mounted on response vehicles and quickly and safely remove disabled vehicles from shoulders or travel lanes, and out of immediate danger. Incident Investigation Sites provide a safe refuge off the main travelway to further investigate and document an incident. Authority Removal laws authorize a pre-designated set of public agencies to remove damaged or disabled vehicles, as well as spilled cargo, from the roadway. Quick clearance/open roads policies bind agencies to quick clearance by setting implied or explicit goals for clearing incidents. Non-cargo vehicle fluid discharge policies exempt non-cargo vehicle fluid spills from hazardous materials response procedures, as long as the spill is contained on the pavement. Fatality certification/removal policies allow a designated EMS



unit to certify death, rather than a coroner, to decrease delays from waiting for the coroner to arrive. Expedited Crash Investigation uses photogrammetry, and other technology, to more efficiently collect data at the incident scene. Quick clearance using fire apparatus allows the use of tow straps on fire department vehicles to pull disabled or blocking vehicles out of travel lanes to the side of the road. Towing and recovery quick clearance incentives combine financial incentives for quick clearance as well as disincentives for slow performance to improve towing performance and reduce clearance times. Major incident response teams are comprised of high-ranking officials from a variety of agencies who train and respond to major incidents, and are also available 24/7. Table 5 (9) contains the challenges and strategies involving quick clearance and recovery.

Table 5: Quick Clearance and Recovery Strategies

QUICK CLEARANCE AND RECOVERY STRATEGIES	Abandoned Vehicle Hazards	Lengthy Minor Incident Clearance	Lengthy Major Incident Clearance	Liability Concerns	EXAMPLE APPLICATIONS
Abandoned Vehicle Legislation/Policy	●				21+ U.S. Metropolitan Areas, IN, NC
Safe, Quick Clearance Laws—Driver Removal		●			~25 States, including FL, GA, MD, NC, OH, SC, TN, TX, VA, WI
Service Patrols		●			130+ U.S. Metropolitan Areas, AZ (Phoenix), CA, FL, GA (Atlanta), IN, MD, MN, NM (Albuquerque), OR, TN, UT (Salt Lake City)
Vehicle-Mounted Push Bumpers		●			CA (Redding, Stockton), MD (Baltimore), NJ/PA (Delaware Valley Region), OH (Cincinnati), TN (Chattanooga), TX (Austin), UT (Salt Lake City)
Incident Investigation Sites		●			16+ U.S. Metropolitan Areas, TX (Houston)
Safe, Quick Clearance Laws—Authority Removal		●	●	●	AZ, CA, CO, FL, GA, IL, IN, KY, MO, NM, NC, OH, OR, SC, TN, TX, VA, WA
Quick Clearance/Open Roads Policy		●	●		35+ U.S. Metropolitan Areas, CA, FL, GA, ID, IN, LA, MD, NV, NH, TN, UT, WA, WI
Non-cargo Vehicle Fluid Discharge Policy		●	●		FL, MN
Fatality Certification/Removal Policy			●		PA, TN, TX (Austin), WA
Expedited Crash Investigation			●		93+ U.S. Metropolitan Areas, FL, IN, TX (North Central Region), UT
Quick Clearance Using Fire Apparatus			●		TX (Austin)
Towing and Recovery Quick Clearance Incentives			●		FL, GA, WA
Major Incident Response Teams			●		DE, FL, IL (Chicago), LA, MD, NJ, OH (Cincinnati, Columbus), NY, TX (Dallas Co.), WA

Based on implementation of these TIM programs, it is possible to measure their impact by observing the improvements to the selected performance measures. Benefits of TIM programs have been observed in several states. In 2005, Maryland DOT’s Coordinated Highways Action Response Team (CHART) reduced average incident duration by 23%, assisted in 20,515 lane blockage incidents, reduced travel delay by 37 million vehicle-hours, saved users 6.4 million gallons of fuel, reduced secondary incidents by 290 incidents, and benefited highway users \$578 million based on travel delay reductions (1). Similar results were observed by the Hudson

Valley's Highway Emergency Local Patrol (H.E.L.P.). In 2005, this motorist assistance patrol responded to 129 incidents, with an average clearance time of 36 minutes, compared to an average clearance time of 42 minutes for 86 incidents that occurred after their weekday operating hours (1). Additionally, the Georgia DOT Towing and Recovery Incentive Program (TRIP) saved, on average, 163 minutes of clearance time per incident (10).

### ***Training Materials***

Tabletop exercises are often used to practice implementing TIM plans. According to FEMA, "a tabletop exercise simulates an emergency situation in an informal, stress-free environment" (11). It focuses on practice of TIM manual protocol, familiarization with roles and responsibilities, and group problem solving. As can be inferred from the FEMA definition, some of the advantages of these exercises are their low commitment in time and resources, effectiveness at reviewing procedures, and ability to acquaint responders with responsibilities and one another. Drawbacks to such training materials include their lack of realism and inability to model system overload.

There are eight steps, according to FEMA, in designing a tabletop exercise. They are to assess needs, define the scope, write a purpose statement, compose a narrative, write major and detailed events, list expected actions, and prepare messages. First a needs assessment must be completed. This reviews hazards, vulnerable areas, functions in need of rehearsal, potential participants, and exercise requirements. Next, to define the scope, several factors must be determined, such as, expense, availability of personnel, seriousness of the problem, capability of the exercise to address the problem, skills and experience of the designers, and the length of the exercise. After considering these factors, the scope can be set, including the type

of emergency, location, functions, participants, and exercise type. Then the statement of purpose can be written. The statement of purpose is a general statement of the exercise goal, but it directs the selection of objectives and clarifies why the exercise is being conducted for those involved. Then, objectives can be set. Objectives are a description of the performance you expect participants to demonstrate. They are an essential part of the exercise process, and should therefore be simple, measurable, achievable, realistic, and task oriented. An exercise should have 10 or fewer objectives. From the objectives, a narrative is composed. The narrative sets the mood of the exercise and sets the stage for later action. It is also one to five paragraphs, very specific, phrased in present tense, and written in short sentences to lend immediacy and tension. It may develop the situation chronologically or emphasize the emergency environment. Next, major and detailed events are written. Developing events serve to link the simulation to the actions you want to occur and to unify the exercise. Major events are big problems resulting from the emergency and are likely based on case studies and operational plans. Detailed events are intended to prompt one or more expected actions. The following step is therefore to list expected actions taken by an organization or an individual. Types of actions can be categorized as verification, consideration, deferral, or decision. Lastly, messages need to be prepared. The purpose of messages is to cause participants to respond and take action in a way that meets the exercise objectives.

### ***Performance Measures***

With so many intangible impacts, it is hard to quantify the benefits of a TIM plan. In an effort to measure these advantages, several performance measures are commonly used, including: number of service patrol assists, average elapsed time from incident occurrence to

detection, average elapsed time from point at which the incident response team is called out until its arrival on-scene, and average elapsed time to normal traffic flow restoration (12). The effectiveness of TIM plans and training exercises have been measured using metrics like these in several states. In Maryland, the Coordinated Highways Action Response Team (CHART) has measured the effectiveness of their programs based on incident response rate, which is the ratio between the number of incidents reported to and those managed by CHART. It was found that “responders are more likely to compute performance measures if they are already collecting the data to support them” (12) . CHART responders typically reported Incident frequency, detection time, response time, and clearance time. These measures will allow effectiveness to be measured and allow identification of ways to improve TIM response and determination of performance.

## **CHAPTER 3: METHODS**

### ***Defining Gaps***

Through the literature review, the best practices in incident management were determined. Primarily, these were drawn from the FHWA toolkits and other effective state programs, such as those existing in Georgia, California, North Florida, and along the I-95 corridor. All of these best practices were then compared to the existing programs in South Carolina. Doing this determined programs that the state has implemented, has planned, is interested in implementing, or doesn't think would be effective, either economically or feasibly. Based on this information, it could be seen which programs needed additional development and where the state has already met national recommendations.

### ***Recommending Programmatic Changes***

Identification of national and statewide best practices showed the disparities between the most successful methods and current practices in South Carolina. For these gaps, such as towing, coroner, HAZMAT, crash investigation, and EMS procedures, further investigation was done. The goal of such investigation was to determine the necessary laws, funding, and implementation procedures needed to address and fill the gaps.

### ***Developing Training Materials***

According to all of these resources, necessary components of the TIM Plan were compiled. This list includes: incident notification, SC TIM laws, incident classification, towing and recovery, HAZMAT, and incident investigation. Specific forms were created for the TIM plan based on the hurricane evacuation plan were incident command structures, incident briefings, incident objectives, organization assignment lists, and traffic plans. These forms were created

for incidents broken down both by county and severity. From the incident command structures, responders are able to determine who is in charge and who is responding for any incident along the highway corridor. The Incident Briefing form provides general information on the incident, including incident name, location, command, and contact information. The Incident Objective Form outlines the goals of incident clearance, as well as the time frame, weather, and necessary safety precautions. The Organization Assignment List assigns roles and responsibilities of responders, and their contact information. Lastly, the Traffic Plans show detailed maps for rerouting in the event that it would aid in quickly clearing the incident.

Tabletop exercises were created as the primary training material for the I-26 corridor. The preliminary planning for these materials was completed based on the FEMA recommended design steps. First, it was necessary to assess needs. In this case, the need was based on the vast differences observed in response times across SC jurisdictions. The next step was to define the scope of the exercise. For these exercises, the scope included roadway incidents on I-26 between Columbia and Charleston. The scope also includes the participants in the exercise. Participants in incidents on the I-26 corridor are: SCDOT, SCHP, Towing, EMS, Fire, and HAZMAT. After defining the scope, a statement of purpose was written. The purpose here was to perform tabletop exercises for responding agencies to practice implementing the new TIM Plan along the I-26 corridor. Once the purpose was defined, several objectives were set. For these exercises, the objectives included: decreasing delay, ensuring safety of responders, practicing communication during incidents, and implementing responder roles and responsibilities. Following setting of objectives, a narrative was composed. As part of the narrative, both major and detailed events were written. Each of these events then required the writing of expected

actions by responders. Finally, for the expected actions, messages were prepared to supplement and prompt next steps of responders.

Following the preliminary tabletop exercise planning outlined by FEMA, FHWA National TIM Responder Training was used as a framework for developing specific tabletop exercises. Based on the objectives set in the preliminary tabletop planning and the evaluation of the CAD data, tabletop exercises were developed to help responders practice protocol for typical South Carolina incidents. Furthermore, to make these exercises even more applicable, actual incidents from the I-26 corridor were used as models when developing each tabletop exercise.

### ***Assessing Existing Metrics***

Computer Aided Dispatch (CAD) data was collected from the South Carolina Highway Patrol (SCHP) to evaluate the current state of incidents on South Carolina roadways. This data was utilized to determine current incident type distributions and incident response time data along the I-26 corridor.

Measuring the differences in delay among different incident types was done via several performance measures, including: notification time, roadway clearance time, incident clearance time, and recovery time. According to the FHWA, these times are defined as follows. Notification time is “the time between the first agency’s awareness of the incident and the time to notify needed response agencies”. Roadway clearance time is “the time between awareness of an incident and restoration of lanes to full operational status”. Incident clearance time is “the time between awareness of an incident and removal of all evidence of the incident, including debris or remaining assets, from shoulders”. Recovery time is the time “between awareness of an incident and restoration of impacted roadway/ roadways to ‘normal’ conditions”. (13)



Times were evaluated for several conditions, regarding location and incident type. For location, durations were compared for areas with and areas without traffic cameras, representing urban and rural areas respectively. Variation among incident times based on type included considering response of EMS, Fire, HAZMAT, MAIT, and towing. Additionally, incident counts for type and severity of incident were also determined.

To determine what programs to focus on improving, these potential benefits were weighed against all the potential and previously recommended improvements. For instance, a longer notification time in a rural area meant that there was more potential benefit for implementing a TIM program in these areas that decreases notification times. The same methodology was applied to the various locations and incident type to determine the potential benefits of implementing new programs. By measuring these benefits, it was determined the best ways to allocate the state's resources, both personnel and financial.

After this data was analyzed, it was easy to determine where issues in data collection exist. This included, for each type of incident and severity level: what percentage of incidents actually have data, what data is collected or needs to be collected, and if the data is recorded in a useable format. From such information, a baseline of current conditions could be set and recommendations could be made to improve future data recording practices.

## CHAPTER 4: RESULTS

### *Defining Gaps*

The FHWA best practices identified in the literature were compared to the current practice in the state of South Carolina to determine those that are implemented, planned, or that the state is interested in implementing. Several detection and verification strategies recommended nationally are being practiced in SC. Those being used by SCDOT include field verification by on-site responders, CCTV, enhanced 9-1-1, and automated collision notification systems, as well as an automated positioning system that is in the process of being developed and implemented. Currently, South Carolina employs the use of the INRIX software for collision notification. However, the state does not currently use any of the other recommended measures. Due to high maintenance costs, frequent/enhanced roadway reference markers are not considered feasible in SC. Additionally, motorist aid call boxes were deemed unnecessary with such a high proportion of road users carrying cell phones. Further research has previously been done to investigate the use of traffic sensors on SC interstates and the associated benefit-cost analysis. This research can be read in “Incident Detection with Sensors on Urban Highways” (14). These programs can be seen below in Table 6.

Table 6: SC Detection and Verification Practices

	Implemented	Planned	Interested	Not Implemented
Field Verification by On-Site Responders	●			
Closed-Circuit Television Cameras	●			
Frequent/Enhanced Roadway Reference Markers				●
Enhanced 9-1-1/Automated Positioning Systems	●	●		
Motorist Aid Call Boxes				●
Automated Collision Notification Systems	●			

South Carolina uses all of the nationally recommended traveler information strategies. Media partnerships with the state are typically only used for major incidents, but all other best practices are used daily on state roads. These implemented strategies can be seen in Table 7.

Table 7: SC Traveler Information Practices

	Implemented	Planned	Interested	Not Implemented
5-1-1 Systems	●			
Traveler Information Websites	●			
Media Partnerships	●			
Dynamic Message Signs	●			
Standardized Message Sets/Use Protocol	●			

Compared to the other functional areas, South Carolina is lacking the most in the area of response strategies. While they do have personnel/equipment resource lists, towing and recovery vehicle identification guide, motorcycle patrols (used for enforcement), and equipment staging areas, there are many gaps in the recommended practices where they could improve.

There are currently no instant tow dispatch procedures, towing and recovery zone-based contracts, ECAD, or dual/optimized dispatch procedures. There also is no motorcycle patrol used for response, but the state is interested in developing these programs. Planned and implemented programs can be seen in Table 8.

*Table 8: SC Response Strategies*

	Implemented	Planned	Interested	Not Implemented
Personnel/Equipment Resource Lists	●			
Towing and Recovery Vehicle Identification Guide	●			
Instant Tow Dispatch Procedures				●
Towing and Recovery Zone-Based Contracts				●
Enhanced Computer-Aided Dispatch				●
Dual/Optimized Dispatch Procedures				●
Motorcycle Patrols	●		●	
Equipment Staging Areas/Pre-positioned	●			

All of the best practices in scene management and traffic control are either being used in South Carolina today or are planned. Response vehicle parking plans and on-scene emergency lighting procedures are currently in the planning phase and SCDOT is conducting training of responders to implement these practices. All other recommended strategies in this area are practiced, and all can be seen in Table 9.

Table 9: SC Scene Management and Traffic Control Strategies

	Implemented	Planned	Interested	Not Implemented
Incident Command System	●			
Response Vehicle Parking Plans		●		
High-Visibility Safety Apparel/Vehicle Markings	●			
On-Scene Emergency Lighting Procedures		●		
Safe, Quick Clearance Laws--Move Over	●			
Effective Traffic Control Through On-Site Traffic Management Teams	●			
End-of-Queue Advance Warning Systems	●			
Alternate Route Plans	●			

Several quick clearance and recovery strategies are practiced in South Carolina. These strategies are: abandoned vehicle legislation/policy, driver removal laws, service patrols, vehicle-mounted push bumpers, authority removal laws, expedited crash investigation, and quick clearance using fire apparatus. Of the remaining gaps, the state cited towing and recovery quick clearance incentives as something they were interested in possibly developing and determining the feasibility. The state is interested in possibly implementing all remaining strategies; these are outlined in Table 10.

Table 10: SC Quick Clearance and Recovery Strategies

	Implemented	Planned	Interested	Not Implemented
Abandoned Vehicle Legislation/Policy	●			
Safe, Quick Clearance Laws--Driver Removal	●			
Service Patrols	●			
Vehicle-Mounted Push Bumpers	●			
Incident Investigation Sites			●	
Safe, Quick Clearance Laws--Authority Removal	●			
Quick Clearance/Open Roads Policy			●	
Non-Cargo Vehicle Fluid Discharge Policy			●	
Fatality Certification/Removal Policy			●	
Expedited Crash Investigation	●		●	
Quick Clearance Using Fire Apparatus	●			
Towing and Recovery Quick Clearance Incentives			●	
Major Incident Response Teams			●	

**Recommending Programmatic Changes**

After analyzing the current best practices, the potential areas for improvement could be identified. Based on the above tables, the areas most in need of improvement were response and clearance strategies. The major gaps existed in towing, coroner, HAZMAT, and crash investigation procedures.

*Towing*

Wrecker regulations in South Carolina consist of 3 wrecker lists, divided by class, assigned to each zone. Once the SChP calls one of the wrecker companies on the wrecker list, the company has 45 minutes to arrive at the scene of the accident. Wrecker fees for Class C

vehicles are \$300/hour and can vary based on incident type for commercial vehicles. These arrangements are similar to programs in Washington, Georgia, Florida, North Carolina, and Virginia before they implemented incentive based towing programs.

Because of the similarities between South Carolina’s current regulations and the previous regulations in states that now have incentive based programs, it is possible to see the potential economic and clearance time benefits in SC. With the current system, there is no motivation for the wreckers to get the job done quickly because the longer they work the more money they earn. Table 11 summarizes the incentive-based programs used by other states.

*Table 11: Towing Incentive Programs*

	SC Regulations	WSDOT (MIT)	GDOT (TRIP)	FDOT (RISC)	NCDOT
Specialized wrecker list for quick clearance?	No	Major Incident Tow	Towing & Recovery Incentive Program	Rapid Incident Scene Clearance	Incident Management Assistance Patrols
Separate list for each wrecker category?	Yes	No	No	No	Yes
Additional training or equipment required?	No	Yes	Yes	Yes	No
Required wrecker business hours?	8:30 A.M. - 5:00 P.M. Monday - Friday	24/7 7 days a week	24/7 7 days a week	None Established (assume standard 8:00A.M.- 5:00P.M. M-F)	24/7 7 days a week

Can passing wrecker respond to accident?	No; not unless contacted by SCHP	Yes; wrecker would be on a route during peak traffic	No	No	No
Time allocation wrecker has to arrive on scene?	45 minutes	15 minutes (business hours)	45 minutes (business hours)	60 minutes	Timely manner
Total Time allocation for wrecker to clean area?	None Established	90 minutes	90 minutes	90 minutes	None Established
Incentive Bonus?	None	\$2,500	\$2,500 standard + \$1,000 equipment bonus = \$3,500 total	\$2,500 standard + \$600/\$1000 equipment bonus = \$3,500 total	None
Minimum wrecker requirements?	One Class A, B, or C wrecker	Two Class C wreckers	Two Class C wreckers and a support vehicle	One Class C wrecker	One Class A, B, or C wrecker
Reimbursement for services not rendered?	None	\$600	\$600	\$600	None
Penalized for excessive cleanup time?	No	No	\$600 flat or \$600/hr	\$600/hr	No

As can be seen in the table, the incentive rate ranges from \$2500/1.5hr to \$3500/1.5hr with additional penalties applied in Georgia and Florida if the required clean-up time is not met. These programs have resulted in large reductions in incident duration. In Georgia, between 2007 and 2009, the Towing and Recovery Incentive Program (TRIP) has seen the average duration of all incidents decrease from 4 hours and 43 minutes to 1 hour and 37 minutes, a 66%



improvement. They have also seen the average duration of “typical” incidents decrease from 4 hours and 52 minutes to 1 hour and 30 minutes, a 69% improvement.

Funding for the TRIP program originally was provided by Congestion Mitigation and Air Quality (CMAQ) federal funds. To qualify for these funds, the program must exist in a federally approved non-attainment region. CMAQ funding of \$2.2 billion was carried over into MAP-21 funding for 2013-2014. These funds are typically only used to start and establish a program during its first three years. GDOT, and the TRIP program, have switched from funding from CMAQ to funding from State Farm sponsorships of the HERO units, which include logos on HERO trucks and sign placements within the DOT right of way. State Farm currently provides \$1.7 million/year of funding.

This funding is used to compensate members of the TRIP program. Members of the program must complete a stringent application process and once approved, are required to maintain a staff of supervisors and operators that have completed national and industry certifications. They are also required to maintain up-to-date equipment, including heavy-duty wreckers and support vehicles with traffic control and fluid spill mitigation equipment. When an incident involving a commercial vehicle occurs that requires TRIP, designated personnel (such as a GDOT HERO supervisor) must activate the response. Once declared a TRIP incident, and the responder is notified, the company supervisor must arrive on the scene within 30 minutes of notification and all basic equipment must arrive within 45 minutes if called between 5:30 am and 7:00 pm, Monday through Friday; at all other times equipment is allowed 60 minutes to arrive at the scene. The company then remains on scene until they receive official notice to proceed and clear the incident. After receiving notice, the roadway must be cleared and open

to traffic within 90 minutes. Monthly After Incident Reviews (AIR) are held by GDOT HERO to discuss and evaluate incident timelines and determine eligibility for incentives. TRIP incentive bonus payments are as follows:

1. \$600 if the TRIP company is called, responds within the specified time, but is not needed.
2. \$2,500 if the TRIP company is called, responds within the specified time, and has the roadway cleared and opened to traffic within 90 minutes after receiving the notice to proceed.
3. An extra \$1,000 is paid if additional special equipment was required and provided, and all time requirements were met.

### *Coroner*

Implementing a traffic fatality certification law permits temporary removal of the deceased from the roadways and can allow for certification of a fatality by a responding agency other than the medical examiner. Currently, Pennsylvania, Tennessee, and Texas have fatality certification laws in place that permit the removal of a victim before the arrival of the coroner if the incident poses a risk to the victim. According to NCHRP Synthesis 318: Safe and Quick Clearance of Traffic Incidents, 73% of jurisdictions require medical examiners or coroners to respond to a fatal crash site before the body of the deceased can be removed and 47% of jurisdictions have legislation or policies establishing procedures and responsibilities for removing deceased victims from vehicles (6) . Several states have policies in place for the removal of bodies if they are in danger of loss or destruction, or under authorization of the

county medical examiner. Only three of the surveyed jurisdictions in this study allowed removal of the deceased victim before the arrival of the medical examiner. In these instances, the victim was moved either to an intermediate location or taken to the medical examiner's office by a private contractor.

### *HAZMAT*

The USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) has developed training modules from the perspective of the HAZMAT carrier. Such training covers carrier requirements, national and local regulations, methods for handling spills, and procedures for reporting spills. PHMSA also developed an Emergency Response Guidebook (ERG) in 2012 for first responders to aid in on-scene procedures and identifying spilled hazardous materials. This guidebook is also available as a smartphone app for easy access and quick response during the crucial moments after an incident occurs. A similar ERG was developed in 2008, and features initial isolation and protective action distances developed by Argonne National Laboratory. In addition to all of these training materials, courses and materials have also been created by the Federal Emergency Management Agency (FEMA), FHWA, NTIMC, and individual states; including Virginia and Florida. Non-governmental agencies, such as the International Association of Firefighters and the Security and Emergency Response Training Center, have also developed training programs.

Many of these training courses and reference materials contain direction on identifying materials after they have been spilled. Typically, it is up to the carrier to notify appropriate authorities about the material and any other pertinent information about the spill. This can be determined via the placard on the sides and end of the vehicle. Each vehicle transporting

HAZMAT should have one or more of these diamond-shaped placards featuring a 4-digit ID number. This ID number is usually on each placard or on an adjacent orange panel and can be used to identify the type of HAZMAT spill. Other than the placards, container labels, shipping documents, Material Safety Data Sheets (MSDS), the 2012 ERG, and the knowledge of persons on scene can be used to identify spilled materials. Additionally, the PHMSA ERG contains nine categories of HAZMAT (e.g. explosives, gases, oxidizing substances, organic peroxides, etc.) with specific response protocols for each category.

In most states, the HAZMAT carrier is responsible for funding clean-up activities. State DOTs usually only contain the spilled materials and wait for the carrier to perform clean-up activities. If immediate action must be taken or the clean-up is outside the scope of the carrier, some state DOTs (e.g. Massachusetts) will call in a contractor to clean up the spill, and then bill the carrier after.

South Carolina requires that the carrier notifies the Department of Health and Environmental Control (DHEC) for every HAZMAT incident requiring clean-up. DHEC is primarily responsible for monitoring the clean-up process, but does not have to be involved in immediate incident response. Should the fire department responders determine that it is a severe HAZMAT incident, DHEC will immediately become involved in the clean-up process.

There are often delays in HAZMAT clean-up when DHEC resources are not nearby, both by time and location. Should a memorandum of understanding be created between DHEC and the South Carolina Emergency Management Division (SCEMD), additional resources could be available for cleaning up HAZMAT spills. By maintaining a contact list of personnel, skills, and materials possessed by SCEMD and their responders, hazardous material spills could be handled

more quickly and efficiently by the closest resources. While this is a potential area for improvement, limited hazardous materials clean-ups in the preceding year (quantity = 2) indicates that the return on investment may be limited. However, maintaining response training is important in the event that the frequency of incidents increases.

### *Crash Investigation*

The total station is currently the method used for crash investigation in the state of South Carolina. Advantages of this program include absolute point accuracy, inexpensive equipment, widely available scanning and image taking facilities, one person operation, and long range capabilities. Total stations, however, have relatively slow operation (49.8 points/hour) and field of view resulting in an average investigation time of 60 minutes (15). The cost of a total station can range from \$20,000 to \$40,000, depending on the style. Through numerous stakeholder meetings, SC responders have expressed interest in moving from the use of total stations towards the use of laser scanners. Laser scanners have absolute point accuracy less than 10mm, fast (100,000 points/sec) and high density data, simple data acquisition, ranges up to 1000m, 360° field of view, and can be combined with other devices, such as GPS and external cameras. Drawbacks to this technology are bulky equipment, high expense, and the technical knowledge and data processing required for operation. The Focus 3D Scanner, targets, tripod, power block battery, dock, charger, and training cost about \$54,000. The Focus scanner includes FARO's proprietary software called SCENE, but the scan data can also be imported in to other 3rd party software programs, including AutoCAD and Microstation. Such technology boasts reductions in time for measurement collection by more than 75%.

### ***Developing Training Materials***

Tabletop exercises were developed to accompany the SC TIM plan. The FHWA National TIM Responder Training was used as a reference in developing exercises specific to South Carolina and the types of incidents typically occurring on roadways. To begin this process, several incidents indicative of typical scenarios and varying severities along I-26 were identified. These incidents included: secondary incidents, roadside hazards, fire, injury, and split-scene multi vehicle. Each of these incident types were then incorporated into guided tabletop exercises. Such exercises documented the steps necessary between the occurrence of an incident and incident clearance in a format that allowed responders to tackle incidents and communication on a step-by-step basis. Exercises were performed using a slideshow to depict the situation followed by the use of hands-on models by responders to indicate their actions.

### ***Assessing Existing Metrics***

Data was obtained from South Carolina Highway Patrol for all interstate incidents from 2012-2013. SCDOT TMS data was also obtained, but was not used due to lack of consistent and sufficient reporting. SCHP data was therefore used in this analysis. To determine where the need for improvement was, first the types of incidents occurring on interstates in the state were examined. There were 61,051 and 57,827 incidents in 2012 and 2013 respectively. Of the almost 119,000 incidents statewide and the 44,000 occurring on I-26, there was a similar breakdown by incident type for both, as can be seen in Figure 2 below.

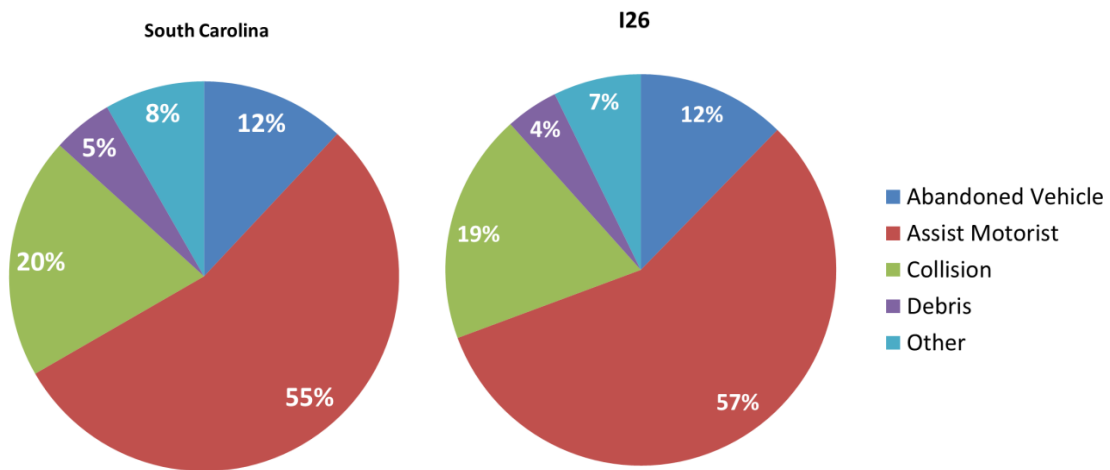


Figure 2: Incident Types in SC (2012-2013)

The most common type of incidents that SCHP and SHEP responded to were motorist assist, collision, abandoned vehicles, and debris in the roadway, respectively. All other response types fell in the “other” category, and only counted for 4-5% of incidents. The incident types recorded include:

- 4 Wheelers in the Road
- Abandoned Vehicles
- Animal Carcass
- Animal on Roadway
- Assault
- Assist Motorist
- BOL
- BOLO: Ped in Roadway
- Burglary
- Car Jacking
- Civil Disturbance
- Collision: Fatlity
- Collision Injuries
- Collision: No Details
- Collision: No Injury
- Collision: Private Property
- Collision: vs. Animal
- Collision: vs. Deer
- Crime in Progress

- Debris in Roadway
- Domestic Problem
- Drag Racing
- Escapee
- Fire: Structure
- Fire: Vehicle
- Fire: Woods
- Fuel Spill
- HAZMAT Incident
- Hit & Run: Fatality
- Hit & Run: Injuries
- Hit & Run: No Injury
- Hit & Run: Private Property
- Hit & Run: Unknown
- Ice/Snow on Roadway
- Inspection at Scales
- Lines Down
- Medical Complaint
- Object in Roadway
- Pedestrian: 1056
- Pedestrian: In Roadway
- Power Lines in Road
- Rest Area
- Subject with a Gun
- Traffic Hazard
- Traffic Light Defect
- Tree in Roadway

Further investigation of incident types and corresponding incident lengths can be seen below in Table 12.

*Table 12: Incident Types and Time Distributions (2012-2013) [incidents]*

Time (min)	Abandoned Vehicle	Assist Motorist	Debris	Collision	% Collision	Total	%
<30	12362	43258	4004	2517	10.6%	62141	57.0%
30-60<	1031	12224	1118	5925	24.9%	20298	18.6%
60-90<	385	5119	411	6453	27.1%	12368	11.3%
90-120<	155	2172	172	3758	15.8%	6257	5.7%
120-720<	281	2234	219	5130	21.5%	7864	7.2%
Timeout (>720)	17	8	2	53	0.2%	80	0.1%
Total	14231	65015	5926	23836	100.0%	109008	100.0%



In this table, it can be seen that for 57% of incident types, the recovery time is under 30 minutes. The only exception of these incident types are collision incidents. These most often lasted 60 to 90 minutes. Additionally, most of the max times are unrealistically high. This suggests that incidents could be timing out in the system if they were not closed properly. Due to the frequency of this occurrence, developing some kind of protocol for closing incidents in a timely manner could be beneficial.

For all incidents and then specifically for the four “most common incidents”, the minimum, maximum, and average recovery times were calculated. Recovery time is the time between the first call being received, and the incident being closed. These times for the each incident type statewide can be seen below, in Table 13.

Table 13: Statewide Recovery Time (2012-2013) [minutes]

All Incidents			
	2012	2013	Total
Min	0	0	0
Max	1430	1436	1436
Average	43	42	43
Abandoned Vehicles			
Min	0	0	0
Max	1416	1338	1416
Average	18	16	17
Assist Motorist			
Min	0	0	0
Max	691	1436	1436
Average	30	30	30
Collision			
Min	0	0	0
Max	1430	1424	1430
Average	96	91	93
Debris			
Min	0	0	0
Max	719	1103	1103
Average	32	31	32

Most of these incident types have a recovery time around 30 minutes or less, except for collision incidents. Due to the higher severity and number of responders required for this type of incident, the average recovery time exceeds 90 minutes. These types of incidents could therefore benefit from additional training and incident management programs.

The same recovery time values were also calculated for the I-26 corridor, seen below in Table 14.

Table 14: I-26 Recovery Time (2012-2013) [minutes]

All Incidents	
	Total
Min	0
Max	1402
Average	40
Abandoned Vehicles	
Min	0
Max	1362
Average	16
Assist Motorist	
Min	0
Max	1226
Average	28
Collision	
Min	0
Max	1402
Average	95
Debris	
Min	0
Max	1103
Average	30

Values were only calculated for the 2012-2013 combined totals in this instance because of the lack of variability seen between years in the statewide data. These values are also very similar to the statewide values, and in most instances are a couple of minutes shorter.

Times along the I-26 corridor were then investigated more closely. Recovery times were broken down by highway patrol troops between Columbia and Charleston along the corridor. The minimum, maximum, and average recovery times for all incident types along this section of interstate can be seen in Table 15.

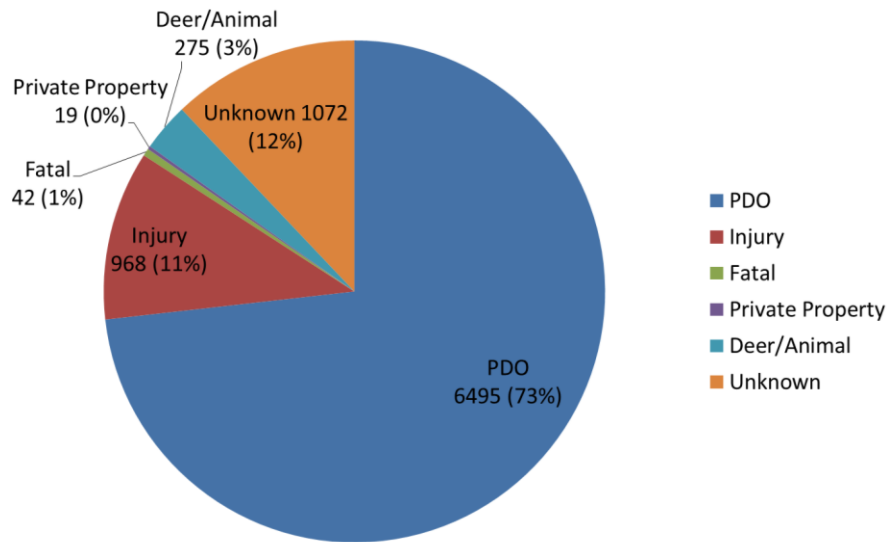
Table 15: I-26 Recovery Times by County/Troop (2012-2013) [minutes]

Lexington (T01C)		
	Total	Number of Incidents
Min	0	3604
Max	1402	
Average	63	
Richland (T01D)		
	Total	Number of Incidents
Min	0	2031
Max	1362	
Average	61	
Calhoun & Orangeburg (T07B)		
	Total	Number of Incidents
Min	0	5521
Max	1103	
Average	61	
Dorchester (T06B)		
	Total	Number of Incidents
Min	0	1908
Max	754	
Average	45	
Berkeley & Charleston (T06A)		
	Total	Number of Incidents
Min	0	18432
Max	1352	
Average	27	

There was a lot of variation among the average recovery time by location. Throughout the state, this time was 42.6 minutes (Table 13) and along the corridor, it was 40.35 minutes (Table 14). When looking at these times broken down by county, it can be seen that the average times are over 30 minutes longer around Columbia than they are around Charleston. A two-

tailed t-test was performed, and the difference between the Columbia and Charleston means was determined to be statistically significant ( $p < 0.0001$ ). These could be due to high congestion levels, higher severity incidents, which naturally have longer recovery times, or inefficient incident management practices. Further, the only known difference in incident management practices between Columbia and Charleston is the dual/optimized dispatch and towing zone contracts already in place in Charleston. This could contribute to the lower recovery time observed in this city. Any of these issues could be benefitted from increased training and statewide TIM programs.

Incidents along I-26 were also analyzed by severity. Severity was reported for collision and hit and run incidents, both of which were included in this analysis. The severities included were property damage only (PDO), injury, fatal, private property damage, and incidents involving deer or animals. The breakdown of severity along the corridor can be seen below in Figure 3.



*Figure 3: Incident Severity on I-26 (2012-2013)*

As can be seen in the figure, 73% of the incidents are property damage only (PDO) incidents, while injury and fatal incidents are only 11% and 1% respectively. These values could also be misleading because incidents involving deer, or even private property, could also cause property damage, injury, or even fatalities. There could be additional benefit to coding such incidents involving animals, instead as just fatal, injury, or PDO.

Some of these severities are combinations of collision and hit and run incidents. Severities reported for collisions were: fatality, injury, no details, no injury, private property, vs. animal, and vs. deer. Conversely, the severities reported for hit and run incidents were: fatality, injury, no injury, private property, and unknown. While several of these severity levels do overlap, there is still room for improvement in severity reporting. For instance, vs. deer could also fall in the category of PDO, injury, or fatality; and reporting one of these severities would provide more information indicative of the incident. Further, 12% of these incidents were

reported as an unknown severity. This high proportion of severities not being recorded indicates much room for improvement in reporting practices. One way this could be achieved is through utilizing the already established severity levels of 1 through 4, making severity less subjective. These severity levels have already been accepted by SCDOT and can be seen below in Figure 4. This Matrix comes from the Georgia DOT, but the same matrix has also been adopted in South Carolina.

**TRAFFIC INCIDENT RESPONSE MATRIX**

LEVEL	LAW ENFORCEMENT	FIRE & RESCUE	EMS	EPD/HAZMAT	TOWING & RECOVERY	H.E.F.O. UNIT	DOT
Level I	<ul style="list-style-type: none"> <li>Notify dispatch</li> <li>Identify nearest shoulder or safe area for relocating vehicle(s)</li> <li>Relocate vehicle(s) to the shoulder or safe area, to await recovery</li> </ul>	No Responsibility	No Responsibility	No Responsibility	<ul style="list-style-type: none"> <li>When directed, respond &amp; remove vehicle(s) from the roadway shoulder, as quickly &amp; safely as possible</li> </ul>	<ul style="list-style-type: none"> <li>Notify TMC</li> <li>Relocate vehicle(s) to shoulder/safe area, to await recovery</li> </ul>	<ul style="list-style-type: none"> <li>Notify TMC</li> <li>Assist relocating vehicle(s)</li> </ul>
Level II	<ul style="list-style-type: none"> <li>Notify dispatch</li> <li>Establish ICP</li> <li>Assist the injured</li> <li>Control crowds &amp; traffic</li> <li>Conduct investigation</li> </ul>	<ul style="list-style-type: none"> <li>May be dispatched to care for injured</li> </ul>	<ul style="list-style-type: none"> <li>Provide medical care to the injured</li> </ul>	No Responsibility	<ul style="list-style-type: none"> <li>When directed, remove vehicle(s) from roadway</li> <li>Remove crash debris from roadway</li> </ul>	<ul style="list-style-type: none"> <li>Notify TMC</li> <li>Assist the injured</li> <li>Establish Traffic Control</li> <li>Assist in relocating vehicle(s) from roadway</li> </ul>	<ul style="list-style-type: none"> <li>Assist in removal of vehicles</li> <li>Assist with clean-up</li> <li>Check for State property damage</li> </ul>
Level III	<ul style="list-style-type: none"> <li>Secure traffic incident scene</li> <li>Assist the injured until Fire and EMS arrives</li> <li>Assist with Traffic Control</li> <li>Conduct investigation</li> </ul>	<ul style="list-style-type: none"> <li>Secure scene</li> <li>Protect life and property</li> <li>Establish ICP</li> </ul>	<ul style="list-style-type: none"> <li>Provide medical care to the injured</li> </ul>	<ul style="list-style-type: none"> <li>Secure area</li> <li>Clean-up of debris</li> </ul>	<ul style="list-style-type: none"> <li>When directed, remove vehicles from roadway, after injured are treated</li> <li>Remove crash debris from roadway</li> </ul>	<ul style="list-style-type: none"> <li>Notify TMC</li> <li>Assist the injured</li> <li>Establish &amp; maintain traffic control</li> <li>Assist with the removal of vehicle(s) from the roadway</li> </ul>	<ul style="list-style-type: none"> <li>Establish Detours as needed</li> <li>Check for State property damage</li> <li>Provide support equipment &amp; materials</li> </ul>
Level IV	<ul style="list-style-type: none"> <li>Secure traffic incident scene</li> <li>Assist the injured until Fire and EMS arrives</li> <li>Assist with traffic control</li> </ul>	<ul style="list-style-type: none"> <li>Secure scene</li> <li>Protect life and property</li> <li>Establish ICP</li> <li>Request clean-up and/or containment of hazardous materials</li> </ul>	<ul style="list-style-type: none"> <li>Provide medical care to the injured</li> </ul>	<ul style="list-style-type: none"> <li>Secure area</li> <li>Clean-up of hazardous materials and debris</li> </ul>	<ul style="list-style-type: none"> <li>When directed, by the Investigating Officer, remove vehicles from roadway, after injuries and/or HAZMAT dangers have been addressed</li> <li>Remove crash debris from roadway</li> </ul>	<ul style="list-style-type: none"> <li>Notify TMC</li> <li>Assist with the injured</li> <li>Establish traffic control</li> <li>Assist with the removal of vehicle(s) from the roadway</li> </ul>	<ul style="list-style-type: none"> <li>Establish detours as needed</li> <li>Assist with clean-up</li> <li>Check for State property damage</li> <li>Provide support equipment &amp; materials</li> </ul>

NOTE: Shaded areas  denote Key Agencies for each Level of Traffic Incident, during initial response.

REMEMBER: "The responding agency arriving first at the traffic incident scene, by default, is the traffic incident manager, at least until the nature of the incident changes and/or additional response agencies arrive on the scene and assume command."

Figure 4: Incident Response Severity Matrix (Source: I95 Coalition)

For each of the severities in Figure 3, the minimum, maximum, and average recovery times were calculated. These times can be seen in Table 16.

Table 16: Recovery Time by Severity (2012-2013) [minutes]

	PDO	Injury	Fatal	Private Property	Deer/Animal	Unknown
Min	0	1	119	2	1	1
Max	1402	707	1276	119	402	707
Average	84	142	381	50	52	142

Most notable in this data is the minimum recovery time for fatal incidents. While most of the minimum recovery times are very low, the minimum recovery time for fatal incidents is 2 hours. This could be indicative of inefficient protocols and definitely leaves room to improve procedures for fatality certification and removal procedures.

For most of the incidents, sufficient time data was collected. Each incident had an notification time, an on-scene time, and an incident closing time. For both years analyzed in this project, there were only missing time data entries 15% of the time. Additionally, of those incidents missing time data, almost 99.9% of these were missing the On-scene time. So currently, SCHP is consistently recording the time they are notified and the time they leave the scene, but they are not consistently recording the time they arrive on the scene. The percentages and number of incidents that fall into these categories can be seen in Table 17 below.

*Table 17: Incidents Missing Time Data (2012-2013)*

Year	Entries Missing	Onscene Time Missing	Total Incidents	% of Total	% Onscene
2012	9446	9441	61051	15.5%	99.95%
2013	8196	8186	57827	14.2%	99.88%

Based on this data, it seems that the process of reporting the on-scene arrival time needs to be improved. Additionally, all of the minimum recovery times around zero and the maximum recovery times around 1400 indicate reporting issues. Minimum times around 0 could indicate that incidents are being reported “after the fact” and one time is reported in all the time fields , and is therefore not accurate. Maximum times around 1400 minutes, which is approximately 24 hours, indicates that incidents could be timing out in the system or are being closed out at the end of the day, rather than at the end of the incident.



Along the same lines, response strategies by individual response groups (i.e. towing, coroner, HAZMAT, crash investigation, etc.) could be improved if notification and arrival times were also recorded for other responders. If times cannot be recorded, there would still be some benefit to at least recording who the responding agencies were.

## **CHAPTER 5: CONCLUSION & RECOMMENDATIONS**

Based on the analyzed data several conclusions could be drawn, and many recommendations could then be made based upon such conclusions

### ***Conclusions***

When analyzing the existing metrics, recovery times along I-26 were analyzed by county. In this analysis, it was observed that recovery times in Columbia were significantly higher than in Charleston, being 63 minutes and 27 minutes respectively. This difference in means was determined to be very statically significant. The only known difference between response strategies in these areas is the existence of a dual/optimized dispatch and towing zone contracts already in place in Charleston. Recovery times, especially around Columbia and the surrounding areas, could be improved by further implementing or spreading such programs.

Analysis of recovery times by severity revealed very high recovery times for fatal incidents. With a minimum recovery time of 2 hours, these incidents could be benefitted by new incident management protocols. If these times are high due to waiting for coroner response to the scene, the implementation of a fatality removal program could allow the return of traffic flow more expeditiously.

A breakdown of incident types observed on SC interstates was determined in this thesis. It was seen that in the last two years, there have only been 2 HAZMAT incidents on interstates statewide. This could be an indication that investing resources in developing a large HAZMAT training program may not be necessary.

Lastly, investigation of recovery times by incident type showed a high proportion of collision incidents lasting over an hour. Depending upon the severity of the incident, this could be due to many contributing factors. One such factor could be the time taken to investigate these collision incidents before they are cleared. This time could be decreased by the implementation of new crash investigation technologies, like laser scanning.

### ***Recommendations***

The nationally recommended best practices were compared to the current South Carolina practices. Gaps were observed and SCDOT expressed interest in developing towing, coroner, HAZMAT, and crash investigation procedures. Successful programs involving these groups of responders were evaluated, including implementation costs and challenges. Several successful national programs, as well as those in Florida, Georgia, and numerous other states were included in this step. This specifically included incentive based towing programs, fatality removal programs, HAZMAT training procedures, and crash investigation technologies. It is recommended that these programs be considered and investigated further when implementing a SC TIM plan. It was however noted that while basic HAZMAT training is necessary, a large or full-scale program may not be cost effective.

After analyzing the data, areas where data collection could be improved were determined. It is recommended that responders more consistently collect on-scene arrival time for all agencies. Additionally, due to the high number of incidents that seem to be timing out and recording recovery times that are too long, it is recommended that improvements to the data collection process be made

## REFERENCES

1. NTIMC. Benefits of Traffic Incident Management. <http://ntimc.transportation.org/Documents/Benefits11-07-06.pdf>, Accessed 5/23, 2012.
2. US Department of Homeland Security. *National Incident Management System*. FEMA, Washington DC, 2008.
3. FEMA. Incident Command System. 9/5/2013. <http://www.fema.gov/incident-command-system>, Accessed 10/23, 2013.
4. United States Department of Transportation. Simplified Guide to the Incident Command System for Transportation Professionals. 2006. [http://ops.fhwa.dot.gov/publications/ics\\_guide/ics\\_guide.pdf](http://ops.fhwa.dot.gov/publications/ics_guide/ics_guide.pdf), Accessed 10/23, 2013.
5. Birenbaum, I., C. Creel, and S. G. Wegmann. Traffic Control Concepts for Incident Clearance. 2009. <http://ops.fhwa.dot.gov/publications/fhwahop08057/fhwahop08057.pdf>, Accessed 10/23, 2013.
6. Dunn, W. M., and S. P. Latoski. *Safe and Quick Clearance of Traffic Incidents: A Synthesis of Highway Practice*. NCHRP Synthesis 318, , 2003.
7. Lockwood, S., J. O'Laughlin, D. Keever, and K. Weiss. *NCHRP Surface Transportation Security Volume 6: Guide for Emergency Transportation Operations*. 525, Transportation Research Board, Washington D.C., 2005.
8. NTIMC. NTIMC: About Us. <http://ntimc.transportation.org/Pages/AboutUs.aspx>, Accessed 5/22, 2012.
9. Carson, J. L. *Best Practices in Traffic Incident Management*. FHWA-HOP-10-050, FHWA, Washington DC, 2010.
10. Metro Atlanta TIME Task Force: Towing and Recovery Incentive Program (TRIP). 2012. <http://www.timetaskforce.com/index.php/time-initiatives>, Accessed 10/15, 2013.
11. FEMA. IS-139 Exercise Design. 1/29/2013. <http://www.training.fema.gov/emiweb/IS/is139lst.asp>, Accessed 10/15, 2013.
12. Balke, K., D. Fenno, and B. Ullman. *Incident Management Performance Measures*. FHWA, Washington DC, 2002.
13. Owens, N., A. Armstrong, P. Sullivan, C. Mitchell, D. Newton, R. Brewster, and T. Trego. *Traffic Incident Management Handbook*. FHWA-HOP-10-013, FHWA, Washington DC, 2010.

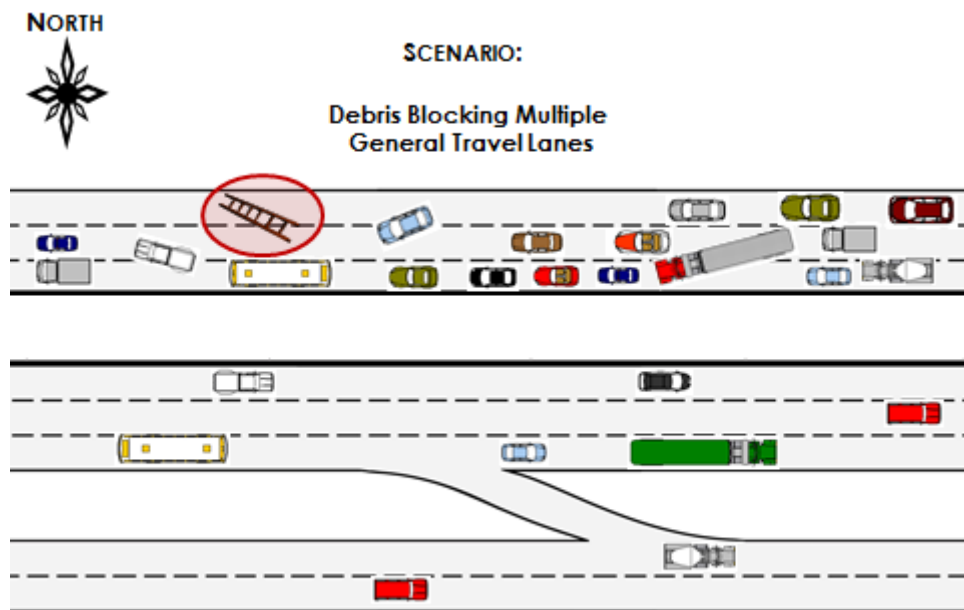
14. Fries, R., M. Chowdhury, Y. Ma, and A. Dunning. Incident Detection with Traffic Sensors on Urban Highways. *ITE Journal*, Vol. 79, No. 8, 2009, pp. 69.

15. Jacobson, L. N., B. Legg, and A. O'Brien. *Incident Management using Total Stations*. WA-RD 284.1, Washington State Transportation Center, Seattle, 1992.

## APPENDICES

# Tabletop Exercise #1

## Debris and Secondary Incident

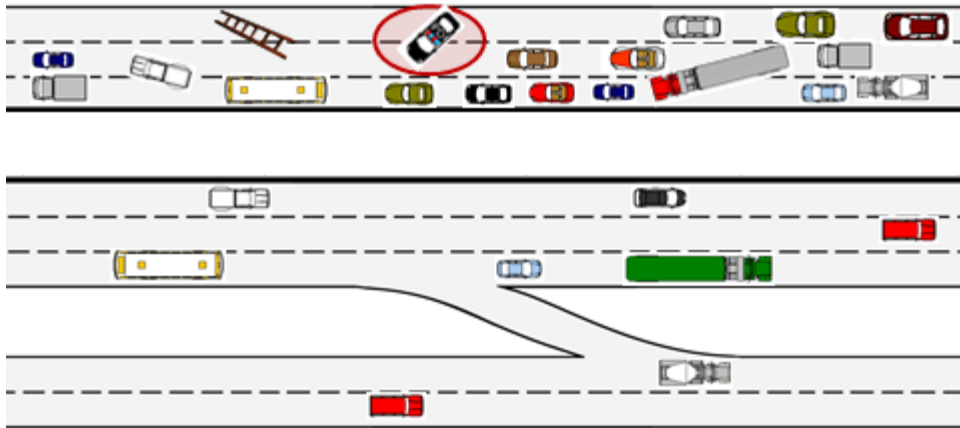


NORTH



ARRIVAL & POSITIONING OF:

First Police Department Officer  
(or Road Service Patrol)



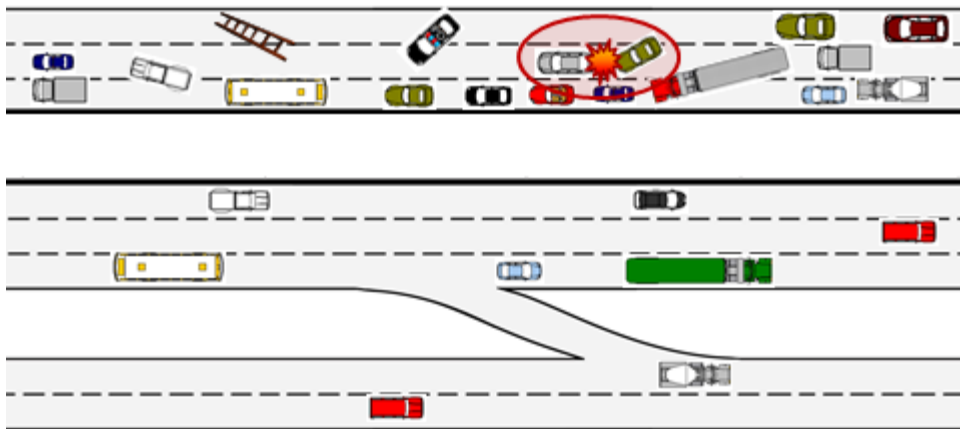
3

NORTH



SCENARIO:

Secondary Incident



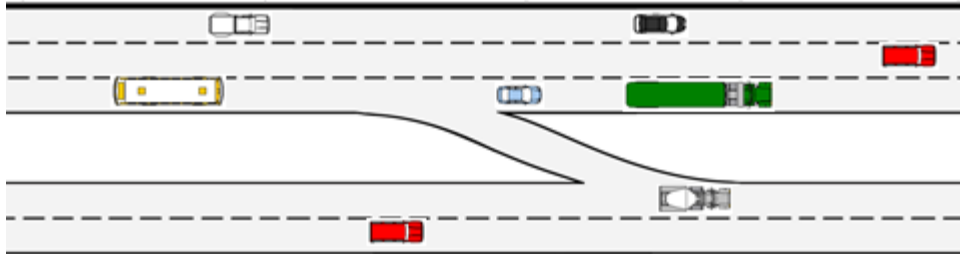
4



NORTH



Debris Removed

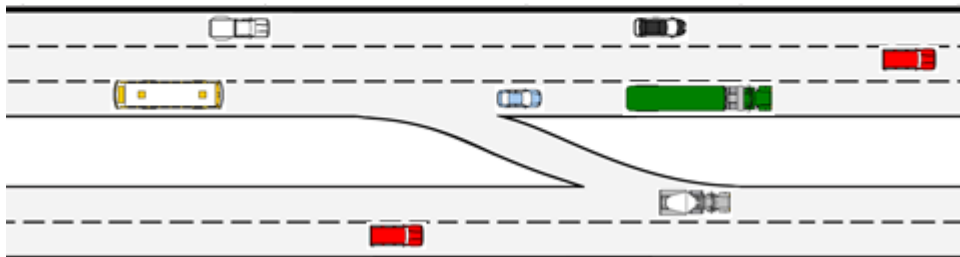


5

NORTH



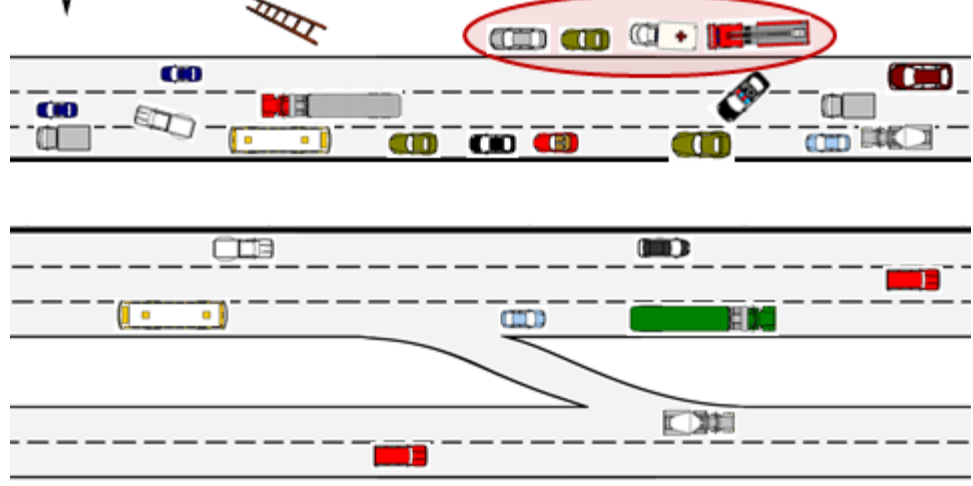
RE-POSITIONING OF:  
Police Department Vehicle



6



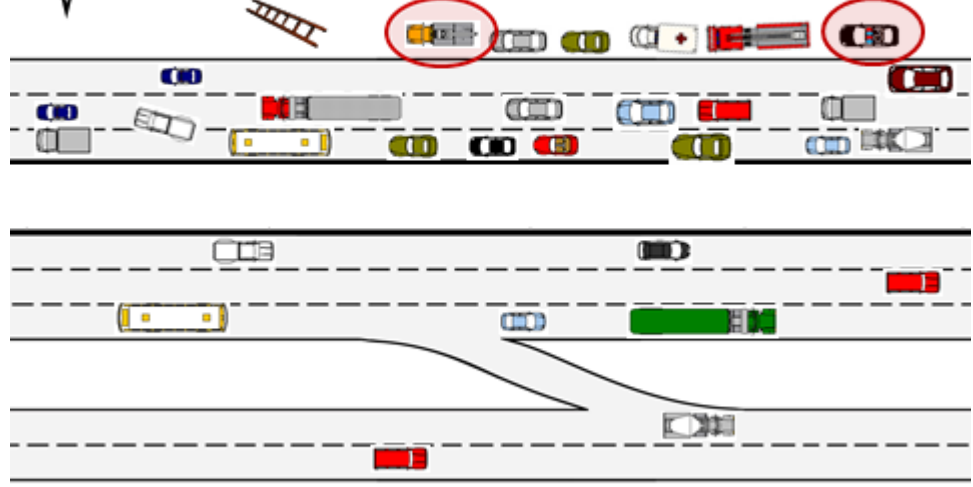
RE-POSITIONING OF:  
Disabled Vehicles  
ARRIVAL & POSITIONING OF:  
EMS Ambulance & Fire Department Vehicle



7



RE-POSITIONING OF:  
Police Department Vehicle  
ARRIVAL & POSITIONING OF:  
Towing



8

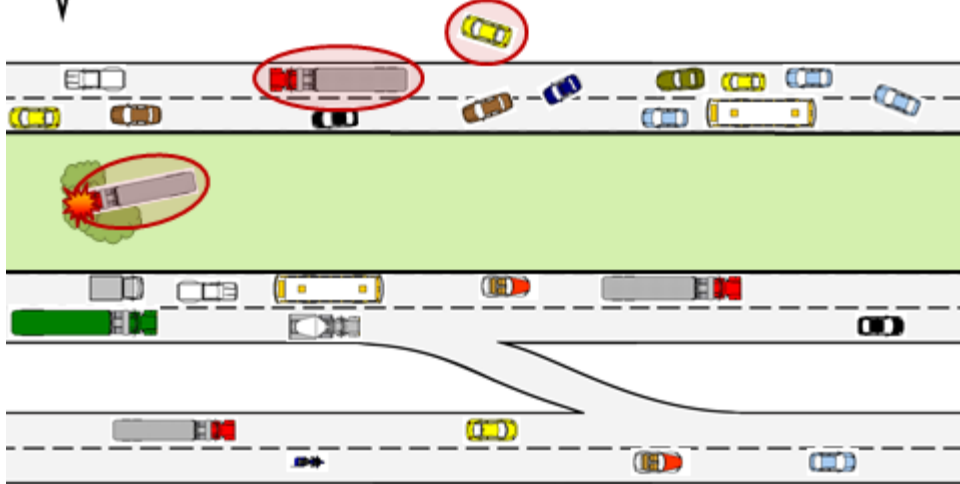


NORTH



SCENARIO:

“Split Scene” Multi-Vehicle Injury Collision-  
Lanes Obstructed



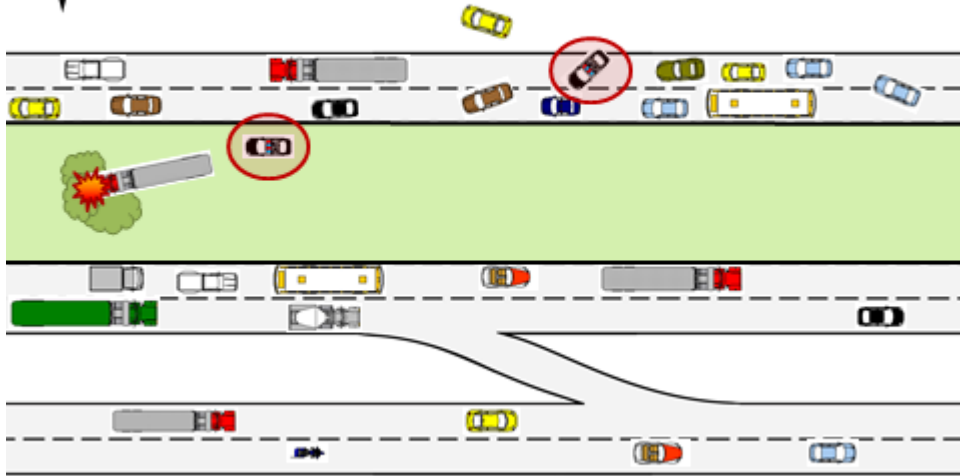
11

NORTH



ARRIVAL & POSITIONING OF:

First and Second Police Department Vehicles

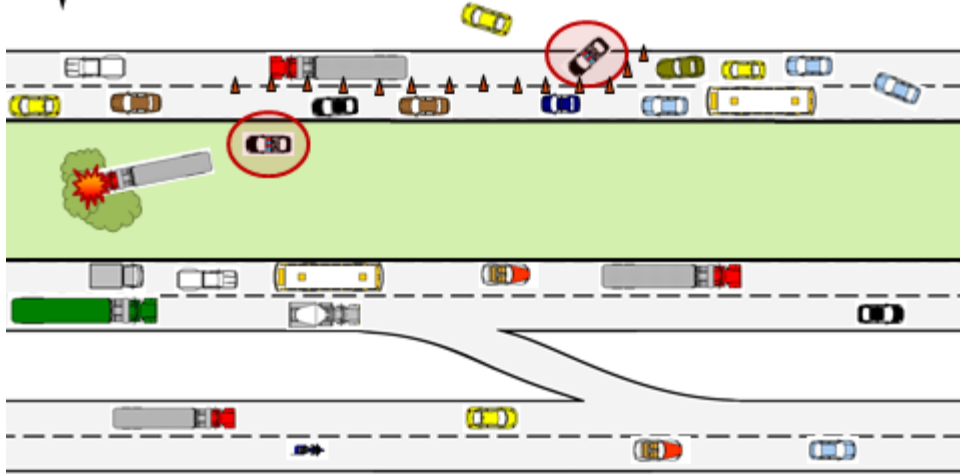


12

NORTH



ARRIVAL & POSITIONING OF:  
First and Second Police Department Vehicles

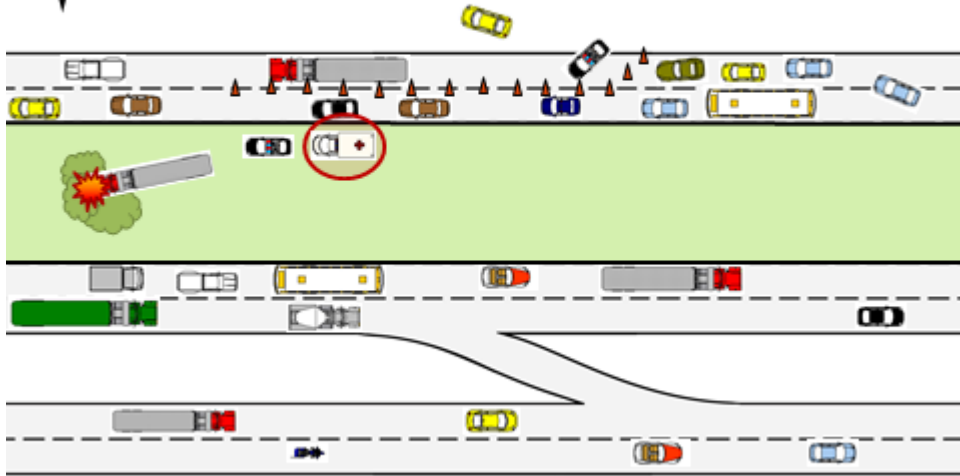


13

NORTH



ARRIVAL & POSITIONING OF:  
First Due EMS Ambulance

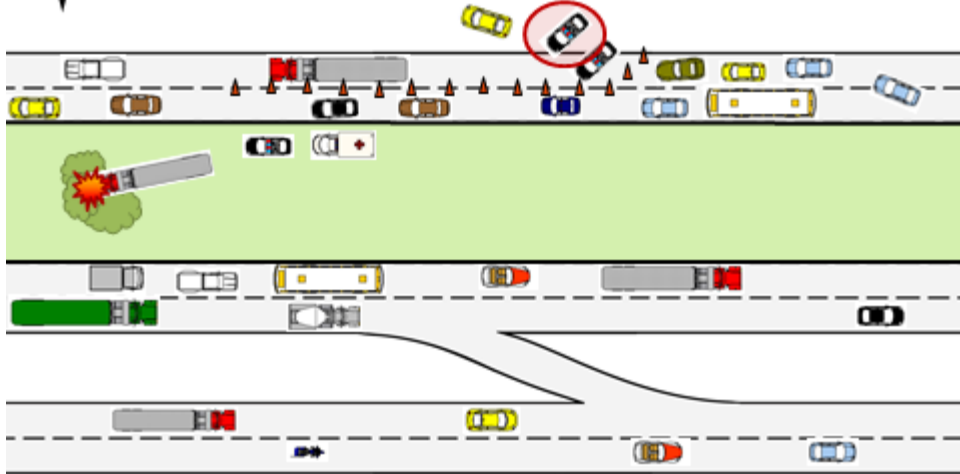


14

NORTH



ARRIVAL & POSITIONING OF:  
Third Police Department Vehicle

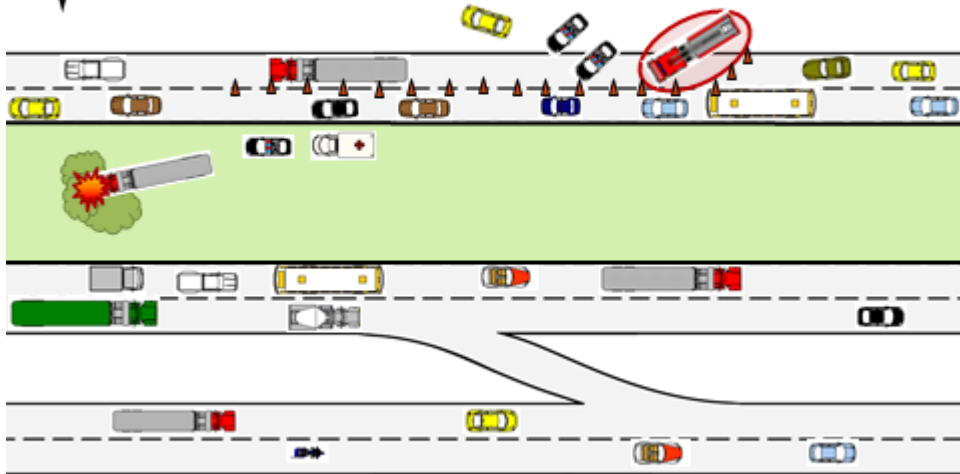


15

NORTH



ARRIVAL & POSITIONING OF:  
First Fire Department Vehicle

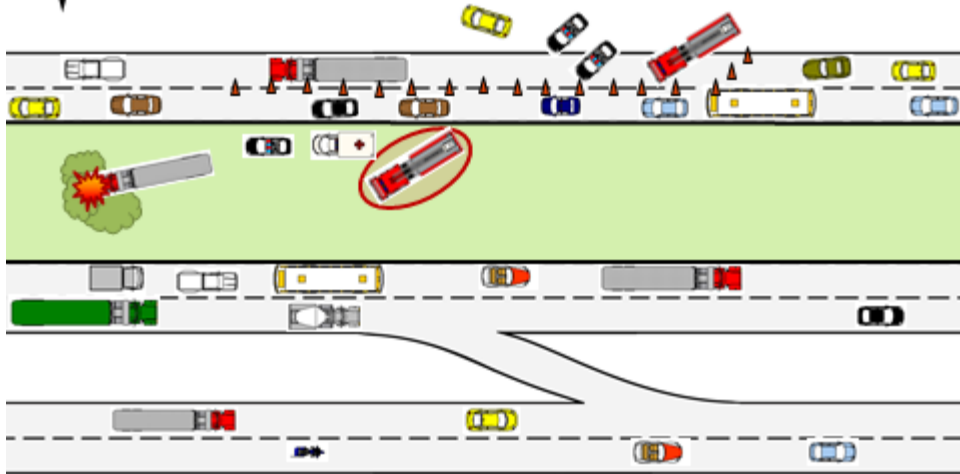


16

NORTH



ARRIVAL & POSITIONING OF:  
Second Fire Department Vehicle

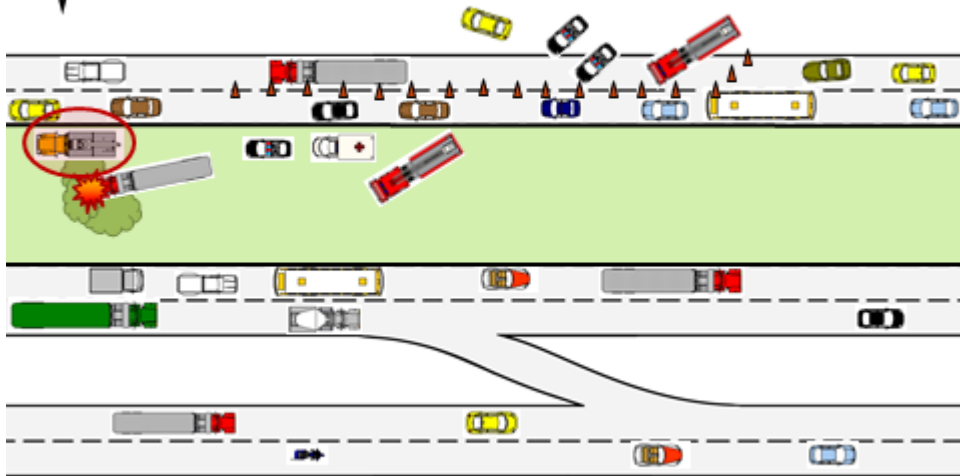


17

NORTH



ARRIVAL & POSITIONING OF:  
Tow Operator 'Stages'



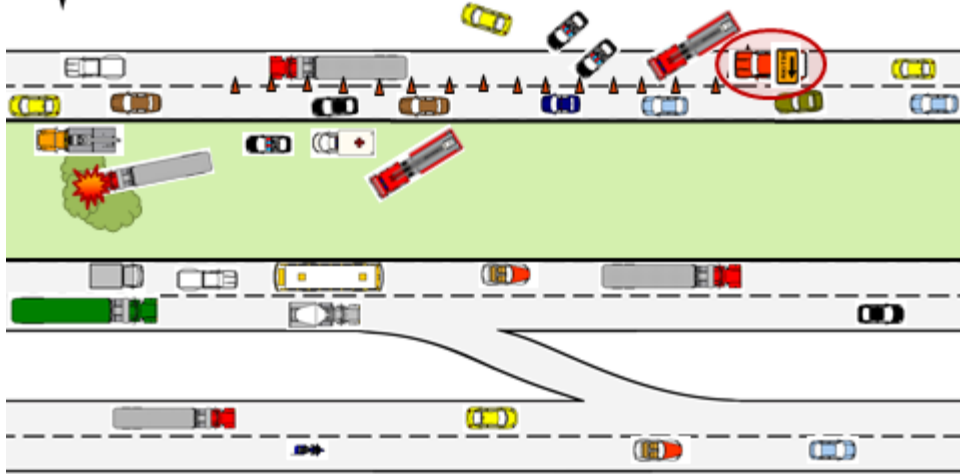
18

NORTH



ARRIVAL & POSITIONING OF:

Road Service Patrol Assumes Traffic Control Duties



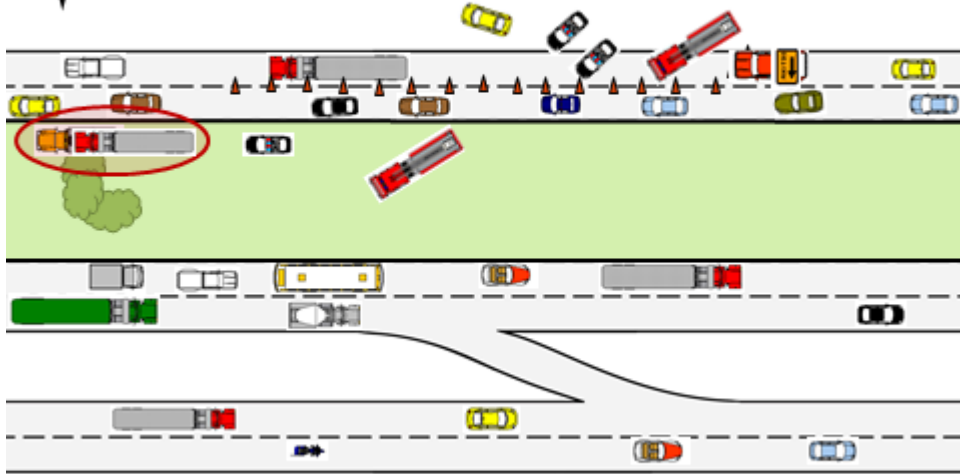
19

NORTH



DEPARTURE OF:

EMS Ambulance  
Tow Truck Loads First Vehicle

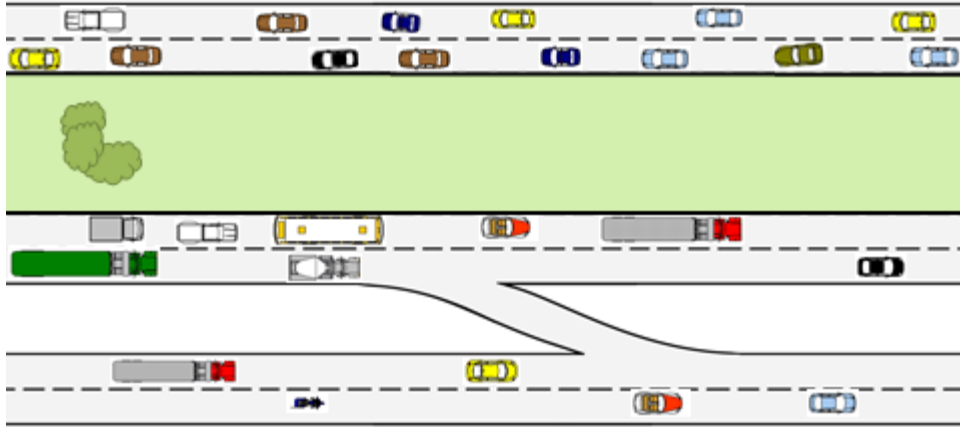


20





SCENARIO RESOLVED:  
Vehicles Removed  
All General Traffic Lanes "OPEN"



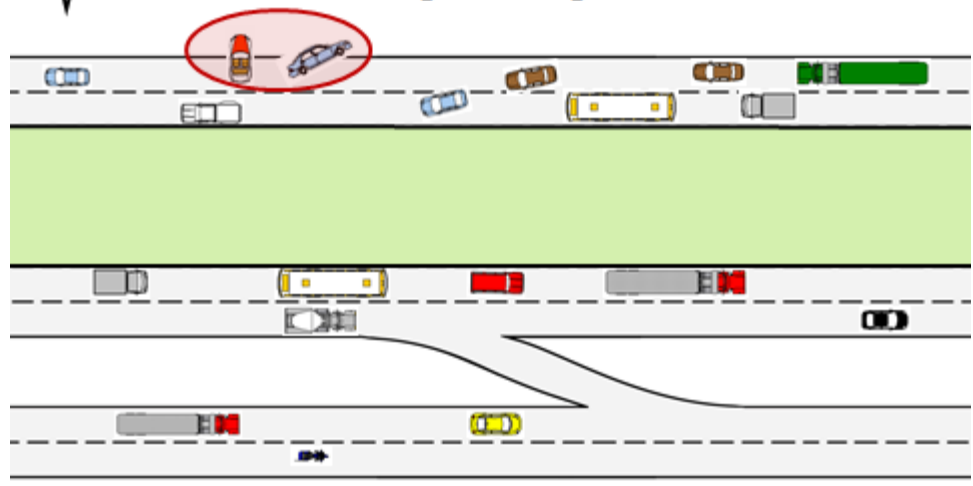
21

## Tabletop Exercise #3

Fatal Collision with Vehicle Rollover

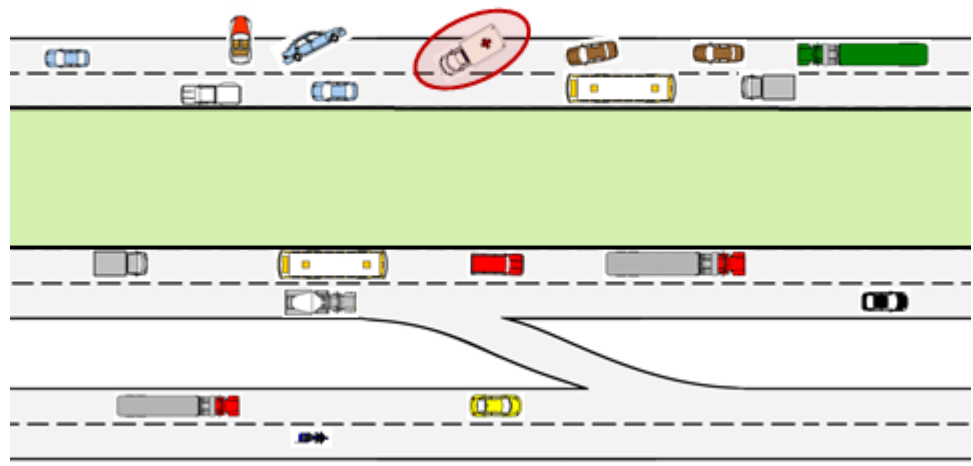


SCENARIO:  
Fatal Collision-  
Two Passenger Vehicles-  
One Vehicle Rollover-  
Right Lane & Right Shoulder Obstructed



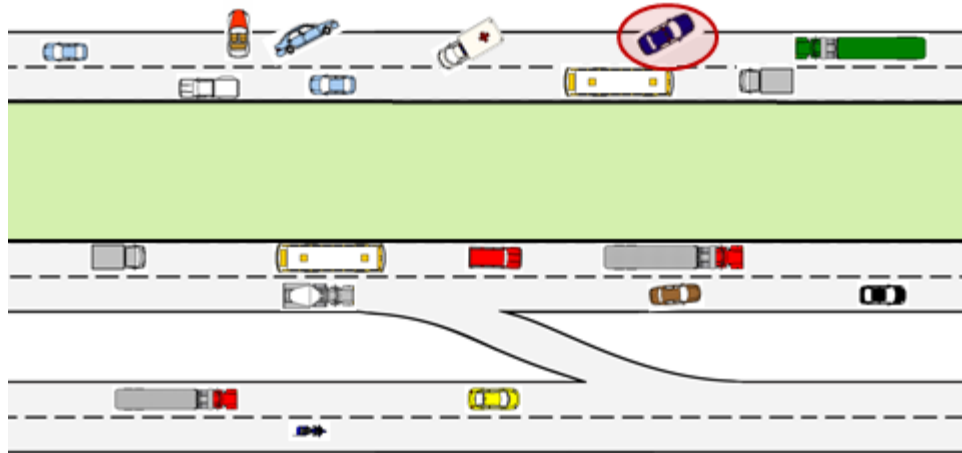
23

ARRIVAL & POSITIONING OF:  
'First-due' EMS Ambulance



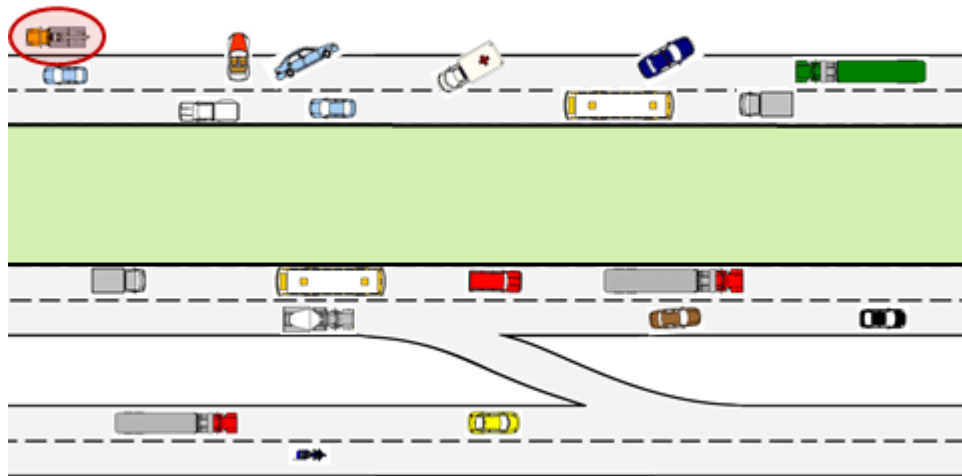
24

ARRIVAL & POSITIONING OF:  
First Police Department Officer



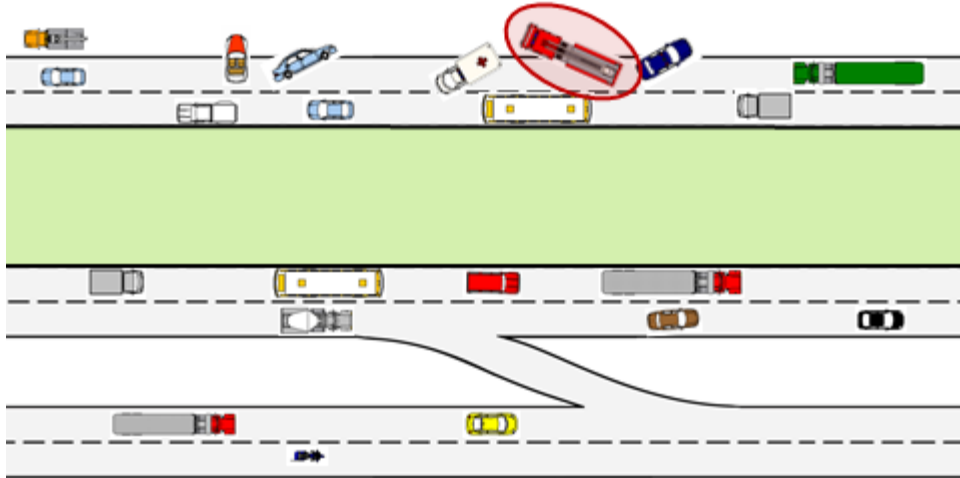
25

ARRIVAL OF:  
Tow Operator 'Stages'



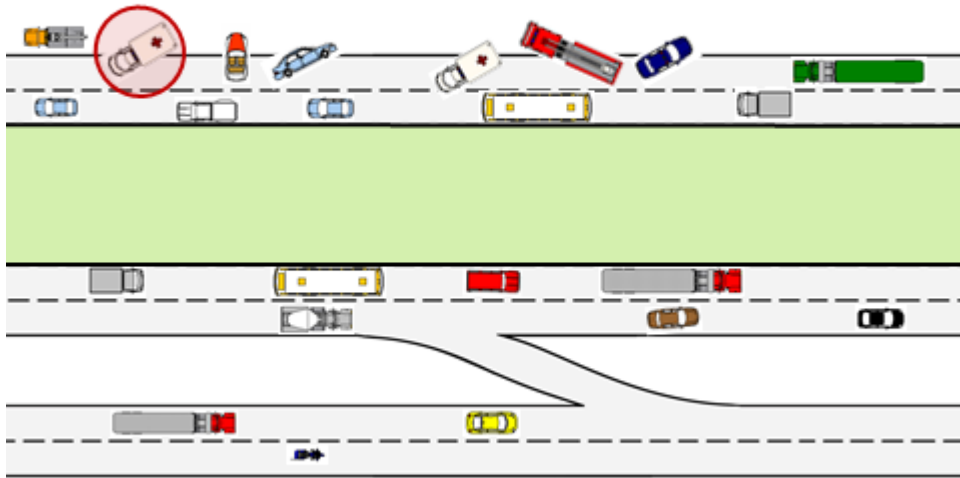
26

ARRIVAL & POSITIONING OF:  
First Fire Department Vehicle



27

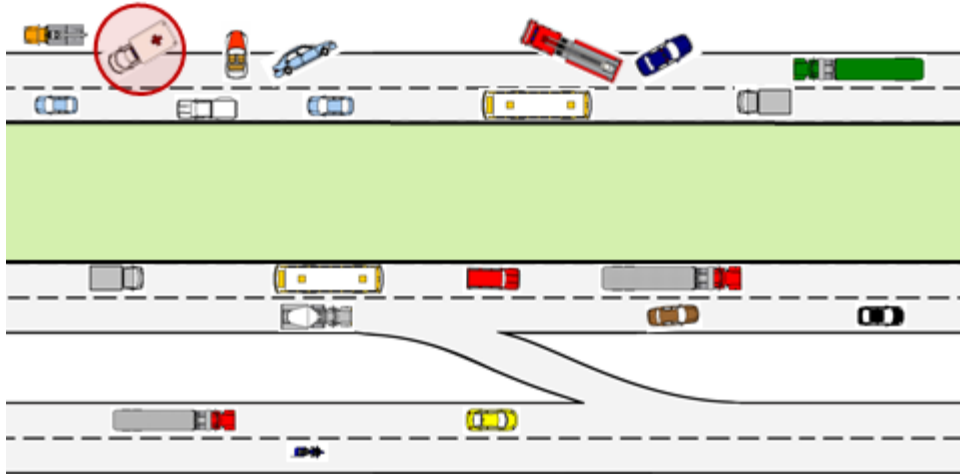
RE-POSITIONING OF:  
EMS Ambulance into Protected Downstream Location



28

RE-POSITIONING OF:

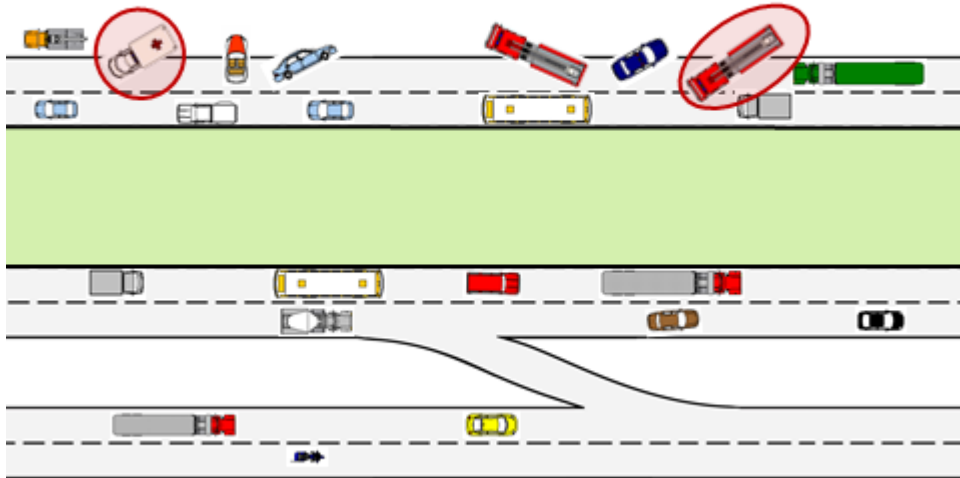
EMS Ambulance into Protected Downstream Location



29

ARRIVAL OF:

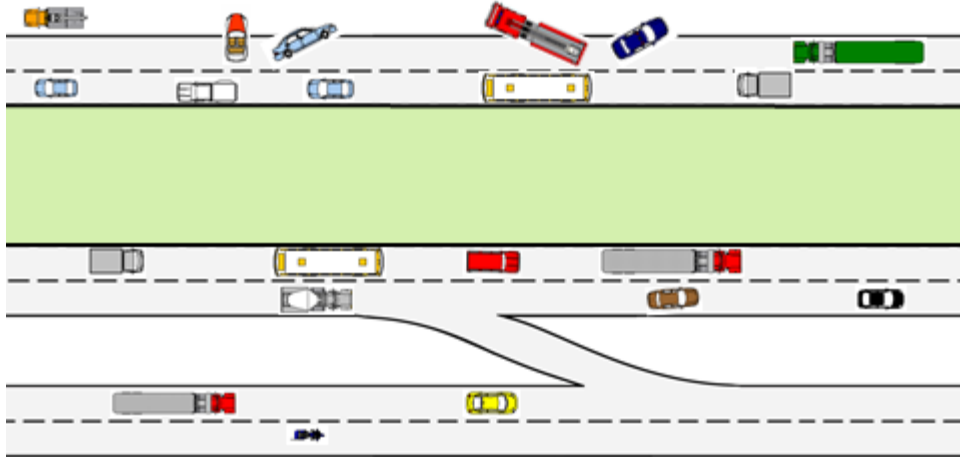
Second Fire Department Vehicle & Coroner



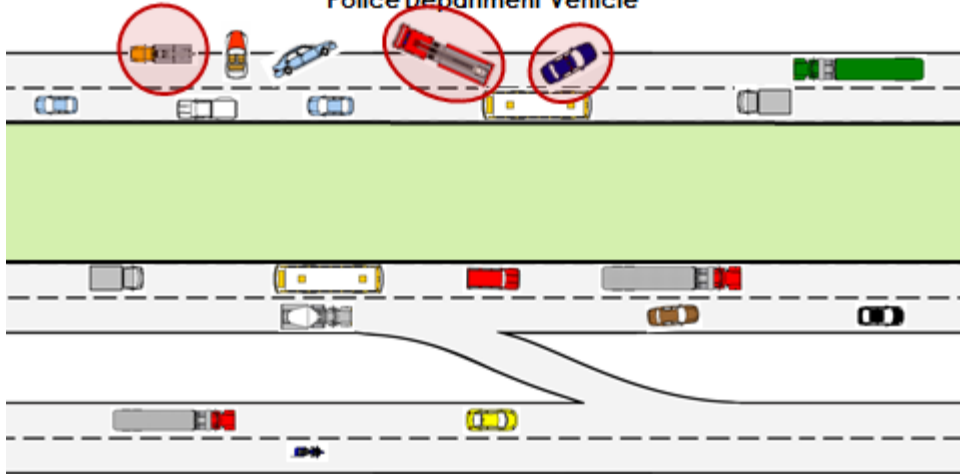
30

DEPARTURE OF:

EMS Ambulance &  
Second Fire Department Vehicle

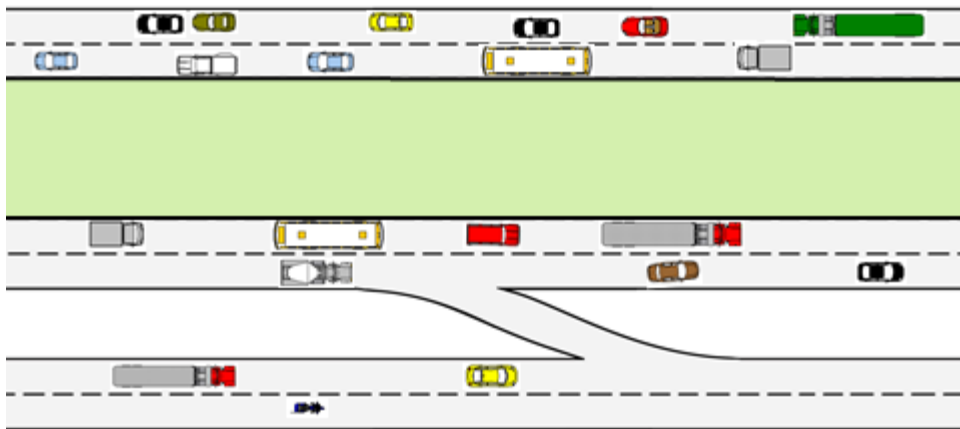


RE-POSITIONING OF:  
Towing  
Fire Department Vehicle &  
Police Department Vehicle



32

SCENARIO RESOLVED:  
Vehicles & Fluids Removed  
All General Traffic Lanes "OPEN"



33





## ***Appendix B: TIM Manual***

### INTRODUCTION

#### Purpose

The purpose of this handbook is to establish standard guidelines and recommendations for traffic incident management and operations. The objectives of these guidelines are to improve safety of the responders, motorists, and victims, and to enhance the efficiency of the incident scene clearance, thereby reducing congestion and secondary incidents.

This handbook provides standard guidelines to the incident responders involved in the incident management process. Incident management is a dynamic and responsive activity. The availability of equipment and personnel and situational awareness should guide the appropriate response during any incident.

#### Audience

Any operator or incident responder who is involved in the incident management process, which includes including incident detection, notification, response, and clearance, should follow the Guidelines.

The intended audience includes the primary and support responders listed below.

#### Primary Responders:

- Law enforcement personnel
- Fire and rescue personnel
- SC Department of Transportation (SCDOT) personnel
- Local Department of Transportation or public works personnel
- Emergency Medical Services (EMS) personnel
- Towing and recovery agency personnel
- 911 dispatch or Transportation Management Center (TMC) staff

#### Support Responders:

- Coroner/medical examiner
- Toll operators
- Environmental Protection Division (EPD) personnel
- HAZMAT mitigation agents

- South Carolina Emergency Management Agency (SCEMA) personnel

#### Traffic Incident Management Definition

Traffic incident management is a planned, systematic, and coordinated effort between different agencies to respond to an incident by optimizing the use of technical, material, and human resources to achieve the goals of safe and efficient incident clearance.

#### Benefits of Traffic Incident Management

At a national level, the benefits attributed to formal traffic incident management programs include enhanced safety of responders, motorists, and victims, and reduced congestion duration and probability of secondary collisions. The National Traffic Incident Management Coalition conducted extensive research nationally and internationally on various traffic incident management programs and identified the following benefits of an effective incident management program:

- Reduced incident duration by 65 percent
- Reduced secondary collision between 30 and 50 percent
- Improved responders' safety by reducing the number of responders who were struck by vehicles
- Enhanced interagency communication
- Enhanced efficiency of first responders through coordinated responses to an incident
- Enhanced awareness of interagency operating procedures
- Promotion of common terminology between responding agencies
- Improved dissemination of incident information

#### Study Area

The SCDOT initiated this project to establish a set of regional traffic incident management operating guidelines for all the agencies that respond to traffic incidents on I-26 from Charleston to Columbia. The I-26 service area includes the entire County Names as shown in Figure 1.



**Legend**

— Contingency Plan

**South Carolina  
Contingency Plan**

0 3.75 7.5 15 22.5 30  
 Miles

Figure 1. South Carolina Contingency Plan on I-26 from Charleston to Columbia

#### How to Revise

Due to the dynamic nature of traffic incident management, it is recognized and expected that periodic revisions to these Guidelines will be required. Emergency responders are encouraged to submit suggestions and/or recommended changes as these Guidelines are applied in the field.

DRAFT

## REGIONAL TRAFFIC INCIDENT MANAGEMENT PLAN FOUNDATIONAL

### 2003 Homeland Security Presidential Directive (HSPD-5)

To receive federal funding, the 2003 Homeland Security Presidential Directive on Management of Domestic Incidents mandates all federal departments and states, territories, tribes, and local governments to adopt National Incident Management Systems in their standard operating procedures. Along with this directive, the Federal Highway Administration (FHWA) also supports the Incident Command System concept and promotes it among all transportation professionals by sponsoring the 2003 Model Procedures Guide for Highway Incidents and 2008 Simplified Guide to the Incident Command System for Transportation Professional.

### National Incident Management System (NIMS)

The Department of Homeland Security developed the National Incident Management System concept in 2004 following the Homeland Security President Directive. The National Incident Management System training provides uniform sets of processes and procedures for the incident management nationwide, which enables responders to work together, manage all levels of domestic incidents, and support the Incident Command System at the incident scene. More information on Incident Command is provided in the following section.

### Incident Command System (ICS)

In 1980, a program called National Interagency Incident Management System (NIIMS) integrated the Incident Command System in its policy, which was later endorsed by various federal agencies to integrate this program in their standard operating procedures. However, this initiative was mandated fully only after the HSPD-5 directive released in 2003. A successful implementation of the Incident Command System enables integrated communication and planning by establishing manageable span of control on different organizations with various jurisdictional boundaries. Incident Command System includes five functions for emergency response operation (1) command, (2) operation, (3) planning, (4) logistics, and (5) finance and administration.

Agencies responding to incidents on State highways will utilize the National Incident Management System (NIMS). The following directions apply to South Carolina according to the

NIMS: The first arriving emergency responder will establish command. Agencies will cooperate and work together for the safe and efficient mitigation of the emergency. Law enforcement, DOT, Fire and EMS representatives will be expected to make decisions based on their experience and expertise in their respective fields to contribute to the successful conclusion of the incident. Any decisions made will be communicated to other agency representatives to ensure coordination of efforts. The SCHP or other senior law enforcement official on scene will make the final determination with respect to any disputes that may arise involving the incident. The senior SCDOT official on scene will make final determination with respect to any disputes that may arise involving the facilities themselves.

#### Unified Command (UC)

Unified Command supports the role of Incident Commanders from multiple disciplines to work on a common goal of safe, efficient, and quick incident scene clearance while they are carrying out their own jurisdictional responsibilities. Although a single Incident Commander handles the command function, an Incident Command System organization should be expanded into Unified Command System to carry out a multi-disciplinary coordinated effort.

#### Emergency Responder Safety Institute (ERSI)

The Emergency Responder Safety Institute serves as an informal advisory panel of public safety leaders committed to reducing fatalities and injuries of the emergency responders on the nation's streets, roads, and highways. The members of this institute include trainers, writers, managers, government officials, technical experts, and leaders who bring together their institutional and technical expertise. Emergency Responder Safety Institute provides detailed information on safety tips and trainings for various responders.

#### National Traffic Incident Management Coalition (NTIMC)

The National Traffic incident Management Coalition, launched in 2004, is a coalition of various incident responder organizations such as American Automobile Association, American Association of State Highway and Transportation Officials (AASHTO), International Association of Fire Fighters (IAFF), International Association of Fire Chiefs (IAFC), and others to promote the safe and efficient management of traffic incidents. This coalition established the National Unified Goal (NUG) in association with the national and international traffic incident responder's organizations. The National Unified Goal is organized into three main objectives:

- Responders' safety
- Safe and quick clearance
- Prompt and reliable incident communications

The National Unified Goal promotes these objectives through 18 strategies that include development of multijurisdictional and multi-disciplinary traffic incident management policies, procedures, and training.

#### US Department of Transportation (USDOT) Traffic Incident Management Program

The US Department of Transportation Traffic Incident Management Program was initiated almost a decade ago as a part of a larger all-hazard program called Emergency Transportation Operations (ETO). This program is established to address six different areas of traffic incident management:

- Traffic incident management self-assessment
- Traffic incident management performance measures
- Quick clearance
- Incident command system
- Integrated communication
- Planned special event traffic management

It is important for the traffic incident management stakeholders within North Florida TPO service area to familiarize themselves with these federal guidelines.

Existing State of South Carolina Policies, Programs and Statutes

Authority tow law

South Carolina §56-5-1210. (B)

*Law enforcement officers or authorized employees of the Department of Transportation may move or have removed from the traveled way all disabled vehicles and vehicles involved in an accident and any debris caused by motor vehicle traffic collisions where it can be accomplished safely and may result in the improved safety or traffic flow upon the road; however, where a vehicle has been involved in an accident resulting in great bodily injury or death to a person, the vehicle shall not be moved until it is authorized by the investigating law enforcement officer*

Steer It and Clear It Law

South Carolina §56-5-1220. (B)

*If a disabled vehicle or a vehicle involved in an accident resulting only in damage to a vehicle is obstructing traffic, the driver of the vehicle shall make every reasonable effort to move any vehicle that is capable of being driven safely off the roadway.*

Move Over Law

South Carolina (Section 56-5-1538)

*Requires motorists to slow down, proceed with caution, and change lanes when approaching stationary emergency vehicles displaying flashing red; red and white; blue; red and blue lights; or amber or yellow warning lights.*



## Abandoned Vehicle Law

The authority to remove an abandoned vehicles is contained in SC Codes of Law §29-15-10, §56-5-5810, and §56-5-5640. These codes of law set out the procedure to be followed when a motor vehicle is abandoned on the highway or private property.

### South Carolina (Section 56-5-5810)

*Abandoned vehicle means a vehicle required to be registered in this State if operated on a public highway in this State that is left unattended on a highway for more than forty-eight hours, or a vehicle that has remained on private or other public property for a period of more than seven days without the consent of the owner or person in control of the property.*

### Roadway Debris Removed by towers

The owner shall immediately remove or have someone remove the spilled load or material. SCDOT may remove the spilled load or material and collect the actual cost of the removal operation from the owner if the owner is unable to immediately remove the spilled load or material. Any responsible party designated by CHP may remove the spilled load or material.

Liability for damage - SCDOT, SChP or anyone designated by those agencies to remove the spilled load or material cannot be held liable for damage to the load/material.

### Lane Closure

SCDOT can restrict access to any or all of the lanes on a State highway to protect the public or the highway itself. SChP will assist by directing traffic as needed.

SChP can direct traffic and restrict access to any or all of the lanes on a State highway as necessary for fire, emergencies or for the public's safety.

### Hazardous Material Spills

SChP has control of the overall scene where a hazardous waste has been spilled on the highway at all locations that they have primary investigative authority. SChP does not have directive

authority over how hazardous waste specialized functions are provided by the various other responding agencies.

#### Workzones

Code-3 drivers must slow down and obey the commands of any representative of SCDOT or the local authority that has jurisdiction that is directing traffic in a work zone. This includes flaggers, construction, and maintenance and contract employers.

SECTION 56-5-1535: Speeding prohibited in highway work zones; penalties; terms; application; signs.

*(A) It is unlawful for a person to drive a motor vehicle in a highway work zone at a speed in excess of the speed limit set and posted by signs. A person violating this section is guilty of a misdemeanor and, upon conviction, must be fined not less than seventy-five nor more than two hundred dollars or imprisoned not more than thirty days, or both.*

*(B) A "highway work zone" is the area between the first sign that informs motorists of the existence of the work zone on the highway and the last sign that informs motorists of the end of the work zone.*

*(C) The penalty imposed by this section applies only:*

*(1) if a sign is posted at the beginning of the active work zone that states "WORK ZONE \$200 FINE AND 30 DAYS IMPRISONMENT FOR SPEEDING";*

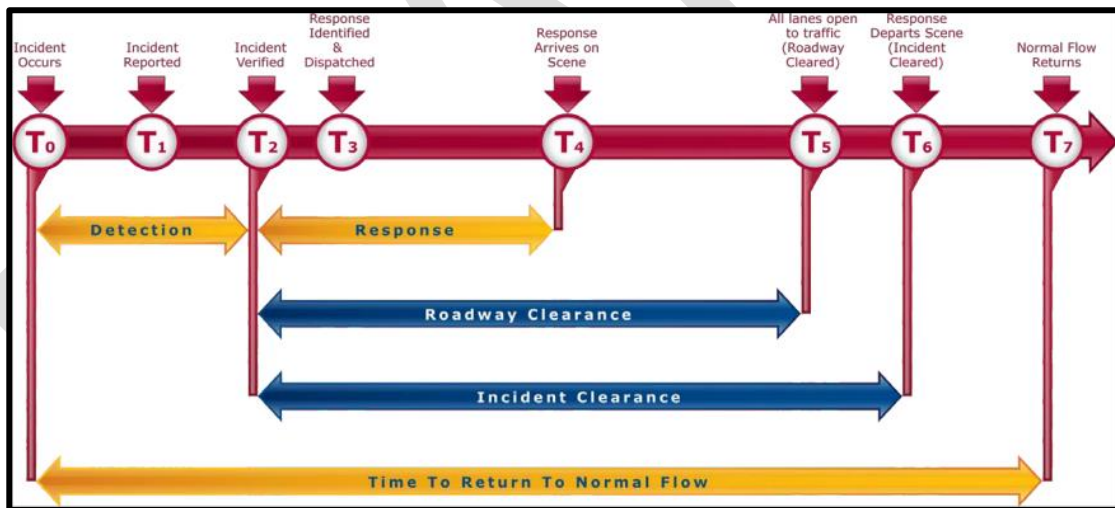
*(2) to the area between the posted sign and the "END CONSTRUCTION" sign. Signs may be posted at the discretion of the Department of Transportation in the highway work zones designed to comply with work zone traffic control standards contained in the Manual on Uniform Traffic Control Devices published by the Federal Highway Administration*

## Incident Management Process

### Traffic Incident Timeline

South Carolina has adopted the national traffic incident management timeline, which is included in Figure 2. The NTIMC has defined two key measures for traffic incident management, roadway clearance and incident clearance, achieved through the following tasks: detection, response, roadway clearance, incident clearance and time to return to normal flow. It is important that all responders understand the difference between these tasks.

1. Detection
2. Response
3. Roadway Clearance
4. Incident Clearance



5. Time to Return to Normal Flow

Figure 2. Traffic incident management timeline

Detection

Incident detection involves discovering and identifying an incident. Early detection is vital to ensure the safety of motorists, who are most vulnerable before any help arrives. Passing motorists typically detect an incident and call 911 to notify law enforcement. Responders involved in detection include law enforcement officers, Traffic Management Center (TMC) operators, and emergency response operators (DOT maintenance).

## Response

The first component of response is notifying response agencies about the incident, using details collected during verification. Early notification is the key for a quick incident response. Following notification, response is reacting to an incident with appropriate and available technical, material, and human resources.

It is the responding agency's responsibility to assess and solicit required resources and determine the fastest possible route to the incident scene. The initial responder is responsible for:

- Deploying temporary traffic controls (TTC)
- Parking the response vehicle upstream to protect the incident scene
- Assuming the role of Incident Commander
- Providing necessary first aid to victims (without exceeding the responder's skill level)
- Assessing the need for additional responders or resources

Response is a major portion of the incident duration and is explained throughout the Guidelines in detail.

## Roadway Clearance

Roadway clearance occurs when all travel lanes are open. This is the primary performance measure for traffic incident management in South Carolina. Roadway clearance time is the

Verification (T2): A component of detection involves confirming the incident location and details. If TMC camera coverage is available, operators should assist with verification. However, if camera coverage is not available, motorists and responders assist with verification.

number of minutes between verifying the incident (T2) and confirmation that all travel lanes are open and available for traffic flow (T5).

#### Incident Clearance

Incident clearance occurs when the last responder has left the incident scene. This is an important measure because even when all travel lanes are open (after roadway clearance), traffic will not recover and return to free flow while responders are still on-scene. Systematic improvements, such as exiting the highway to finish reports, should be made to reduce the incident clearance time because every minute on-scene is hazardous for emergency responders. A reduction in incident clearance times will improve responder safety by reducing the exposure of secondary incidents. Incident clearance time is the number of minutes between verifying the incident (T2) and confirming that all responders have left the scene (T6)

#### Time to Return to Normal Flow

The time to return to normal flow is the period following an incident when traffic is proceeding at its standard or expected rate of speed for a particular segment of roadway.

#### Incident Types/Classifications

In South Carolina, there are three types of incidents: major, intermediate, and minor.

#### Major

The expected duration of a major incident is more than two hours. Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding two hours. Examples of major crashes include:

- Chain reaction crashes
- Crashes that require a significant medical response, a coroner response, and/or a crash reconstruction response (e.g., fatalities)

- Incidents involving advanced, prolonged environmental clean-up (e.g., incidents involving hazardous materials)
- Overturned tractor trailers
- Complex commercial vehicle incidents with large debris fields or cargo fires
- Structural damage
- Wildfires near the roadway
- Acts of terrorism

#### Intermediate

Intermediate traffic incidents typically affect travel lanes for a time period of 30 minutes to two hours, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks. Examples of intermediate crashes include:

- Major roadway debris
- Overturned cars, RVs, or small trailers
- Multi-vehicle crashes
- Commercial carrier crashes

#### Minor

Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of less than 30 minutes. On-scene responders typically include law enforcement and towing companies, and occasionally SC Highway patrols. Examples of minor crashes include:

- Disabled vehicles in a travel lane or on the shoulder
- Minor crashes that can be moved or relocated to the shoulder
- Minor roadway debris

## Priorities at an Incident Scene

The following are the priorities at an incident scene listed in sequence according to their relative importance:

### Priority 1: Life Safety

The most important concern is the protection of emergency responders, incident victims, and the public.

### Priority 2: Incident Stabilization

To enhance operational safety, actions must be taken to stabilize the incident. This will help prevent secondary crashes, protect evidence, provide safe, quick clearance and protect the environment as described in the following:

*Prevention of Secondary Crashes:* To minimize the risk of another motor vehicle crash involving response units and personnel, responders must properly warn approaching traffic that there is a hazard ahead, to slow down, and to use caution. Responders should utilize available traffic control devices and, if possible, position apparatus to divert traffic around the crash scene. Special attention should be paid to the end of the traffic queue; motorists approaching the end of a queue are unlikely to be aware of the crash ahead. Responders should contact dispatch with incident information for dissemination to travelers to reduce congestion and the potential for secondary incidents.

*Protection of Evidence:* Responders will make every effort to minimize the impact of their presence on the crash scene. For example, responders should not cause damage to vehicles beyond what is necessary for extrication purposes or remove debris not in an actively flowing traffic lane until authorized. Crash scene investigators rely upon scene evidence to reconstruct the event. These reconstructions are often used to hold the involved persons accountable for their actions during potential criminal proceedings. Responders should understand that any crash is a potential crime scene and must be treated accordingly.

*Safe, Quick Clearance:* At an incident, every responder's goal should be to clear the scene safely and quickly to restore traffic flow and limit the diversion of traffic to less desirable, more hazardous routes. It is important to note that South Carolina's Steer It and Clear It law requires motorists involved in non-injury crashes to move drivable vehicles to a location where they will

obstruct traffic as little as possible.. The priority of safe, quick clearance also aligns with the National Unified Goals for Traffic Incident Management.

*Protection of the Environment:* For hazardous materials and/or potential hazardous materials scenes, responders with the proper personal protective equipment and training will strive to contain the spilled product while minimizing exposure.

### Priority 3: Protection of Property

Responders will attempt to protect or save property by limiting damage to vehicles to what is necessary to stabilize and remove trapped persons. Property salvage operations will also be conducted as soon as safely possible.

### Traffic Management

Traffic management is the process of managing traffic around the incident scene to improve incident scene safety. Traffic management around the incident scene is classified into the following three categories:

1. Approach
2. Access or exit
3. Detour or alternate route

#### Approach Traffic Management

Traffic approaching an incident scene is most vulnerable to the roadway obstructions, which may potentially trigger a secondary incident. The objective of approach traffic management is to make the incident area as prominent as practical to warn motorists using temporary traffic warning signs and traffic control devices.

#### Access or Exit Traffic Management



Access or exit traffic management is a safety precaution adopted by incident responders while entering and exiting the incident area. These movements should be limited, controlled, and monitored by response personnel to ensure a high level of safety for responders and passing motorists. In addition, proper use of turn signals, strobe lights, flashers, etc., increases the visibility of responders and warns traffic of their intention.

#### Detour or Alternate Route Traffic Management

Detour or alternate route traffic management is a process of managing traffic passing through the incident scene using standard equipment such as detour signs and portable changeable message signs (PCMS) to reduce congestion around the incident scene and thereby reduce the chances of secondary collisions. Incident commanders should prepare and implement the detour or alternate routes with the help of the local public works department, usually directed from the traffic management center.

Once detoured, it is very important for motorists to have continuing directional signs to route them back to their original path. The local public works department may provide additional personnel when requested. The signs typically involved are temporary traffic control signs, trailblazer signs or portable changeable message signs along the alternate route.

## Stakeholder Responsibilities

The roles and responsibilities described in this section are intended to illustrate how these agencies and emergency services providers are typically involved in the incident management process. Roles and responsibilities of those involved with incident management activities will vary based on severity of incidents and jurisdictional boundaries.

### Incident Commander

SCHP uniformed personnel shall assume incident command (IC) at emergency incidents where they have primary investigative authority. The highest ranking CHP official is the on-scene incident commander.

The Incident Commander has the responsibility to:

- Direct the resources, where in his/her opinion, they will be most effective.
- Ensure the operation of emergency vehicles is in accordance with the Vehicle Code and the Standard Operational Guidelines of the responding agencies.
- Correct the unsafe behavior of any personnel (but may not direct those personnel to do anything that would create an undue hazard to the health and safety of any person).
- Ensure the welfare of all parties involved take precedence over accident investigation duties.
- Ensure that the injured are receiving appropriate care, and that a safe environment for the motoring public, involved parties, and emergency service providers is maintained.
- Ensure that jurisdictions affected by hazardous material spills are contacted in a timely manner. Monitoring the situation and confirming that a response from affected political subdivisions and/or allied agencies has been received.

The responsibility for incident command may shift if the incident evolves into a widespread multi-jurisdictional emergency incident. However, the SCHP IC shall maintain incident command duties, responsibilities, and investigative authority at the original site of the incident.

Incident Command System responsibilities must continue until all emergency operations at the scene have been terminated and order has been restored. Discontinuing emergency management activities and protection of the scene before the emergency and its attendant hazards are eliminated could result in additional injuries and property damage.

### Law enforcement Branch

The Highway Patrol has primary jurisdiction over all incidents that occur on State routes with the exception of some incorporated cities. In the incorporated cities, Highway Patrol still has authority to investigate incidents and enforce traffic laws and regulations.

Typical highway incident management responsibilities include:

- Serves as Incident Commander
- Secures incident scene
- Protects incident scene
- Performs first responder duties
- Assists responders in accessing the incident scene
- Establishes emergency access routes
- Controls arrival and departure of incident responders
- Polices perimeter of incident scene and impact area
- Conducts crash investigation
- Performs preliminary traffic control

Medical examiners

Medical examiners should report to an incident scene when called by the on-scene law enforcement officer, or when a fatality is involved. Medical examiners may participate in the response, clearance, and AIR processes. During clearance, the medical examiner may authorize other agencies to move or remove victims from the incident scene.

Crash investigators

Incidents involving crashes with serious injuries and/or fatalities require a thorough investigation by trained personnel. A crash investigator must be summoned to the scene unless the initial or on scene officer is a crash investigator. Because these severe crashes are considered crime scenes rather than simply traffic incidents, responsibilities for crash investigators are somewhat different from those of the on-scene officers.

Crash investigators should perform the following:

- Immediately upon arrival on the scene, meet with the on-scene officer and Incident Commander to be briefed on the current situation.
- Assess the incident, determine what additional assistance may be needed, and develop a plan for the investigative process.
- Work with the Incident Commander and other agencies on-scene to safeguard potential evidence, and to modify the “work zone” to include the overall scene and evidence, as necessary.
- Prioritize the necessary tasks and conduct those tasks that require closure of travel lanes first.
- Document the scene through photographs and a field sketch.
- Locate and measure all vehicle locations and evidence, or mark these positions with paint so they can be documented at a later time.
- Collect and secure all short-lived evidence.
- Coordinate with other responders the restoration of traffic flow. Reduce the size and impact of the incident scene.
- Maintain communications with the Incident Commander on the needs and progress of the investigation so appropriate changes can be made to the overall incident management plan to expedite the scene recovery.
- Ensure that all on-scene information has been collected and/or documented, and advise the Incident Commander that this portion of your investigation is complete so that the incident clearance and recovery can begin.
- Document, or have documented, the information concerning the drivers, passengers and any witnesses for follow-up.
- As with the responsibilities for law enforcement in general, these are basic guidelines and are not intended to be the extent of the investigators tasks. Some incidents may require more time to investigate than others, depending on the complexity of the crash, but the key to remember for quick scene clearance and recovery is communication.
- It is imperative that the investigator(s) and Incident Commander maintain good communication throughout the event, so both can accomplish their tasks in the quickest and most efficient manner possible.

Fire and rescue

Fire and rescue services are provided by local, city, county and state fire departments and hazmat agencies.

Typical highway incident management responsibilities include:

- Protects the incident scene
- Rescues/extricates victims
- Extinguishes fires
- Responds to and assesses incidents involving hazardous materials release
- Contains or mitigates hazardous materials releases.
- Assumes role of Incident Commander, if appropriate
- Supports unified command as necessary

Emergency Medical Service (EMS)

Emergency medical services primary responsibilities are the triage, treatment and transport of crash victims.

Typical highway incident management responsibilities include:

- Provides medical treatment to those injured at the incident scene
- Determines destination and transportation requirements for injured victims
- Coordinates evacuation with fire, police and ambulance or airlift
- Transports victims for additional medical treatment
- Supports unified command as necessary

## HAZMAT Mitigation Agencies

Upon discovery of a HAZMAT incident by on scene fire, law enforcement, or DOT, efforts should be made through contact with the responsible party (the carrier) to activate their hazardous materials mitigation contractor. While the local fire jurisdiction may assist with containment and mitigation of vehicle fluids or HAZMAT cargo leaks and spills, they only provide limited containment/public safety protection and not ultimate clean up.

Activation/notification to the responsible party's contractor as soon as possible will expedite their arrival and shorten the mitigation time. In the event that the responsible party does not have a mitigation contractor, local fire or EPD officials have access to a database of contractors. Contacting the closest contractor will minimize delay or extended arrival times.

HAZMAT mitigation agencies may assume the role of Incident Commander and/or participate in UC. These agencies should minimize clean-up time to reduce the amount of HAZMAT exposure and its lingering effects. When they play a major role in traffic incident management, the HAZMAT agency should participate in AIR meetings.

## Towing and Recovery

Towing and recovery services are responsible for the safe and efficient removal of wrecked or disabled vehicles and debris from the incident scene.

Typical highway incident management responsibilities include:

- Recovers vehicles and cargos
- Removes disabled or wrecked vehicles and debris from the roadway
- Mitigates non-hazardous material (cargo) spills
- Mitigates incident vehicle fluid spills
- Supports unified command as necessary

## Media

In the event of incidents or scheduled events that generate heavy traffic congestion, communication of accurate, real-time information is essential. Many larger county agencies have a Public Information Officer (PIO) trained to manage communications regarding an incident within their jurisdiction. All media should be directed to the PIO to ensure that incident responders are able to complete their tasks at an incident as quickly as possible, and that incident information is conveyed according to community standards and local/state policies.

While the TMC staff manages the essential messages for those on the roadways via messages on changeable message signs (CMS), the media liaisons update the media via text, e-mail, phone, and social media networks, such as Facebook and Twitter. Government agencies and incident responders provide updates to the media outlets, which assist in getting that information to the traveling public via traditional and new media. An “early warning system” may catch motorists before they end up in severe traffic congestion behind an incident, thus helping to prevent a secondary crash. This is especially important in densely populated areas.

The PIO, media liaison, or TMC supervisor decides how much information to provide to the media, especially with regard to a fatal crash. However, when traffic teams know a fatality is involved in an incident, they tend to provide more information to the public, including more intense warnings to avoid the accident area, and even alternate routes. The media may also want to send cameras to the incident scene, whereupon the PIO is essential for keeping them corralled.

While public information office and local media personnel play a vital role in disseminating traveler information, they do not participate in response, clearance, and recovery processes. When they play a major role in the traffic incident management process, however, they should participate in AIR meetings.

State/local agencies

The state or local transportation agency includes traffic engineering personnel, roadway maintenance, Highway Patrol (HP), Transportation Management Center (TMC), and Emergency Management Division.

Traffic Engineering

Traffic engineers and managers play an important role in establishing the traffic incident management policies and procedures and may get involved in the following scenarios:

- Providing recommendations for Traffic Incident Management during the plan development process.
- Coordinating response with the roadway maintenance resource office.
- Arranging emergency procurement of additional resources.
- Soliciting heavy-duty equipment at the incident scene.
- Assisting in emergency planning, such as evacuation, detour, and alternate route planning.
- Traffic engineering personnel should participate in AIR meetings when they play a major role in traffic incident management.

#### Roadway Maintenance

The role of SCDOT Maintenance Personnel (SCDOT-MP) is to provide a safe, efficient and sustainable highway system for its users. When requested, SCDOT-MP will respond and deploy resources to major traffic incidents 24 hours a day, 7 days per week. Each SCDOT District will develop and implement response procedures in an attempt to meet the goal of providing assistance within 30 minutes of notification during the assigned working hours of each maintenance yard and 60 minutes after hours.

SCDOT roadway maintenance personnel should perform the following:

- Upgrade temporary traffic controls (TTC), determine detour routes and discuss clearance strategies in coordination with unified command.
- Determine and deploy the necessary heavy equipment and manpower to reopen the roadway if there is a delay in clearing the travel lanes or if the task is beyond the capabilities of the wrecker service on scene in coordination with unified command.
- Make every effort to assist in the relocation of materials in the shortest possible time, using available equipment, if cargo or spilled loads (non-hazardous) are involved. All such materials or any vehicles relocated by SCDOT will be moved the minimum distance necessary to eliminate traffic hazards.



- Assess any damage to state assets and notify parties responsible for the repair.
- Document all SCDOT hours and equipment used for traffic control, roadway clearance and debris clean up.
- Secure the traffic scene to the extent possible prior to leaving the travel lanes.
- Work continually with all responders to ensure that the needs of motorists and state roadways are being met in the most professional, safe and efficient manner.

#### SC Highway Patrol

The typical services provided by High Patrol may include changing tires, assisting in moving vehicles, providing jump-starts, providing gasoline, providing first aid or cardio-pulmonary resuscitation (CPR), containing minor spills, and setting up the temporary traffic control devices. However, Highway Patrol participates in the following traffic incident management processes:

- Detection, verification, and notification – Highway Patrol are on the road patrolling; therefore, they might encounter the incident first. When the Highway Patrols are the first responders, they should notify the traffic management center and request additional help through them. In the case of a minor incident, Highway Patrols provide assistance to the disabled vehicle and clean up any debris on the road.
- Response – Highway Patrols may also play the role of first responder when they detect the incident first. The role of first responder is provided in Section\*\*\*\*\*. Road Rangers should summon additional help through the traffic management center or may contact the 911 dispatch center.
- Clearance – Highway Patrol's participate in the clearance process and perform the following roles:
  - Help move the incident vehicles from the travel lanes and provide additional help such as, tire change, jump-start, and provision of gasoline
  - Assist other responders with the temporary traffic control device relocation or removal
  - Clean and remove debris from the roadway

- Direct traffic around the incident scene using flags and/or arrow boards
- Mitigate minor spills or leaks and clean up debris
- Recovery – Highway Patrols should clean up the incident scene and help recover the normal traffic flow condition.
- Traffic Management – Highway Patrols may participate in traffic management and aid other responders with additional resources as requested. Highway Patrols should also provide help in setting up the temporary traffic control devices along alternate routes or detours.
- Traveler Information – Highway Patrols do not participate in this process; however, they should update the traffic management center periodically on incident scene development.
- After action review – The Highway Patrol supervisor should participate in the after action review meetings.

#### Traffic Management Center

The TMC in Columbia is staffed by operators, dispatchers, traffic specialists, media liaisons, and managers dedicated to incident management. The TMC operator's primary role is to monitor and help coordinate the incident activities using traffic cameras, changeable message signs (CMS), and alert messages.

TMC operators continuously monitor the roadway system using CCTV cameras and are actively involved in the incident detection process. Operators receive reports of incidents by answering calls from 911 centers. The operators use traffic cameras to verify the incident detail and location. In case of a road-user phone call, they ask a series of questions to the callers to complete the verification process. After verifying the incident, the operators will notify the dispatcher, who then dispatches a unit to the incident.

TMC personnel manage the response process by performing the following functions:

- Implementing response plans, including CMS messages for planned and unplanned events.

- Notifying high level SCDOT and SChP personnel through incident paging.
- Coordinating with the on-scene responders to continuously update response plans and the Estimated Time of Clearance (ETC).

The TMC plays a major role in broadcasting traveler information by:

- Activating traveler information systems
- Continuously updating traveler information as the incident evolves.
- During an incident,

TMC operators will:

- Continue with the response plan by updating all information until incident clears.
- Coordinate with TMCs in neighboring states if the incident affects their highway system or if regional traffic diversions can be implemented for long duration incidents.

TMC personnel should close the response plan once the incident scene is cleared. When appropriate, TMC personnel should participate in AIR meetings.

#### Emergency Management Division

The agency for the State's emergencies, disasters, and significant events is the South Carolina Emergency Management Division (SCEMD). SCEMD approaches its responsibilities from an "All Hazards" perspective. South Carolina is at risk from a multitude of hazards. Hurricanes, tornadoes, floods, and ice storms are all examples of natural hazards that can affect South Carolina. Manmade hazards include industrial accidents, transportation accidents, criminal activities, transportation accidents, criminal activities, civil unrest, and in today's environment, terrorism.

A basic principle in Emergency Management is Tiered Response. Local authorities will do everything they can to resolve the emergency. When the local authority sees the need for help, they go to the county, then the county goes to the state and then the state will go to the federal

government. Whenever resources from outside the impacted jurisdiction are engaged, they are in support of the local authority that retains responsibility for managing the response.

Based on this guiding principle, through the State Operations Center (SOC), SCEMD can play a supporting role in responding to a major transportation incident. SCEMD can coordinate with other state agencies for support. Examples of this may include requesting [SC Department of Health & Environmental Control](#) assistance on a Hazardous Materials related incident; Department of Agriculture assistance when animals, animal products or food products are involved; and American Red Cross assistance in sheltering and feeding people associated with the event. SCEMD's role is to assist in coordinating the State of South Carolina's response to an event.

## **CHAPTER 5: INITIAL SCENE RESPONSE**

### **5.1 WORK ZONES AND FIRST RESPONDERS**

South Carolina Vehicle Code Section 56-5-760 states that the provisions of this section do not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons.

South Carolina Vehicle Code Section 56-5-760 authorizes the right of way for emergency vehicles to respond to incidents.

South Carolina Vehicle Code Section 56-5-1535 authorizes representative of SCDOT to restrict use of and regulate movement of traffic through or around work zones.

In order to transit a work zone safely, vehicles operating in emergency status must obey the direction of flaggers in work zones. Work zone flaggers will provide a clear lane for Code-3 vehicles as soon as possible once they are aware of the need. First responders can expedite this process by coordinating with the TMC in their region (see Section 12) prior to reaching the work zone. Once a path has been cleared and permission has been given to proceed through the workzone, emergency vehicles should obey all directions of the personnel in the work zone and proceed at a safe speed to avoid endangering themselves or the workers in the work zone.

### **5.2 INCIDENT RESPONSE PRIORITIES**

**Priority 1: Life Safety** – Initial efforts are to preserve lives, including those of responders, incident victims and passing motorists. Safety is the highest priority throughout the incident.

**Priority 2: Incident Stabilization** – Utilizing best practices, stabilize the incident scene to prevent fire, eliminate ignition sources, contain hazardous materials and stabilize vehicles involved in the incident.

(1) Prevention of Secondary Incidents – Responders should utilize available traffic control devices and, if possible, position apparatus to divert traffic around the crash scene. Special attention should be paid to the end of the traffic queue, utilizing permanent and portable Variable Message Signs (VMS) to warn motorists of slow or stopped traffic as they approach the end of the queue.

(2) Protection of Evidence – All incident sites are potential crime scenes and must be treated accordingly. Responders must make every effort to minimize the impact of their presence on the crash scene.

(3) Safe, Quick Clearance – It should be the goal of all responders to clear the scene as soon as practical and to restore traffic flow to limit the diversion of traffic to less desirable and/or more hazardous routes.

Priority 3: Protection of Property and the Environment – Responders should attempt to protect and preserve the highway infrastructure and limit damage to vehicles involved in incidents to what is necessary to stabilize and remove victims trapped in the vehicles. Property salvage operations should be conducted as soon as safely possible. For hazardous materials and/or potential hazardous materials scenes, responders with the proper personal protective equipment and training should strive to contain the spilled product while minimizing exposure.

### 5.3 SCENE SIZE-UP

As soon as practical upon arriving at the scene of a traffic incident the first responder should provide the emergency operations/dispatch center with the information outlined below. As much information as possible should be provided before initially exiting the response vehicle:

(1) Location of incident.

(a) County

(b) Route

(c) Post mile/nearest intersection

(d) Direction (NB, SB, EB, WB)

(2) Incident type (e.g., fire, earthquake, flood, radiological emergency, hazardous material spill).

(3) Type of hazardous materials involved (if any).

(a) Impacts to traffic (# lanes blocked, etc)

(2) Vehicle information (number and type of vehicles involved, level of damage)

(3) Number of persons potentially affected by the incident.

(4) Anticipated threat/hazards to emergency responders.

- (5) Lead agency.
- (6) Resources needed:
  - (a) Personnel
  - (b) Vehicles
  - (c) Equipment/Supplies
- (9) Location of the ICP or staging area (if established).
- (10) Ingress/egress routes.

#### 5.4 INFORMATION NEEDED FROM THE FIELD

Experience has shown that each of the agencies that may be called out to an incident is best qualified to identify what resources should be dispatched to an incident. The best way to ensure there are fewer delays in getting the right personnel and equipment to the incident is to provide information on the incident itself, relay that to dispatch and have them relay it to the other agencies.

A picture is worth a thousand words – Using smart phone, tablet and other technologies, take two to three pictures of the scene and transmit them to dispatch so they can transmit them to the other first responders. Focus on critical information requirements:

- (1) Overall scene photo
- (2) Placards for any possible hazardous waste
- (3) Gross Vehicle Weight Rating (GVWR) placard on the vehicle's driver's side doorframe
- (4) Photo of any spilled load with a description of what was spilled

## **CHAPTER 6: RESPONDERS' SAFETY PRECAUTIONS AND EQUIPMENT**

### 6.1 RESPONDER SAFETY

#### *6.1.1 Personal Safety*

In addition to safety apparel, the following personal safety item guidelines will protect responders in and outside of their vehicles. To ensure safety, responders should:

- (1) Use a seat belt.
- (2) Wear gloves when changing tires or removing debris from the roadway.

- (3) Wear disposable exam gloves if there is a possibility of contact with blood borne pathogens. Leather work gloves are not a substitute.
- (4) Wear safety shoes, such as steel toe boots, to protect feet from falling objects or crushing injuries.
- (5) Avoid loose or hanging clothing or personal items that may become snagged when working on disabled vehicles.

### *6.1.2 High Visibility Apparel/Safety Vests*

All responders must wear approved high-visibility apparel at all times when working outside of the vehicle. "Part 634 - Worker Visibility," published by FHWA under Title 23 of the Code of Federal Regulations (CFR), requires all workers within the right-of-way of a Federal-aid highway to wear high-visibility clothing. This requirement applies to all emergency responders. Safety apparel must be conspicuous during both daytime and nighttime. To ensure the effectiveness of high-visibility apparel, responders should:

- (1) Keep high-visibility apparel clean to maintain reflectivity and visibility.
- (2) Replace high-visibility apparel when it is worn, heavily soiled, or faded.
- (3) Wear high-visibility apparel on top of all other clothing, including jackets.

## 6.2 VEHICLE MARKINGS

### *6.2.1 Vehicle Markings/Retroreflective Tape*

The use of retroreflective tape on response vehicle increases its visibility at nighttime and low visibility conditions. The amount of retroreflective markings on a vehicle may vary depending on the responding agency's guidelines. Some response vehicles may not have the sophisticated lighting apparatus necessary to be conspicuous to passing traffic during low visibility conditions. Therefore, having a good amount of retroreflective taping on these vehicles may substitute for such a deficiency. The figure below provides examples of vehicles with retroreflective taping during day and night hours.

Vehicle Markings



The National Fire Protection Association (NFPA) Section 1901 provides the fire and rescue department vehicles retroreflective taping guidelines. The choice of color for the retroreflective tape varies depending on the responding agency's color of preference. Typically, alternating bands of red and white or red and yellow are the colors of choice. In some cases, the responding agency's standard logo may substitute some amount of taping. Use the following checklist as a quick guideline to retroreflective taping:

- (1) Apply tapes on the front, back, and sides of the vehicle
- (2) Test the retroreflectivity life of the tape periodically
- (3) Clean and replace tape periodically
- (4) Optimize the amount of vehicle taping
- (5) Avoid excessive taping to prevent a blinding effect

### *6.2.2 Vehicle Lighting*

Emergency vehicle lighting enhances the safety of the incident scene by increasing the visibility of the response vehicles and by warning the approaching traffic. However, excessive lighting may distract oncoming motorists, especially during nighttime and low visibility conditions. Emergency vehicle lights are for warning purpose only, and optimal use of such lights ensures safety of responders at the incident scene.

MUTCD Chapter 6 recommends that public safety agencies examine their emergency vehicle lighting policies, especially those that relate to lighting after a traffic incident scene is secure. The objective should be to reduce the amount of lighting at the incident scene, while maintaining the safety of those at the scene. The following are the basic guidelines developed for the use of emergency vehicle lights at a traffic incident:

Emergency flashing lights should be turned off:

- (1) When the emergency vehicle is outside and farther away from the travel lanes.



- (2) When multiple response vehicles are parked at the incident scene, turn off the overhead flashers on all the vehicles except for the rear and front vehicles.

After securing the incident scene, use the following light-shedding procedures to best utilize the various emergency lights at the incident scene:

- (1) Turn off the opti-com lights
- (2) Turn off the headlights, unless required to illuminate the incident area
- (3) Turn off the white strobes
- (4) Turn on the ground lights when present
- (5) Turn on the amber arrow board/directional lights
- (6) Turn on the compartment lights

**Note:** Do not use the high-intensity flashing lights. The high-intensity flashing lights may instigate certain medical conditions in drivers susceptible to such frequencies and may greatly distract the approaching traffic.

## 6.3 VEHICLE PLACEMENT

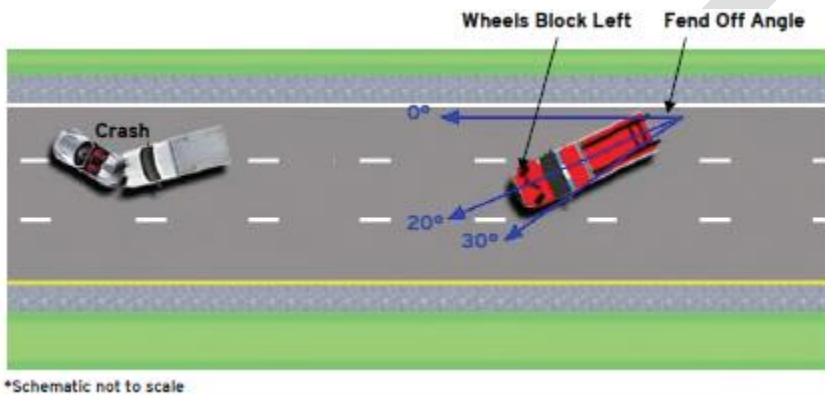
### 6.3.1 Vehicle Parking

Proper vehicle parking within the traffic incident management area can add protection to the incident scene by creating a physical barrier between upstream traffic and the incident space. The following checklist provides guidelines for proper vehicle parking at an incident scene:

- (1) Allow sufficient buffer space between the incident and the response vehicle.
- (2) All responding agencies should park their vehicles on same side of the roadway as the incident. This reduces the need for responders to cross traffic lanes and reduces responders' exposure to the live traffic.
- (3) Fire and rescue personnel should position their vehicle at an angle or fend off position, as shown below, to shield the activity area and protect responders and victims at the incident scene. Parking angle to the right or to the left of the incident scene depends on the location of the incident on the road and the equipment access needs of fire/rescue personnel. It may also vary depending on the use of apparatus equipped with the side-mounted pumps; in that scenario, park the fire and rescue apparatus downstream of the incident with the pump side angled toward the incident. To minimize lane blockage, use the following precautions:
  - (a) Close only the lane(s) blocked or impacted by the incident

- (b) Occupy additional lane(s) only when absolutely required for victim and/or responder safety
  - (c) Open the blocked lane(s) when no longer required
- (4) Responders should turn the wheels of a parked vehicle away from the incident scene. If the vehicle is struck by an errant motorist, this may reduce the probability of the vehicle dragging straight into the incident scene.

#### Emergency Vehicle Parking



#### 6.3.2 Vehicle Positioning

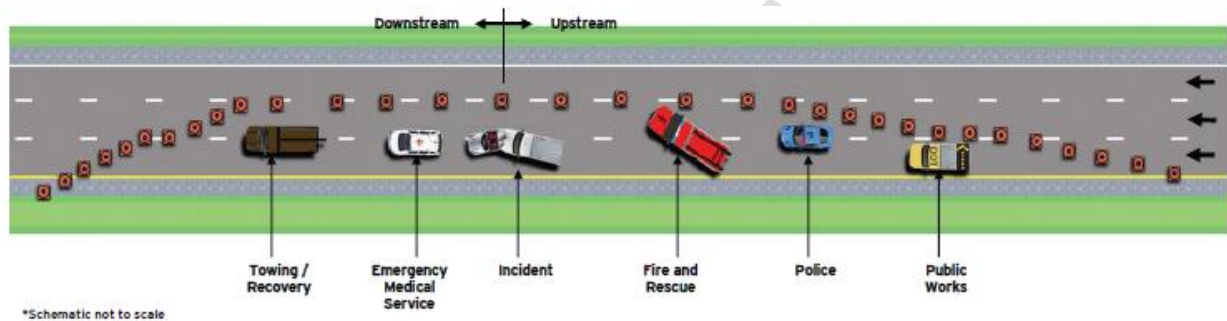
Strategic vehicle positioning can facilitate an efficient response and support clearance activities. Use the following order of vehicle positioning according to motorists' perspective:

- (1) Upstream vehicle positioning
  - (a) Transportation agency
  - (b) Law enforcement
  - (c) Fire and rescue
- (2) Downstream vehicle positioning
  - (a) Emergency medical services
  - (b) Towing and recovery
  - (c) Other investigators (homicide or medical examiner)

Transportation personnel should position their vehicles at the extreme upstream location of the traffic incident management area, with or without arrow panel, to provide advance warning and direct traffic away from the closed travel lane(s). Fire and rescue personnel should position their vehicle closest to the incident scene at an angle or fend-off position. Emergency medical services and towing and recovery personnel should position their vehicles downstream of the

incident. Emergency medical services personnel are often the first to depart from the incident scene, and upstream positioning provides them the safest conditions while they render aid to the injured victims. In situations when emergency medical services and the fire and rescue department are a single unit, the vehicle position shall be downstream of the incident and angled in such a way that it provides safe and easy access to rescue equipment. The figure below shows typical vehicle positioning.

#### Typical Vehicle Positioning



#### 6.3.3 Non-Blocking Incidents

Non-blocking incidents, which involve a vehicle on the shoulder or off the road and only one or two responders, are the most common type of incident. It is important to note that even though traffic lanes remain open, incidents on the shoulder or off the roadway can sometimes be more hazardous than lane blocking incidents. Traffic controls and advance warning are minimal, and passing motorists are less likely to slow down, Move-Over laws notwithstanding.

The following are general guidelines for responders working alone on or along active roadways:

- (1) Stay aware of oncoming traffic.
- (2) Minimize the time spent standing or walking between your vehicle and other vehicles.
- (3) Plan an escape path.

At the scene, responders should:

- (1) Park well off the travel lane.
- (2) Practice space safety. Park closely enough to read the license plate, but no closer than two to four car lengths. Exceptions should be limited.
- (3) Avoid stopping in the glide path on the outside of a curve. Vehicles operated by inattentive drivers or at an unsafe speed may drift onto the shoulder.
- (4) Check traffic before exiting the vehicle.

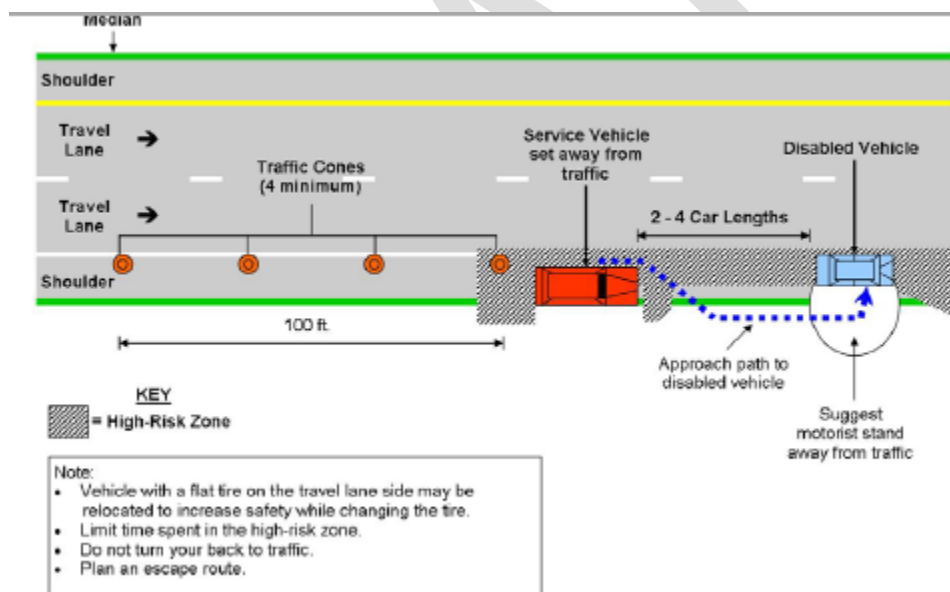
- (5) Turn and look and use peripheral vision to monitor oncoming traffic for potential errant vehicles.
- (6) Approach the incident vehicle on the side away from traffic. In most cases, this is the passenger's side of the vehicle. If the vehicle is on the left shoulder or median, approach the vehicle on the driver's side.
- (7) Scan the interior of the vehicle while approaching it.

When providing traffic controls at a non-blocking incident, responders should:

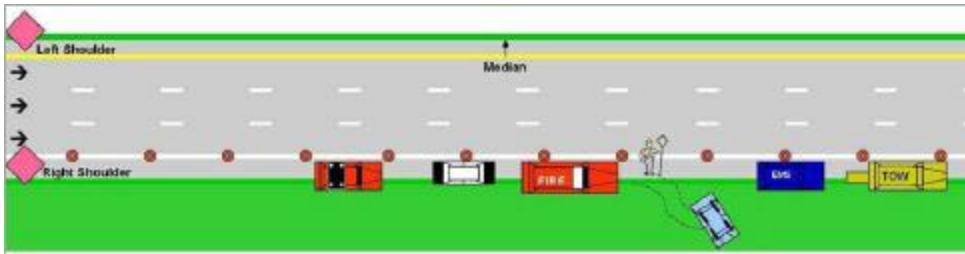
- (1) Use traffic cones and flares for responder safety as well as for traffic control.
- (2) Use flares when necessary, making sure that there is no fuel spill. Do not use flares for illumination. Never kick a flare.
- (3) Remove all flares and other materials when the incident is clear.

The figures below illustrate vehicle placement and traffic control for non-blocking incidents.

#### Non-Blocking Incident with Single Responder



#### Non-Blocking Incident with Multiple Responders



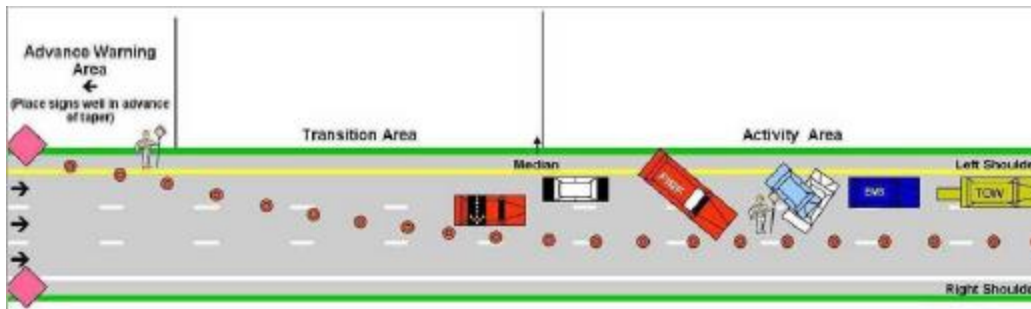
### 6.3.4 Blocking Incidents

Lane blocking incidents, where at least one lane of traffic is blocked, are more critical than non-blocking incidents because they directly affect approaching motorists. The following are general guidelines for responders working at a lane blocking incident:

- (1) Place the response vehicle in a visible location between the incident and approaching traffic. An arrow panel (when available) and traffic cones should be used to warn motorists and direct traffic around the scene.
- (2) Consider repositioning the initial response vehicle to allow more room for emergency vehicles as additional resources arrive.
- (3) Confer with other on-scene agencies, when appropriate, through the Incident Command structure to ensure that emergency vehicle placement is optimized for scene safety, onscene operations, and traffic flow past the scene. Consider staging additional response vehicles off-site until needed.
- (4) Take only as many lanes as needed, for only as long as needed.
- (5) Take an extra lane (called Lane Plus One) where needed to provide a safe buffer against moving traffic. Open the lane when the extra buffer is no longer needed.
- (6) Relocate the response vehicle as needed to best utilize the arrow panel once the traffic cones are in place.
- (7) Continue to look for opportunities to improve traffic flow and scene safety.

The figure below illustrates vehicle positioning and TTC device placement at lane-blocking incidents.

#### Blocking Incident in Two Lanes



## 6.4 TRAFFIC CONTROL

### 6.4.1 Traffic Cones

For lane blocking incidents, guidelines for placing traffic cones should be:

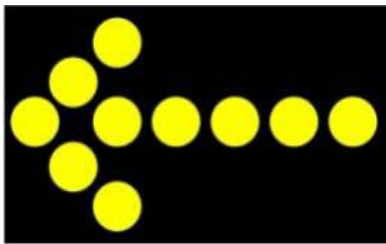
- (1) Set traffic cones in a taper to guide approaching traffic into available lanes to safely pass the incident.
- (2) Deploy traffic cones at the rear of the response vehicle and work upstream.
- (3) Reinforce and straighten traffic cone lines and tapers after their initial placement to increase effectiveness and maximize visibility of the cones.
- (4) Do not turn away from traffic while placing or removing cones.
- (5) Space cones equally, about 40 feet apart, but at least 25 feet apart initially. As an example, if 16 cones are available, use 12 cones for the lane closure taper, which should be approximately 400 feet minimum on high-speed roads, and four cones along the activity area to quickly make the scene safer.
- (6) Place cones around response vehicles, and place at least one cone downstream past the incident to allow a parking spot for the ambulance or EMS vehicle.
- (7) Use pavement markings as a distance reference to help with cone placement. Roadway skip line striping is typically in 40 foot segments (10 foot painted stripe and 30 foot gap).
- (8) Increase the number of cones and the distance between cones as the speed of approaching traffic increases. This gives motorists more time to react, slow down, and merge. Full MUTCD TTC is the goal for intermediate and major incidents, so actions at the scene should be taken to approach this level of traffic control as additional resources arrive.
- (9) Delineate traffic tapers with clean, retroreflective cones.
- (10) Use only retroreflective cones when working at night.

(11) Use additional cones from other responding units as available.

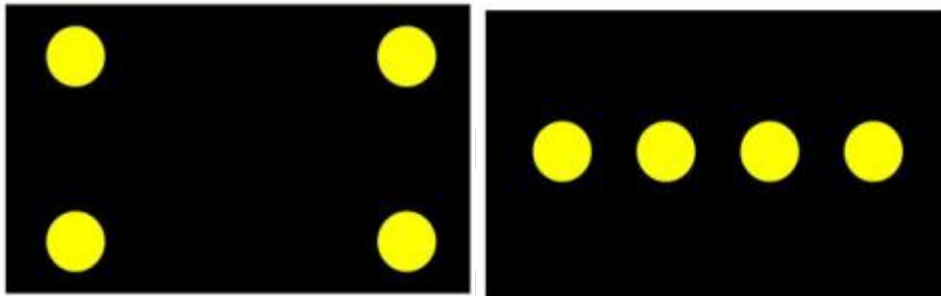
(12) Improve traffic flow by moving the transition taper

#### 6.4.2 Arrow Panels

The arrow panel, used in conjunction with traffic cones and other traffic control devices, provides positive guidance to direct approaching traffic away from a blocked travel lane at an incident scene. Use the arrow panel in Arrow mode, shown below, only to indicate a blocked travel lane.



Use the arrow panel in Caution mode, shown in Figure 7, when on or near the shoulder of the roadway. The four corner arrow panel should be used when in the shoulder and the line arrow panel when in the travel lane.



#### 6.4.3 Flagger

At an incident scene, manual positive traffic control, also called flagging, reduces rubbernecking and helps keep traffic moving smoothly. When resources permit, the flagger function should assist in slowing and directing approaching traffic. Flaggers shall be outfitted with high-visibility safety apparel. Stop/Slow paddles are the preferred hand-signaling device because they provide more positive guidance than red flags.

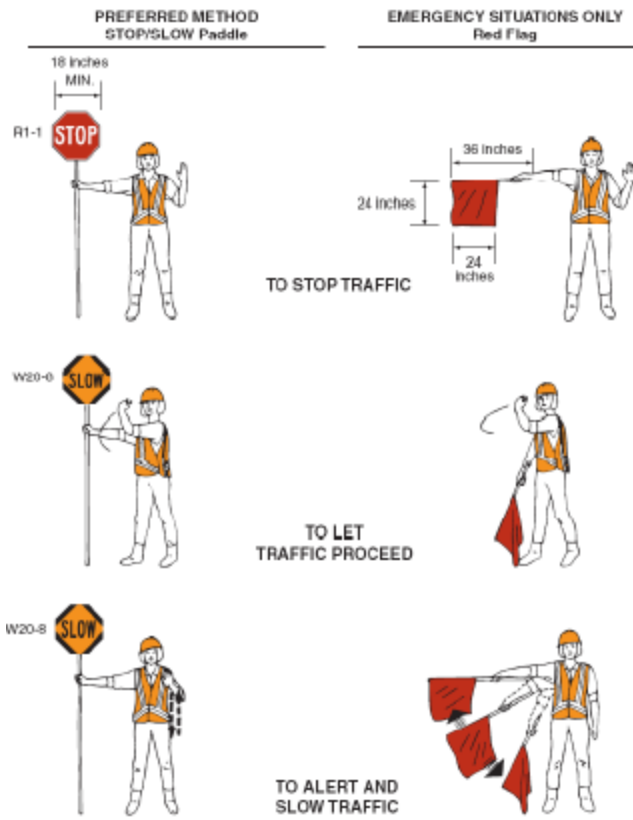
NOTE: Except for unusual circumstances or emergencies, flaggers should not be used on freeways. Permanent or portable VMS should be used in advance of the incident whenever available. Flagging should be done as a last resort and the red flag should only be used until such time as a stop/slow paddle is available.

Qualified flaggers should provide manual traffic control, but if necessary, any response personnel can provide it. The following are guidelines for effective positive traffic control:

- (1) Do not use bystanders, good Samaritans, or other untrained personnel for traffic control duties.
- (2) Give commands or directions to traffic in a clear, courteous, but firm tone.
- (3) Accompany verbal commands to “stop,” “slow down,” and “proceed” with appropriate hand movements or the use of a Stop/Slow paddle or flag. Whistles can also be an effective tool.
- (4) Stand at a safe location adjacent to the wrecked vehicles when providing positive traffic control in the activity area.
- (5) Stand at a safe location near the beginning of the taper when providing positive traffic control in the transition taper area.
- (6) Make eye contact with the drivers of approaching vehicles to encourage them to pay attention to their driving and not the incident. This will increase the flow of traffic past the incident scene, reducing delay.
- (7) Avoid providing individualized directions to motorists as this can create more congestion by slowing traffic. The flagger’s job is to keep traffic moving safely past the incident scene.

Flagger Commands for Emergency Positive Traffic Control





#### 6.4.4 Spotter

When resources permit, a traffic spotter should monitor traffic and activate an emergency signal if a motorist's actions do not conform to established traffic control measures. A portable air horn or similar device is an ideal emergency signal. A portable radio is not recommended for this purpose, since all responders on the scene are unlikely to be monitoring the same radio frequency.

### 6.5 INCIDENT SCENE

#### 6.5.1 Incident Scene Illumination

Proper illumination, or lighting, of the incident scene is vital. However, exercise care to ensure that scene lights are not blinding to traffic. When available, use vehicles with special lighting capabilities. Vehicle-mounted lighting setups that can be controlled remotely will allow responders to direct lights downward and minimize the amount of light that reaches motorists.

### *6.5.2 Cancel En-route Responders*

The Incident Commander may cancel en-route secondary responders depending on the need of the incident. Before issuing a cancellation, the Incident Commander should thoroughly assess the entire incident scene. En-route responder cancellation policies should be discussed with all stakeholders in advance to avoid interfering with an agency's standard operating procedures. Canceling en-route responders not only reduces their exposure to hazardous condition but also creates an additional space for the activity area.

### *6.5.3 Personal Vehicle Use*

Responders should limit the use of personal vehicles at an incident scene because they lack safety features such as vehicle marking, strobe lighting, and other safety apparatus that are present in the response vehicles. If personal vehicles must be used, responders should park the vehicle as far away from the travel lanes as possible. When possible, park the vehicle entirely off the roadway system such as at a parking lot or rest area.

### *6.5.4 Helicopter Landing and Staging*

In cases where incident victims need urgent or time-sensitive medical treatment, air ambulances or medical helicopters may be necessary. In preparation for their arrival, responders must designate a landing zone (LZ).

Ideally, a short-distance transport to a suitable site off of the highway should be considered for the safety of responders and for quicker roadway clearance. However, every incident is different. The on-scene medical controller or incident commander must promptly decide where to set up the LZ to expedite the victim's transport to an appropriate trauma center.

The following are guidelines for setting up an LZ

- (1) An LZ should be no less than 100' x 100' in size on flat terrain during the night, and no less than 50' x 50' during the day. The LZ should be clear of debris and loose soil and free of overhead obstructions, wires, or trees. Other responders and personnel should be at least another 100' from the landing zone.
- (2) Ideally, the LZ is marked with appropriate strobe lights, light sticks, and even emergency vehicles. An ideal landing zone is a vacant, cleared, well-defined area. Traffic cones should not be used because rotor wash can potentially suck them into the main rotor. Do not use crime scene tape or rope to mark the LZ.

Responders should remember the following safety guidelines at an LZ:

- (1) When communicating and directing the helicopter to the LZ, use the clock method based on the nose of the aircraft.

- (2) Follow the direction of the flight crew for all movement around the aircraft. Only maneuver around the aircraft when escorted to and from the aircraft by a member of the flight crew.
- (3) Approach the aircraft from the front or sides (from 9 o'clock to 3 o'clock), never from the rear, and always within full view of the pilot. Keep low when approaching the aircraft.
- (4) Stay clear of the tail rotor.
- (5) Do not run or smoke.
- (6) Use eye and ear protection, if available.

#### *6.5.5 Emergency Scene Access*

The Incident Commander or first responder should determine the shortest and/or fastest route available to arrive at the incident scene; and notify other agencies responding to the incident scene. While responding to an incident, responders should practice the following precautions:

- (1) Establish contact with the Unified Command or on-scene respond.
- (2) Use the highway shoulder whenever possible to access the incident scene
- (3) Use sirens and flashlights while working through the traffic
- (4) Slow down the vehicle gradually and do not use sudden braking
- (5) Travel against the traffic flow only with extreme caution
- (6) Exit from the protected side
- (7) Look around before moving or exiting from the incident scene
- (8) Work within the established traffic incident management area
- (9) Coordinate with the Incident Commander if any additional space is needed

## **CHAPTER 7: TRAFFIC CONTROL AND SCENE MANAGEMENT**

### **7.1 COMPONENTS OF TRAFFIC INCIDENT MANAGEMENT AREAS**

#### *7.1.1 Advance Warning Area*

The advance warning area is established upstream of the incident area for alerting oncoming traffic of the incident ahead and to promote a reduction in travel speeds. The advance warning

area should include placement of warning signs such as portable changeable message signs, fluorescent pink signs, cones, flares, and other means. The length of advance warning area depends on the road characteristics (rural or urban), geometry (straight or curved section), and speed (low or high). The tables below show the advanced warning area sign details and spacing:

### Advance Warning Area Sign Details and Spacing

Sign Size	48 in. x 48 in. for high speed road (> 65 MPH) 36 in. x 36 in. for moderate to low speed road	Roadway Type	Distance Between Signs (ft.)	
Sign Color	Fluorescent pink with black texts and border		A	B
Sign Material	Vinyl rollups	Low Speed Urban (less than or equal to 40 MPH)	100	100
Sign Height <sup>12</sup>	1 ft. for signs mounted on temporary supports	High Speed Urban (greater than or equal to 45 MPH)	350	350
Sign Lateral Clearance <sup>13</sup>	2 ft. - 4 ft. in urban areas 6 ft. - 12 ft. in rural areas	Rural	500	500
		Expressway/Freeway	1000	1500

Source for Table 2a and 2b: Modified MUTCD Chapter 6C

<sup>12</sup> Sign height is the distance between the roadway elevation and the bottom of the sign

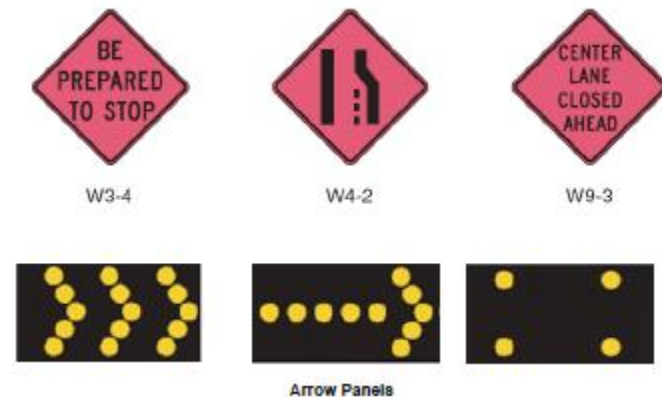
<sup>13</sup> Sign lateral clearance is the distance between the edge of travel lane and the corner of the sign

Use the following checklist while setting up the advance warning signs at the incident scene:

- (1) Set up signs to the left, right, or on both sides of the roadway
- (2) Set up signs perpendicular to the roadway and facing the traffic
- (3) Set up signs well in advance for the roadway with vertical and horizontal curves
- (4) Set up signs at least two feet away from the travel lane
- (5) Set up signs in advance of any visual obstruction such as trees or road curvature

Examples of typical advance warning area signs are shown below.

### Advance Warning Area Signs



### Portable Changeable Message Signs

Portable changeable message signs are another tool for providing drivers advance warning.

Portable changeable message signs can be used for intermediate incidents and are strongly recommended for use during major incidents.

### *Changeable Message Signs*

Changeable Message Signs (CMS) are permanent, structure-mounted, electronic signs.

CMS are remotely operated and can provide advance warning messages to motorists if an incident occurs downstream.

#### *7.1.2 Approach Area*

Identifies the nature of the equipment or vehicle that the motorist is about to encounter, allowing them to analyze the situation.

#### *7.1.3 Transition Area*

The transition area is used to redirect approaching traffic out of its normal travel path by setting up a merge taper, as shown in Figure 3. The first responders at the incident scene should use the amount of cones available with them to set up an initial taper, as shown in Figure 5. Because of the limitation of the amount of cones available with each responder, it may not be possible to set up a long taper meeting the MUTCD criteria. However, a short quick, taper should be set up for the closed travel lane as soon as practical because any taper is better than no taper.

Use the following checklist while setting up the taper at an incident scene:

- (1) Taper length should be sufficient to allow space for parking responders' vehicles
- (2) Taper should allow sufficient buffer length for the incident scene
- (3) Taper should include any line of sight obstruction such as road curvature or trees
- (4) Traffic cone spacing should be maximized until additional cones become available
- (5) Taper length should be extended as additional cones become available to allow sufficient stopping distance for safe merge and lane change

The following section summarizes the methodology to calculate various taper lengths. It is suggested to use the following dimension measurements as guidelines and not standards.

### *Taper Lengths*

The MUTCD Chapter 6C identifies three types of taper lengths establishment around the work zone that also applies to the incident Hot Zone:

1. Merge taper – provides a safe merge space for approaching traffic during lane closures. The length of the merge taper varies with the roadway speed, and the same taper length should be used for multiple lane closures.

2. Shoulder taper – provides a safe shoulder activity space for the responders and acts as a traffic warning. It is important to set up a shoulder taper when an incident requires an extended duration of shoulder occupancy.

3. Downstream taper – prevents traffic from abruptly cutting in front of the responders while they are still working on the incident. The length of the downstream taper is standard and should be established the same for all the lanes, which is 100 feet per lane.

#### *Field Placement of Traffic Control Devices*

Length measurement could be a difficult task in the field. It may not be practical during incident management conditions to measure the distance between traffic control devices or traffic incident management area component lengths by accurately using the measurement tools. Therefore, one useful reference in the field can be the pavement markings. The standard white skip markings are 10 feet long spaced at 30-foot intervals. Use this technique to establish the approximate traffic incident management area component lengths, starting at the approximate start of the incident scene and moving upstream to measure the upstream buffer space and transition taper lengths, and downstream to measure the downstream buffer space and termination taper lengths.

A reference table to determine the spacing and number of traffic control devices can be seen below.

Reference Table for Spacing and Number of Traffic Control Devices

Road Speed Limit (MPH)	Traffic Cone Spacing <sup>1*</sup> (ft.)		Upstream Shoulder Taper	Upstream Transition Taper	Upstream Buffer Space	Downstream Buffer Space	Downstream Termination Taper
	Taper	Non-Taper	Length (ft.)	Length (ft.)	Length (ft.)	Length (ft.)	Length (ft.)
20	20	40	25	80	115	40	100 per lane
25	25	50	40	125	155	63	100 per lane
30	30	60	60	180	200	90	100 per lane
35	35	70	80	245	250	123	100 per lane
40	40	80	110	320	305	160	100 per lane
45	45	90	180	540	360	270	100 per lane
50	50	100	200	600	425	300	100 per lane
55	55	110	220	660	495	330	100 per lane
60	60	120	240	720	570	360	100 per lane
65	65	130	260	780	645	390	100 per lane
70	70	140	280	840	730	420	100 per lane

*Source: Modified 2003 MUTCD*

#### 7.1.4 Activity Area

(1) Fend Off Position—Position of the emergency vehicle.

(2) Buffer Zone - The buffer space is an additional work area around the incident scene to provide a safe working space for the responders. The buffer space also provides a recovery area for errant vehicles that may enter the traffic incident management area. There are two types of buffer space in the activity area:

- (a) Upstream Longitudinal Buffer Space – this buffer space covers the distance between the incident space and transition area. The length of the upstream longitudinal buffer space is determined based on the stopping sight distance of a vehicle traveling at posted speed limit.
- (b) Lateral Buffer Space – This is the space between the adjacent travel lane and incident space. The lateral buffer space provides an additional safe operating area adjacent to the incident scene to protect responders from passing traffic. The amount of lateral buffer space needed depends on various conditions, such as time of day, weather, and roadway condition. As a rule of thumb, if the lane adjacent to the incident cannot maintain a minimum travel lane width of 10 feet, the entire lane could be closed.

(3) Incident Site—Restricted to authorized personnel only.

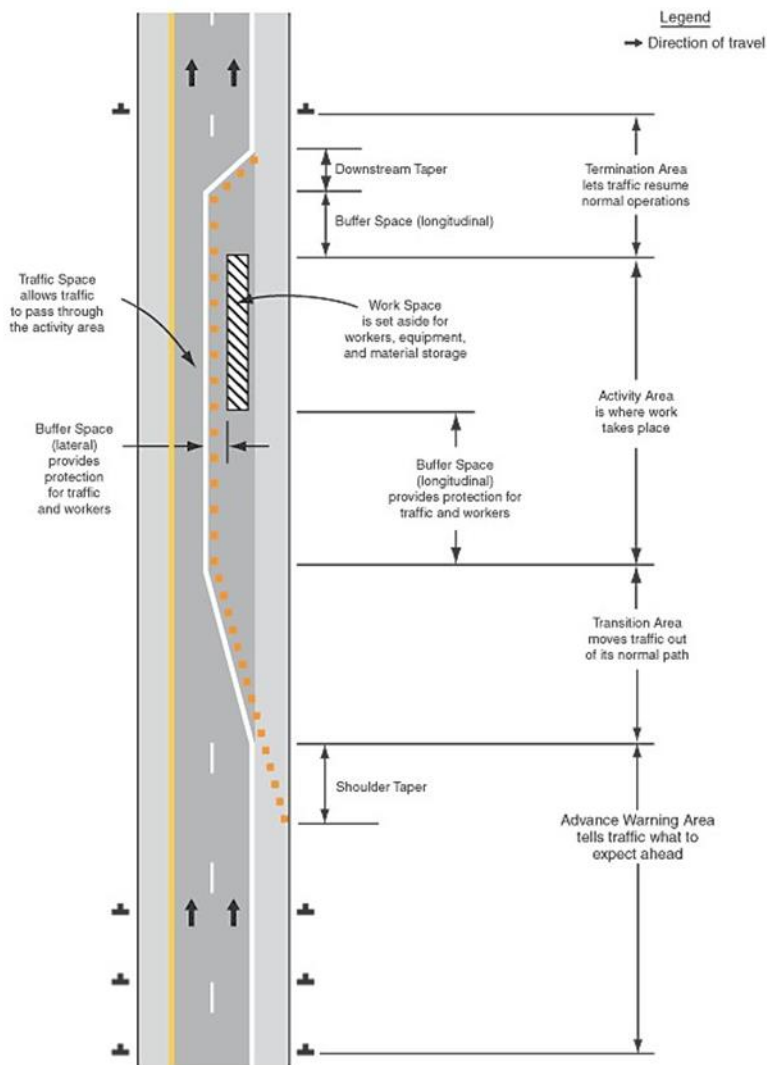
(4) Staging Area—For emergency Vehicles not immediately required to perform a function or provide shielding at the incident scene . This area should be downstream/upstream of the incident site and the location should not create a traffic hazard or obstruction

(5) Traffic Space—Where traffic is allowed to pass by the Activity Area.

#### *7.1.5 Termination Area*

The termination area is used to notify motorists that the traffic incident management area is ending and returns them to their normal driving path. The termination area is comprised of two components, as discussed below:

- (1) Downstream buffer space – is the space between the incident scene and the start of the termination taper, as shown in Figure 3. The length of upstream buffer space should be at least half of the downstream buffer space length.
- (2) Downstream taper – is provided to prevent sudden traffic cutting in front of the incident responders. The length of the downstream taper should be 100 feet long for each lane closed. Therefore, the termination area length varies with the number of lanes closed.



## 7.2 TEMPORARY TRAFFIC CONTROL AT A TRAFFIC INCIDENT MANAGEMENT AREA

Upon arrival at an incident scene, responders should work as quickly as possible to establish a TIMA.

TIMAs provide traffic control and advance warning, which are both necessary to maintain a safe working area at an incident scene. In the early stages of an incident, responders should use all equipment on hand to set up traffic control, while realizing that the TIMA will be expanded and/or enhanced as additional responders arrive and more resources become available. As the incident progresses, the scene may escalate (i.e., go from a one-lane closure to multiple lane closure) or deescalate (i.e., go from a multiple lane closure to a one-lane or shoulder closure).

All TIMAs should conform to the standards established in Chapter 6I of the Manual on Uniform Traffic Control Devices (MUTCD). Chapter 6I provides guidance on the types of TTC devices that should be used at a TIMA based on the incident type.



For instance:

- (1) For major and intermediate incidents, TTC zones should include proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue.
- (2) For minor incidents, it is not generally possible or practical to set up a lane closure with traffic control devices. When a minor incident blocks a travel lane, it should be removed from that lane to the shoulder as quickly as possible.

TTCs at a TIMA help move road users safely and quickly past or around an incident, reduce the likelihood of secondary traffic crashes, and keep motorists off the surrounding road system.

TTCs include devices such as:

- (1) Traffic cones
- (2) Arrow panels
- (3) Warning signs
- (4) Manual traffic control (flagging).

Motorists have become accustomed to the traffic control measures that are used in work zones and are familiar with how to react to them. TIMAs and traffic control devices that differ from work zones may confuse drivers.

## 7.9 DISMANTLING THE INCIDENT SCENE

At each incident, responders need to develop a de-commit plan. Incident Command must monitor and control the dismantling of the scene and plan to remove personnel, apparatus, injured persons, bystanders, and vehicles safely from the scene. All debris must be cleared from the roadway so that it doesn't present an additional hazard.

Dismantle the scene backward from the termination area to the advance warning area.

The following are considerations to keep in mind while removing personnel and apparatus from the scene:

- (1) Ambulance leaving scene with or without traffic control
- (2) Dismantling safe incident space
- (3) Blocking apparatus leaving the scene
- (4) Picking up traffic cones safely

Personnel must realize that conditions change as the incident terminates, and the following will likely occur:

- (1) Safe area may no longer be intact.
- (2) Frustrated drivers may increase speed to make up for lost time.
- (3) Frustrated drivers may enter gaps in safe incident space.
- (4) Vehicles (e.g., ambulances) leaving the scene may be too busy watching traffic to see personnel on scene.

When an incident scene has been cleared, the appropriate agency (generally the maintaining authority) should be notified that the roadway is open. Additionally, if dispatch, the TMC, or other agencies were notified of the incident, they also need to be notified that the incident is clear.

At the conclusion of an incident, responders should facilitate the safe removal of all components— including remaining responders, responder vehicles, and TTC devices—of the incident scene, using these guidelines:

- (1) Remove all debris from the travel lanes and shoulder.
- (2) Remove traffic control devices in the upstream direction. Start at the termination area and work back to the advance warning area.
- (3) Notify dispatch when the lanes are reopened.
- (4) Be alert for impatient motorists. With the incident victims and vehicles removed, delayed drivers will not be as cautious and may not see you.

## **CHAPTER 8: INCIDENT ACTIONS**

### **8.1 ABANDONED VEHICLES**

Abandoned vehicles left by motorists on roadway shoulders—especially on high-speed, access controlled roadways—are a safety hazard and can restrict the response of emergency vehicles.

Law enforcement agencies with jurisdiction need to detect, check, and order the removal and impoundment of abandoned vehicles. Any vehicle found in a location that is hazardous to traffic should be processed as an immediate tow. All other abandoned vehicles should be removed as soon as possible after the statutory time allowance has expired.

Any non-law enforcement agencies that do not have impoundment authority can assist in the handling of abandoned vehicles, using these guidelines:

- (1) Check for the following scenarios without entering the vehicle:
  - (a) Injured, sick, or incapacitated individuals

- (b) Anything suspicious in nature, such as a punched ignition, damaged door lock, or a broken window with glass debris still in the vehicle
- (2) Notify dispatch of anything unusual.
- (3) Advise dispatch if the vehicle is in a hazardous location. Dispatch can contact law enforcement for immediate or expedited removal of the vehicle.
- (4) Tag or mark the rear window to notify other units and law enforcement that the vehicle has been checked. Tag the vehicle only if it is not an immediate hazard.
- (5) Follow procedures for logging or notifying dispatch when tagging a vehicle.

Notify dispatch of previously tagged vehicles that have not been moved after the time limit has expired.

## 8.2 DISABLED VEHICLES

Occupants of a vehicle that breaks down on any highway, especially a high-speed roadway, face substantial risks. Make every attempt to respond promptly to this type of incident. Quick response will help safeguard vehicle occupants who may be tempted to accept a ride from a stranger or walk alongside the roadway to seek assistance.

Once you observe or become aware of a motorist who needs assistance, you have a special obligation to help out. Within reason, you must adjust your direction of travel and respond to the incident with due caution but without delay.

- (1) Stop to offer assistance when a motorist with a disabled vehicle is encountered unless en route to a higher priority call.
- (2) Call dispatch and indicate your intention to turn around and offer assistance if the disabled vehicle is in the opposite direction of travel.
- (3) Notify dispatch of the location and basic description of the vehicle for follow up if you must bypass a motorist for a higher priority incident.

If you are dispatched to a disabled vehicle and encounter another along the way, you may stop for a short time and check the problem. If you cannot make immediate repairs, advise the motorist that you will return after the other call is cleared.

### *8.2.1 Relocating Vehicles from Hazardous Locations*

Safety is every responder's primary responsibility. If a vehicle is located in a hazardous location or is blocking a travel lane, make every effort to relocate the vehicle prior to rendering assistance.

- (1) Determine if the vehicle should be relocated to a safer location before rendering assistance in:
  - (a) Curves: Motorists tend to hug the inside of a curve or drift off the road on the outside. Make sure there is sufficient sight distance for traffic to see you.
  - (b) Narrow left shoulders.
  - (c) Locations where barrier walls or guardrails limit shoulder width and restrict an escape path.
- (2) Take special care when performing activities such as a tire change on the traffic side of the vehicle. Consider relocating the vehicle unless it is more than six feet off the travel lane.

### *8.2.2 Safe and Damage-Free Push Bumper Use*

Using a response vehicle with a push bumper to relocate a disabled vehicle can be done safely and without damage by following some basic guidelines. Consider the location, weather, and traffic conditions. Contact dispatch to request assistance if you are concerned about highway traffic speeds, your safety, or the competence of the motorist. Do not relocate a vehicle if you suspect the driver is substance impaired.

A push bumper is designed to push a vehicle only for limited distances to reduce a safety hazard. Be prepared to explain to the motorist that you cannot push them down the highway, to an exit, or into a service station. Motorists may even ask you to push them to their home. Be polite but stay in control, and remember that your role is to reduce the potential of a secondary incident. Usually, a suitable relocation site is nearby—just make sure you and the motorist agree on the location to which you will push the vehicle.

- (1) Do not push a vehicle that has bumper misalignment, previous damage, or an obstruction such as a trailer hitch, tire carrier, or ladder. If possible, photograph the vehicle's bumper before and after pushing it.
- (2) Do not push a vehicle if you cannot see ahead of it.
- (3) Before you start to push:
  - (a) Tell the driver what you want them to do.
  - (b) Confirm that the driver understands you.
  - (c) Advise exactly where you want the driver to go.
  - (d) Remind the driver that steering and braking will be hard but will work.
  - (e) Advise the driver not to hit the brakes hard or abruptly.

- (f) Make sure the driver can hear your instructions. The driver side window should be open.
- (4) Make sure the vehicle's:
  - (a) Ignition key is in the on position.
  - (b) Transmission is in neutral.
  - (c) Parking brake is off.
- (5) Approach the disabled vehicle to be pushed slowly. Make gentle contact.
- (6) Check traffic.
- (7) Advise the driver that you will start pushing.
- (8) Push slowly, maintaining a shallow angle.
- (9) Back off before the driver brakes.
- (10) Advise the driver when to stop.
- (11) Instruct the driver to set the parking brake and secure the vehicle.

### *8.2.3 Basic Assistance to Motorists with Mechanical Problems*

In some instances, you may need to provide basic assistance (e.g., changing tires, giving jump starts, or even providing a small quantity of fuel to reach the next fuel station) to get the motorist safely back on the road. Use the following guidelines when offering assistance to a motorist with a disabled vehicle.

Follow the guidelines on Safe Vehicle Placement while making motorist assists.

- (1) Contact dispatch prior to leaving your vehicle and provide the following information:
  - (a) Exact location, including direction and a mile post or cross street.
  - (b) Color of the vehicle.
  - (c) Make of the vehicle.
  - (d) License plate (tag) number.
  - (e) Description of vehicle problem (e.g., disabled or abandoned).
- (2) Approach on the non-traffic side. Walk past the passenger door, and turn to face traffic. Clearly identify yourself and ask, "Are you okay?" and, "How may I help you?" Do not open the door; ask the driver to lower the window.

- (3) Return to your vehicle if you plan to attempt repairs and place a minimum of four traffic cones behind your vehicle along the edge line, approximately 35 to 40 feet apart. (Use skip lines as a guide for spacing.)
- (4) Move vehicles blocking a travel lane or in a hazardous location, such as on a narrow shoulder or at the end of a gore area, before providing assistance or repairs.
- (5) Relocate the vehicle under its own power if possible or by pushing it to a safe location when possible. Follow the guidelines in section 7.2.2 for proper use of push bumpers.
- (6) Contact dispatch and request back-up assistance if the safe relocation of a vehicle on a narrow shoulder is not possible. Use traffic cones and, if an arrow panel is not available, emergency lighting.
- (7) Get as much information as you can from the driver when attempting to determine what is wrong mechanically with a stalled vehicle. Ask questions that include the following:
  - (a) Has this ever happened before?
  - (b) How did the vehicle act prior to stalling?
  - (c) Do you know of any specific problems with the vehicle?
- (8) Avoid any disassembly or removal of parts. Instead, confine repairs to readily apparent problems that can get the motorist underway. Attempt to limit your assistance to no more than 15 minutes.
- (9) Direct the driver to have permanent repairs made promptly. Do not refer motorists to specific tow companies or repair shops. Give them options.
- (10) Offer the motorist the opportunity to make a local cell phone call if attempted repairs are unsuccessful. If the motorist requests a tow truck or motor club, notify dispatch in accordance with agency practices.

#### *8.2.4 Response for Hybrid Vehicles*

Hybrid vehicles are becoming more popular in the United States. Emergency Response Guides for the majority of auto brands and models can be found on the Internet. There are many types of

Hybrid vehicles, including:

- (1) Gas/Electric
- (2) Hydrogen Fuel Cells
- (3) All Electric (Plug ins)

(4) Multi Fuel Vehicles

(5) Hydraulic Hybrids

The eight steps below should be followed in order to safely respond to hybrid vehicles.

- (1) Stop, look, and listen. A hybrid may have gone to sleep. In this mode, you would not hear an engine running. For this reason, NEVER approach an accident vehicle from the front or rear—only from the side.
- (2) If you smell battery acid or propane gas, do not approach the vehicle without self contained breathing apparatus (SCBA).
- (3) Chock the wheels.
- (4) Identify the vehicle.
- (5) Shift it out of gear or place it in park.
- (6) Turn off and remove the key (smart keys should be at least 25 feet away from vehicle)
- (7) Be sure the ready light or auto stop light is off.
- (8) Set the park brake.
- (9) Disconnect—do not cut—the 12 volt battery. Avoid working in the front or rear of the vehicle as much as possible.
- (10) Never cut or touch the orange, blue, or yellow wires or connectors.

### 8.3 TRAFFIC CRASHES

Each agency responding to a traffic crash has its own roles and responsibilities. Depending on the severity of the crash, more resources may be deployed to the scene. The guidelines below are generalized and can be considered for use by any responder.

You may be the first to arrive at a vehicle crash. Your ability to quickly analyze the situation and take appropriate action to stabilize the scene and clear the incident is an important part of your job.

- (1) If fire rescue and EMS have not yet arrived, park your vehicle in the blocked lane. If no lanes are blocked, park on the shoulder. After EMS arrives consider using a large vehicle to provide a wider safety buffer for the emergency personnel.
- (2) Notify dispatch of:
  - (a) Your exact location.
  - (b) The lanes that are blocked.

- (c) The number of vehicles and general vehicle description.
  - (d) The license tag number(s) of at least one of the involved vehicles.
- (3) Approach each driver and determine if s/he can drive the vehicle to the shoulder.
  - (4) Call dispatch to request law enforcement and EMS if you see any apparent injuries, or if a driver or passenger indicates that s/he is injured. Provide dispatch with as much information as possible on the number and types of injuries.
  - (5) If the incident appears to be minor, ask each driver, "Do you want me to call EMS to transport you for treatment?" If no ambulance is needed, advise the driver that you will safely help move the vehicle off the road.
  - (6) Note: If this is an injury crash, law enforcement will need to complete an investigation. To aid the investigation, do not move any wrecked cars or debris until permitted.
  - (7) If the motorist is cooperative but doesn't feel comfortable driving the car, offer to drive it off the road.
  - (8) Relocate the wrecked car with your vehicle if it is not drivable.
  - (9) The ideal location to relocate the vehicles to is off the roadway completely. If possible, utilize an AIS (accident investigation site) or a location near the exit ramp on a cross street or a frontage road.
  - (10) If the crash cannot be relocated, start setting up emergency TTC and facilitate the flow of traffic past the crash scene.
  - (11) Do not leave a lane-blocking incident unprotected.
  - (12) To reduce the duration of the incident and limit rubbernecking, leave the crash scene and park off the roadway system to write your final report. Turn off emergency lighting and look for a safe area to park such as a fast food parking lot to complete the report.
  - (13) Clean up all debris and mitigate fluid spills before opening a lane. However, do not move any debris until the investigating traffic officer gives approval.

### *8.3.1 Working with Other Responders*

Responders at a traffic incident make up a team and depend on each other for assistance. You are a professional whose skills include making a scene safe and quickly establishing traffic control. Everyone on the responding team should focus on safely clearing the scene and opening the travel lanes as soon as possible.

Because you will be working with other responders assigned to your area, you should have the opportunity to form a close professional partnership. This partnership will ensure the effective and safe management of traffic incidents on your roadways.



The following are general suggested guidelines for effective teamwork:

- (1) Check in with the Incident Commander and begin to set up your TTC. Position your vehicle to help move traffic safely past the scene.
- (2) Ask other responders to position their vehicles within the coned off activity area.
- (3) Adjust the cones to protect all of the emergency vehicles. Fire and EMS may want to keep one additional lane closed (Lane Plus One) as a buffer between moving traffic and their personnel.
- (4) Talk to the Incident Commander about moving or repositioning some of the response vehicles to improve traffic flow once the injured have been treated. Be persuasive but not confrontational. In some cases, after a few minutes you may again suggest that response vehicles be repositioned to facilitate traffic flow.
- (5) Be sensitive to law enforcement's job of investigating serious crashes, especially if there is potential for a fatality. Protect and preserve the scene as best you can to allow a complete investigation. If you are first on the scene, pay close attention to details, including who the drivers are. Try not to park on skid marks or other potential evidence.
- (6) Allow law enforcement enough time to document the scene and begin the crash report. Offer your assistance and begin to sweep up debris and absorb spilled vehicle fluids, as permitted.
- (7) Ask for authorization to reduce the number of blocked lanes and begin moving the vehicles from the travel lanes. (Vehicles from serious crashes with multiple injured or incidents with possible fatalities will need to remain in place until the crash investigation is sufficiently complete.)
- (8) Work with tow operators to expedite the clearance of the vehicles, fluids, and crash debris. Tow operators are part of the response team. If a wrecker is not yet on scene, suggest to law enforcement that you will move the wreckage off the travel lanes.
- (9) Always look for opportunities to expedite the clearance of the wrecked vehicles from the travel lanes.

### *8.3.2 Relocating Crash Vehicles Prior to Wrecker Arrival*

In many cases, the towing company may not arrive on-scene immediately. You can assist by relocating the vehicle(s) from the travel lanes for towing later.

Be aggressive in relocating wrecked vehicles from travel lanes to the extent permitted by your agency guidelines. Confer with the Incident Commander and begin to move the wrecked vehicles once injured persons are extricated and investigation is complete, using these guidelines:

- (1) Relocate wrecked vehicles well off the travel lanes to the right side (in most cases). Place the vehicle in a position that gives the wrecker easy access.
- (2) Consider relocating the vehicle to an exit ramp or a safe area out of sight of traffic.
- (3) Drive the wrecked car off the road if it can be started.
- (4) Relocate crash vehicles with your push bumper. Get assistance with traffic and push the wreckage from the road unless it is not safe to do so.
- (5) Consider using a tow strap as an alternate method to relocate wrecked cars from travel lanes. This method works well if there is front end damage where locked wheels may prevent pushing.
- (6) Look for and document any prior damage before relocating the vehicle.

### *8.3.3 Vehicle Fires*

Smoke from vehicle fires can cause visibility issues that affect responders and passing motorists. It may be prudent to close traffic lanes adjacent to the fire; however, it is generally a good idea to maintain some traffic flow at the scene to facilitate the arrival of fire apparatus. In some cases on arterial roadways, smoke may require closing both directions of traffic for a short period of time. Upon arrival at a vehicle fire:

- (1) Notify dispatch and provide location and a vehicle description. If it is a commercial truck, look for and report any indication of hazardous materials, and look for placards and HAZMAT ID numbers.
- (2) Assist the vehicle occupants and escort them to a safe area away from the fire.
- (3) Secure the scene. Provide traffic control and, if possible, keep traffic flowing to expedite the arrival and parking of fire crews.
- (4) Attempt to extinguish only small fires if safe to do so.
- (5) Do not approach a completely involved vehicle. There is risk of a tire, bumper support, or the fuel tank exploding.
- (6) Set up cones and other available temporary traffic controls.

### *8.3.4 Truck Crashes*

Major truck crashes can have serious impacts on highway traffic. You can assist in many ways to manage the scene and remove the wreckage and spilled loads from the roadway both quickly and safely.

Your initial role is to set up emergency temporary traffic controls, just as in other incidents. Your devices are short term and will need to be upgraded to comply with the MUTCD as more resources become available.

During a truck crash, all responders should strive to safely reduce the size of the scene and the number of lanes closed. This goal can be accomplished by the following:

- (1) Take quick action to contain or absorb any spilled vehicle fluids.
- (2) Relocate spilled non-hazardous cargo to open an additional lane. In some cases an additional lane can be opened by moving spilled cargo by hand.
- (3) Assist other responders to expedite reopening travel lanes. This assistance may include working with heavy-duty tow operators.
- (4) Modify and upgrade the TTC devices to match the changing scene conditions.
- (5) Stay alert to traffic and maintain a sense of urgency at the scene.
- (6) Communicate frequently with dispatch with status reports from the scene.
- (7) Discuss and coordinate the transfer of the traffic controls with the Incident Commander, other responding personnel, and dispatch.
- (8) An on scene responder should be assigned to facilitate traffic movement past the activity area to reduce rubbernecking. This traffic control does not have to be from law enforcement.

#### 8.4 VEHICLE FLUID SPILL MITIGATION

Incidents occur in which vehicle fluids such as engine oil, radiator fluid, hydraulic fluid, brake fluid, and diesel fuel from a ruptured fuel tank spill into the roadway. The most frequent fluid at a commercial vehicle crash is diesel fuel. Prompt actions by an initial responder to contain or reduce the size of the spill will greatly reduce the impact and duration of the incident. It is important to identify that the spilled fluid is not from a cargo tank. The following actions apply only to non-cargo spilled vehicle fluids.

- (1) NO ACTIONS BY RESPONDERS TO CONTAIN OR MITIGATE A VEHICLE FLUID SPILL SHIFTS LIABILITY FROM THE RESPONSIBLE PARTY.
- (2) Identify the spill as a vehicle fluid, not cargo.
- (3) Begin containing the vehicle fluid spill to keep it from spreading.
- (4) Request assistance for large diesel fuel spills like saddle tank ruptures.
- (5) Contain and limit the spill from spreading. Build a dike. Apply any available absorbents—even dirt from the roadside.
- (6) Use available materials to try to reduce leaking vehicle fluids at the source.
- (7) Seek assistance from the fire rescue personnel at the scene if you do not feel safe working with the fluids.

- (8) Advise dispatch of the estimated number of gallons spilled. Dispatch will make proper notifications.
- (9) For large spills beyond the on-scene resources, incident command should discuss the need for and request a maintenance crew or clean-up contractor.

## 8.5 INCIDENTS INVOLVING HAZARDOUS MATERIALS

Commercial vehicle incidents are among the most challenging and dangerous tasks responders must manage. An incident involving hazardous material cargo is even more perilous.

While you should mitigate spills of vehicle fluids such as diesel fuel, you must address actual hazardous material cargo spills differently and with extreme caution.

Familiarize yourself with the color and appearance of the material identification placards in the US DOT Emergency Response Guidebook.

At the scene of a truck crash where there is a spill or leak of an unidentified cargo, especially a placarded load, use the following guidance:

- (1) Notify dispatch immediately.
- (2) Approach the incident cautiously; do not rush in.
- (3) Approach the incident from upwind.
- (4) Stay clear of all spills, vapors, fumes, smoke, and any cargo that is the source of these potential hazards.
- (5) Identify the cargo ID number indicated on the placards from a safe distance and update dispatch with the information.
- (6) Check the driver and assist only if it is safe to approach.

## 8.6 REMOVING DEBRIS NOT RESULTING FROM A TRAFFIC CRASH

Random or unexpected debris of any kind on a highway is a major concern and presents a real threat to motorists. Accidents frequently occur when drivers either stop suddenly or make abrupt lane changes to avoid striking debris. Debris is often kicked up by trucks, wind, or even mowers, and it can become a deadly projectile.

Removing debris from the travel lanes is a dangerous activity and requires appropriate caution. While there is no single safe way to remove debris from travel lanes, consider traffic volume, prevailing speed, sight distance, and time of day when determining how to remove the debris.

Debris on the shoulder has the potential to become a safety concern if a driver pulls off the roadway. Such debris can damage the driver's vehicle, or it could be thrown back into moving traffic. When removing debris from the roadway, a responder should:

- (1) Notify dispatch of any debris. Provide the exact location, which lane(s) are affected, a general description, and whether you can remove the debris unassisted or if backup will be required.
- (2) Pull well off the roadway and correctly position your vehicle.
- (3) Use appropriate emergency lighting.
- (4) Keep personal safety a top priority—safety vest and gloves are a must.
- (5) Park upstream from the debris. This will keep debris that is struck by passing vehicles from being propelled into you or your vehicle.
- (6) Point at the debris to help drivers avoid striking it if you are waiting on the shoulder for traffic to clear.
- (7) Contact dispatch and request assistance if it is not possible to remove the debris safely. You may need to coordinate with police to create a rolling road block to approach the debris in some cases.
- (8) Attempt to remove debris completely from the roadway system. If it cannot be removed, place it well off the travel lanes and shoulder to be picked up at a later time. Consider using a cone to mark the location. Notify dispatch for follow-up.
- (9) After you report the debris, do not continue patrolling until you take action to remove it.
- (10) Turn in any valuable items you find to your supervisor. Disposition of the items will be handled through established agency procedures.
- (11) Use your PA system to notify the driver of a truck with the load spilling on the travel lanes. If the driver does not stop, contact dispatch and give the location, type of material being spilled, direction of travel, license number, and, if possible, the company name and any other pertinent information. Remember only law enforcement has the authority to make the truck pull over. Do not become involved in a pursuit.
- (12) Stop and consider clean-up procedures if a spilled load is a hazard to traffic. Request assistance through dispatch if the location is unsafe or the amount of debris too great.

## 8.7 ROAD CLOSURES AND DETOURS

Major incidents with all travel lanes blocked for an extended period will likely require an emergency alternate route detour around the incident scene.

Emergency alternate route detours are generally pre-planned along the best available route. Large trucks are a concern on detours because of both their size and weight.

If no pre-established detour exists, work with the Incident Commander and other responders to close the roadway at an exit near the incident that provides a viable alternate route.

Implementing emergency alternate routes requires substantial additional resources. This includes local law enforcement and public works personnel, who can direct traffic and/or optimize traffic signals on the detour route. Agencies may use temporary detour signing and portable CMS to help motorists navigate back.

The alternate route should be monitored or patrolled for congestion levels, breakdowns, or problems with commercial vehicles making turns.

## 8.9 DAMAGE TO STATE HIGHWAYS

SCDOT should be notified IMMEDIATELY for any of the following:

### *8.9.1 Bridges*

Abutments, columns, decks, railings, etc.

#### (1) Concrete

- (a) Any significant fire damage.
- (b) Any hit that creates or is suspected of chipping or cracking the concrete.

#### (2) Metal (Identify type of rail: Guard rail or bridge rail)

- (a) Any missing rail.
- (b) Any significant fire damage.
- (c) Any protruding or bent rail that could be hazard to the public

### *8.9.2 Guardrail*

Any damage to the rail or posts.

### *8.9.3 Jersey Wall or K-Rail*

#### (1) Jersey wall - Any permanent concrete wall used as a traffic divider .

- (a) Any significant cracking or chipping.

#### (2) K-rail - Any temporary or portable concrete wall used as a traffic divider.

- (a) Any significant cracking or chipping.
- (b) When the rail has been moved enough to have an impact on traffic.

#### *8.9.4 Electrical Lines or Power Poles*

All electrical and traffic signal problems should be reported. Unknown electrical hazards may be present and must be made safe by qualified electrical personnel to assure the safety of the public

#### *8.9.5 Fences*

- (1) Barbed wire or wire mesh
  - (a) Anytime there is live stock in the area.
  - (b) Any time the posts are bent towards traffic or create other hazards.
- (2) Chain link.
  - (a) Anytime there is live stock in the area.
  - (b) Any school area.
  - (c) Any residential or heavy pedestrian area.
  - (d) Any time the posts are bent towards traffic or create other hazards.
  - (e) Any time it will compromise the security of an adjacent business.

#### *8.9.6 Large Debris*

Any time that the debris could have either a physical or visual impact on traffic. This could be either on the travel way or on the improved or non-improved shoulder. This includes “dead animals”

#### *8.9.7 Hazards in the Roadway*

This would be the same as Large Debris but includes things like large potholes, slippery substances, any fuel, oil or chemical spill, etc.

#### *8.9.8 Sand Barrels and Other Attenuators*

Any sand barrel or other energy attenuator hits.

#### *8.9.9 Damaged or Missing Signs*

Regulatory signs include signs regulating the movement, access, speed, stopping, or parking of vehicles. Regulatory signs are generally black and white or red and white.

The following signs should be immediately replaced if missing or damaged:

- (1) “STOP”
- (2) “YIELD”

- (3) "WRONG WAY"
- (4) "DO NOT ENTER"
- (5) All other regulatory signs that could adversely affect the travelling public if not replaced.

Due to local traffic conditions other highway signs, which are critical to traffic safety, may need to be replaced as soon as possible. SChP Officers reporting damaged highway signs should describe the sign and location in as much detail as possible. The following information will help TMC/Dispatch personnel evaluate and respond to the situation.

- (1) State Route Name or Number and nearest cross road.
- (2) Mile Post Marker if known.
- (3) Type of sign by name ("STOP", "ONE WAY", etc.) or by description, "a right curve arrow, black on yellow".
- (4) Type and number of posts supporting the sign, (i.e. "a STOP sign is supported by one 4X4 post")
- (5) Brief description of damage to the sign. (i.e. "the sign is okay, but the post is broken.")
- (6) If the sign is "black on white" or "red on white" regulatory sign, are there other signs or pavement markings to direct traffic until the damaged sign can be replaced.

Any sign that is a hazard to the traveling public or pedestrians, or any regulatory sign that is damaged, knocked down or in the SChP Officer's opinion, in need of attention, should be reported to the TMC as soon as possible. The TMC will notify the appropriate maintenance personnel and they will determine its priority to be replaced. SCDOT will inform the appropriate SChP communications center that action will be taken, including ETA, when possible.

#### 8.10 ADVERSE WEATHER CONDITIONS

The SChP should notify the TMC immediately upon identification of adverse weather conditions as described below. When the SChP requests VMS usage, SCDOT will decide on the appropriate VMS message. If a conflict occurs, the SCDOT Field Supervisor will meet on site with SChP to resolve the issue.

When requesting VMS activation for adverse weather conditions, the SChP officer should give specific locations affected by the adverse weather conditions (i.e. "Visibility is less than 500 feet on SRx between count a and county b" or "please turn on the VMS with the following message "xxxxx xxxxx").

The SChP officer who requests VMS for adverse weather conditions is responsible for informing the TMC when the VMS can be turned off. If the adverse weather requiring the VMS continues past the end of the requesting officer's shift, the oncoming shift and the communications center should be notified of the need to monitor conditions and inform the TMC when the VMS can be blanked.



If the requesting officer is out of position due to an emergency and cannot monitor the weather in the area covered by the activated VMS, the officer should inform the TMC through the appropriate communications center. The TMC will attempt to verify weather conditions through alternate sources.

Guidelines for the VMS messages used for adverse weather conditions are as follows:

#### *8.10.1 Limited Visibility*

Fog and dust: Established criteria for “FOG” or “DUST” messages apply. Appropriate VMS Fog messages are activated when the SChP or other reliable sources report visibility of less than 500 ft., or when “Pacing”, is required by the SChP due to conditions of poor visibility.

#### *8.10.2 High Winds*

Wind: VMS will be activated at the request of the SChP patrol units or other reliable sources. Sustained wind velocities of less than 20 MPH generally would NOT require VMS activation unless the SChP officer believes that the traffic safety requires a cautionary sign.

#### *8.10.3 Heavy Rain*

Heavy rain: If the SChP officer believes that heavy rain has reduced visibility or caused flooding and the use of a VMS would help prevent accidents the TMC will activate the VMS with the approved message. Flooding can vary depending on the area but is generally considered to mean standing or flowing water on the roadway, which presents a significant hazard to motorists

#### *8.10.4 Snow*

Snow: If the SChP officer believes that snow will be falling and temperatures at that location will result in the snow sticking to the roadway, the officer should immediately advise the TMC. The following conditions should be communicated to the TMC so that the travelling public can be notified:

- (1) Snow is imminent and the temperature is cold enough that it is anticipated snow will stick to the roadway (no traffic control - advisory to public of possible delays).
- (2) Snow is falling and may or not be sticking to the roadway (no traffic control - advisory to public of possible delays)
- (3) Snow is falling and sticking to the highway. SChP is pacing or escorting convoys (advisory to public of delays ahead).
- (4) Snow has created unsafe conditions. SChP has closed freeway (advisory to public of delays and detours if available).

### 8.11 CORONER CONSIDERATIONS

If the coroner's response is going to be delayed, there are certain steps that need to be taken before the vehicle/victim can be re-located off the travelled way. In some cases, it may not be possible to re-locate the vehicle/victim. In each case, the local coroner should be contacted prior to moving any possible evidence.

SCHP and the local Coroner's Office should both be consulted prior to any movement or clean-up conducted after a traffic fatality.

#### *8.11.1 Coroner Investigation/Response*

- (1) The Coroner is responsible for determining the cause and manner of death. They are also responsible for positively identifying the deceased, preserving property and notifying next of kin. Moving the wreck and/or the deceased can greatly inhibit their ability to conduct an independent investigation into the traffic fatality.
- (2) SCHP should notify the local Coroner's Office of any traffic fatality as soon as possible so there will not be further delay in response by a Coroner Investigator

#### *8.11.2 Criminal vs. Non-Criminal Conduct*

- (1) If the fatality was or could have been caused by a criminal act, such as a DUI, road rage or shooting, no items should be moved from the roadway without express authorization from CHP and the local Coroner's office.
- (2) SCHP can call the local Coroner's office to brief them on the scene and request authorization to move a body and/or vehicle prior to the Coroner's arrival.
- (3) If authorization to move the body and/or vehicle is granted, the Coroner can provide specific instructions on how to document the scene prior to disturbing it. It is important to thoroughly photograph the scene and mark the original position of the wreckage and/or body (pedestrian or ejected from vehicle) prior to moving anything.

#### *8.11.3 Loss of Evidence or Property*

- (1) Vehicles should never be moved further than the nearest/safest shoulder or off ramp (minimal distance at a slow speed) in order to ensure preservation of evidence.
- (2) Any items that break loose from the vehicle should be documented, collected and preserved for the Coroner. The smallest item may assist in the identification of the decedent or their next of kin. It may also assist in determining cause and/or manner of death.
- (3) If there is a belief that any evidence or property will be lost, nothing should be moved.
- (4) If the environment (road conditions, weather, onlookers) are causing possible destruction or loss of evidence, an effort should be made to document and preserve the evidence. SCHP can coordinate this effort when the Coroner is not on scene.

#### *8.11.4 Disruption of the Body*

- (1) Unless life-saving measures require extraction, it is extremely important for the Coroner to see the body and vehicle as they came to rest.
- (2) If a vehicle is moved prior to the arrival of the Coroner, the decedent should be left in place within the vehicle, undisturbed.
- (3) If movement of the vehicle disrupts the position of the body, this should be documented and the information should be presented to the Coroner.

DRAFT