



Death in the line of duty...

NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

A summary of a NIOSH fire fighter fatality investigation

February 28, 2011

Volunteer Fire Police Captain Dies After Being Struck by a Motor Vehicle at a Controlled Roadway - Pennsylvania

Executive Summary

On February 12, 2010, a 62-year-old male volunteer fire police captain (the victim) was fatally injured when he was struck by a motor vehicle while positioned at a controlled intersection. The victim was dispatched to the scene of a motor vehicle incident to control traffic. He had placed 5 warning devices (lime green traffic cones) across the two-lane roadway and lighted a flare adjacent to the traffic cones. A short time later, as he was standing near the middle of the blocked-off roadway with his back to oncoming traffic, a motor vehicle ran through and over the cones striking him. After initial first aid was administered by two volunteer fire fighters, the victim was transported to the local hospital by ambulance where he was pronounced dead about 2 ½ hours later.



**Incident scene. Approaching from the west.
(NIOSH Photo)**

Contributing Factors

- *no advance warning to motorists of the blocked-off roadway*
- *the inconspicuousness of the victim*
- *the victim had his back to oncoming traffic.*

Key Recommendations

- *ensure that the placement of warning devices (portable signs, traffic cones, flares and portable changeable message signs) informs drivers of what to expect when approaching an incident scene*
 - *ensure that personnel controlling traffic wear high visibility apparel and helmets*
 - *ensure that standard operating guidelines include guidance on identifying and maintaining a safe location while working in or near moving traffic*
 - *ensure that a personnel accountability system is in place and adhered to during emergency operations*
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- *utilize state and local departments of transportation for additional resources*
- *consider participating in the establishment of local traffic incident management committees.*

Additionally, incident management agencies (e.g. departments of transportation) should

- *consider disseminating traffic control and road condition information to motorists utilizing local commercial and public radio and television broadcasts.*

Fire service representatives and interested parties should

- *participate in the development of new safety standards to reduce the risk to emergency personnel providing traffic control at emergency incidents.*

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH "Fire Fighter Fatality Investigation and Prevention Program" which examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency's reports do not name the victim, the fire department or those interviewed. The NIOSH report's summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency's recommendations and is not intended to be definitive for purposes of determining any claim or benefit.

For further information, visit the program Web site at www.cdc.gov/niosh/fire or call toll free 1-800-CDC-INFO (1-800-232-4636).



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Introduction

On February 12, 2010, a 62-year-old male volunteer fire police captain (the victim) was fatally injured when he was struck by a motor vehicle while positioned at a controlled roadway. On February 14, 2010, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of the fatality. On March 11-12, 2010, a safety consultant under contract with NIOSH traveled to the fire department and interviewed the chief of the fire department. Subsequent telephone conversations were held with the witnesses to the incident and the state police investigator. The victim's training records, photographs of the incident scene, state police investigative report, certificate of death, and the fire department's standard operating guidelines (SOGs) were reviewed. The incident site was examined and photographed by the investigator.

Fire Department

The volunteer fire department has one station with 38 active volunteer fire fighters serving a population of approximately 6,500 residents in a geographic area of around 16 square miles.

The fire department was incorporated in 1959 and had written standard operating guidelines (SOGs) which had been adopted by the department in 2001. The purpose of the SOGs for fire police officers is to establish guidelines to enhance the safety of emergency service personnel responding to incidents. The fire department's SOG number I, Dress, dictates that emergency response when directing traffic on emergency or non-emergency duties include hat, vest, traffic control device (baton or flag), and badge which must adhere to Pennsylvania safety regulations, which require the use of high visibility apparel and helmets that meet the requirements of ANSI/ISEA 107 Standard for High Visibility Apparel and Headwear.¹ The departments SOGs did not address safe positioning of responders while directing traffic.

Personal Protective Equipment

At the time of the incident, the victim was wearing his own personal clothing which consisted of: a high visibility tassel hat, work gloves, work shoes, and coveralls with some reflective (high visibility) areas. This clothing was not compliant with the department's SOGs and did not conform to the requirements of ANSI-ISEA 107 Standard for High Visibility Safety Apparel and Headwear.¹ The victim was equipped with a radio.

Training and Experience

The fire police captain (the victim) had approximately 44 years of fire fighting experience; however, he had less than one year experience as a fire police captain with the department. He had completed the following training: Basic Fire Police; Basic Fire Police Refresher; Highway Incident Scene Safety and Traffic Control; First Responder Awareness; and Advanced Fire Police.

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Timeline

The timeline for this incident includes approximate times obtained from the Pennsylvania State Police Crash Report.

- **1228 Hours**
A telephone call came into the 911 emergency services center requesting emergency assistance for a motor vehicle incident.
- **1240 Hours**
A request for fire police was received and was dispatched seconds later.
- **1250 Hours**
The Fire Police Captain (the victim) arrived on scene.
- **1333 Hours**
The victim was struck by a motor vehicle.
- **1610 Hours**
The victim was pronounced dead at the local hospital.

Weather/Road Conditions

At the time of the incident, the weather was partly cloudy with a visibility of about 10 miles. The temperature was approximately 35 degrees Fahrenheit and the winds were from the north north/west at 7 miles per hour (mph). The section of roadway where the incident occurred was dry, approximately 22-foot wide, gradient level, road alignment curved, was covered with asphalt and posted with a 45 mph speed limit.

Investigation

On February 12, 2010, two motor vehicles travelling in opposite directions on a section of state roadway collided causing serious injuries to the drivers. The incident also resulted in a utility pole being sheared off and electrical power lines being knocked down. At 1228 hours, a telephone call came into the 911 emergency services center requesting emergency assistance. The 911 center dispatched the local volunteer fire department apparatus and an ambulance. A request for fire police was received at 1240 hours and was dispatched seconds later.

The volunteer fire police captain (the victim) arrived on scene at 1250 hours. While travelling to the scene, he received instructions from the 911 communications center to close off the road at the “Y” intersection west of the motor vehicle incident. The victim proceeded about 400 feet west of the motor vehicle incident to the “Y” intersection where he closed both lanes (east/west) of the state roadway. The road traffic was to be detoured at the “Y” intersection to an adjacent township roadway around the motor vehicle incident (see photo 1). The victim parked his vehicle on the side of the road at the juncture of the two roadways at the “Y” intersection, and activated the red mini-light bar atop his vehicle. The victim, dressed in coveralls with some reflective areas and carrying a flashlight/traffic wand, placed five 18-inch florescent lime green warning devices (traffic cones) across both lanes of the

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state highway. He also lighted a phosphorous road flare and placed it on the ground adjacent to the traffic cones (see Diagram and Photo 1).

The victim was standing on or near the double yellow lines in the roadway with his back to oncoming traffic from the west, while electric crews were replacing the utility pole. At about 1333 hours, a motor vehicle travelling in the east bound lane approached the coned area and drove through the coned area and struck the victim. Upon impact, the victim was thrown onto the hood of the car, carried on the front of the vehicle and then thrown to the ground in front of the vehicle when it came to a stop.

The Pennsylvania State Police were notified and dispatched at 1337 hours, and arrived shortly thereafter. A State Police Officer found the victim lying face down on the roadway with two local fire department personnel administering first aid to the victim. The State Police Officer then requested medical personnel to the scene. Medical personnel arrived on scene and transported the victim to the local hospital where he was pronounced dead at 1610 hours. The driver of the vehicle that struck the victim was a 72-year-old male. He reported to law enforcement that he did not see the victim, and was later cited for careless driving. The driver's blood alcohol level was checked and resulted in a 0.00 reading. There was no evidence of drug use or use of a cellular telephone at the time of the incident.

Contributing Factors

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that ultimately led to the fatalities:

- no advance warning to motorists of the blocked-off roadway
- the inconspicuousness of the victim
- the victim had his back to oncoming traffic.

Cause of Death

The Certificate of Death listed the cause of death as blunt force trauma.

Recommendations

Recommendation #1: Fire departments should ensure that the placement of warning devices (portable signs, traffic cones, flares and/or portable changeable message signs) informs drivers of what to expect when approaching an incident scene.

Discussion: Part 6 of the November 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) includes Chapter 6I - Control of traffic through traffic incident management areas.² Chapter 6I defines a traffic incident management area as “an area of highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of Temporary Traffic Control (TTC) zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles

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return to the original lane alignment and are clear of the incident.” Also, according to the MUTCD, traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

- A. Major—expected duration of more than 2 hours,
- B. Intermediate—expected duration of 30 minutes to 2 hours, and
- C. Minor—expected duration under 30 minutes.

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 for a period exceeding 2 hours. The duration of this incident exceeded 3 hours due to the two vehicle collision, serious injuries and downed power lines.

MUTCD guidance for major traffic incidents states that all traffic control devices needed to set up the TTC should be available so that they can be readily deployed for all major traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert traffic approaching the queue and to encourage early diversion to an appropriate alternative route. Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the back of the queue. If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.²

Warning devices are a means by which emergency personnel can convey information to motorists approaching an incident scene, referred to as the “advance warning area.” The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the incident scene. National Fire Protection Association (NFPA) 1500, Standard on Fire Department Occupational Safety and Health Programs, section 8.7.5 recommends that one or more of the following warning devices be used to warn oncoming traffic of the emergency operations and the hazards to members operating at the incident: (1) Fluorescent and retro-reflective warning devices such as traffic cones, (2) Federal Highway Administration (FHWA)-approved 48 in. by 48 in. retro-reflective signs stating “Emergency Scene Ahead” (with directional arrow overlay), (3) Illuminated warning devices such as highway flares, and (4) Other appropriate warning devices appropriate to warn oncoming traffic of the emergency operations.³ Additionally, cones should be predominantly orange and should be made of a material that can be struck without causing damage to the impacting vehicle. For day time and low-speed roadways, cones should be not less than 450 mm (18-inches) in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 700 mm (28-inches) in height.² NFPA 1500, Section 8.7.6 states that warning devices should be placed and utilized with proper considerations given to visual obstruction such as hills, curves, blind spots, or unusual localized weather conditions such as fog or rain.³

Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in feet should be substantially longer than for lower speed roadways—from 8 to 12 times the speed limit in mph. Since two or more advance warning signs are normally used for these conditions, the advance warning area should extend 1,500 feet or more for open highway conditions.

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Weather conditions, curves and hills that limit visibility of the incident scene require that the advance warning devices be placed at an even greater distance.

Portable signs can be transported on an emergency vehicle to the incident scene where they can be placed in a location that allows maximum visibility to oncoming traffic. The MUTCD states “where special emphasis is needed, signs may be placed on both the left and right sides of the roadway. Signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades.”²

Portable changeable message signs can be used as temporary traffic control devices. The flexibility to display various messages allows the signs to be used in a wide variety of applications (e.g., at a crash or for emergency incident management). The primary purpose of portable changeable message signs is to advise the road user of unexpected situations. Some typical applications may include: where the speed of vehicular traffic is expected to drop substantially; where crash or incident management is needed; or where changes in road user pattern occur.²

The roadway on which the incident occurred had a 45 mph posted speed limit. The road curved to the left and was at the juncture of a Y intersection. The victim had placed a flare and 5 18-inch lime green traffic cones across the roadway at the juncture of the Y intersection approximately 400-feet west of the initial motor vehicle incident. Also, the victim’s personal vehicle was parked nearby with a red mini-light bar activated. No other traffic control devices such as signs (e.g. Be Prepared to Stop or Detour signs) were used in advance of the controlled roadway. At about 1333 hours, the victim was standing behind the lime green traffic cones on or near the double yellow lines on the roadway with his back to oncoming traffic. The victim was struck by a motor vehicle and died several hours later. The driver of the vehicle that struck the victim reported to law enforcement that he did not see the victim.

Recommendation #2: Fire departments should ensure that personnel controlling traffic wear high visibility apparel and helmets.

Discussion: The need to wear personal protective equipment such as a retro-reflective, brightly colored vest arises from the fact that personnel need to be highly visible while directing or blocking traffic near an incident scene. Fire department personnel (e.g. fire police) should wear the clothing that is referenced in the fire departments SOG’s and if relevant, required by state laws. In Pennsylvania where this incident occurred, there is a requirement that “All workers including flaggers shall wear a helmet and high visibility fluorescent orange or yellow-green apparel with retro-reflective material that meets ANSI 107-2004 Class 2 risk exposure anytime day or night. Class 3 high-visibility apparel should be considered for additional flagger visibility at night.”^{4,5} During inclement weather, high-visibility fluorescent rain gear may be used. Additionally, the fire department should provide each member with the appropriate protective clothing and protective equipment to provide protection from the hazards to which the member is or is likely to be exposed. Such protective clothing and protective equipment shall be suitable for the tasks that the member is expected to perform.³ In this incident, the victim was wearing his own personal clothing which consisted of a high visibility tassel hat, work gloves, work shoes, and coveralls with some reflective (high visibility) areas. The clothing worn by the victim did not meet his department’s SOGs or state requirements listed above.

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Recommendation #3: Fire departments should ensure that standard operating guidelines include guidance on identifying and maintaining a safe location while working in or near moving traffic.

Discussion: This line-of-duty death provides a reminder that emergency responders can never depend on lights, signs, flares or cones to protect them when they are working near moving traffic. Fire departments need to ensure that multiple prevention strategies are in place and emergency responders must maintain an awareness to what is going on around them at all times. NFPA 1500, Section 8.7.1, 8.7.4, and 8.7.8 suggests fire departments should make every effort to protect members from conflict with motor vehicle traffic.³ Fire departments should train members on how to identify and pre-plan an escape strategy should they encounter a dangerous traffic situation such as a vehicle entering the emergency work zone.⁶ Additionally, in the absence of other traffic control devices such as a sign board, emergency response vehicles can be used to control traffic and provide a protected area for emergency response workers. A vehicle with emergency lights flashing provides additional warning. In this case, the victim had closed both lanes of the state roadway by using five 18-inch lime green traffic cones. At the time of the incident, the victim was not using his vehicle (equipped with a light bar) to block traffic, and for reasons unknown, he had positioned himself in the middle of the roadway behind the cones with his back toward oncoming traffic when a vehicle ran through and over the cones striking and killing the victim.

Recommendation #4: Fire departments should ensure that a personnel accountability system is in place and adhered to during emergency operations.

Discussion: As with any emergency operation by a fire department there must be a system of accountability in place to ensure the working environment is as safe as possible and that emergency personnel are routinely observed. In this case, there is no indication that the Incident Commander, or other on-scene responders were interacting with the victim nor did anyone recognize the dangerous position the victim had placed himself in. Traffic control personnel (e.g. fire police) should not be left unaccompanied for long periods of time without a system of accountability in place.³ NFPA 1500, Sections 8.3 *Risk Management During Emergency Operations*, Section 8.4 *Personnel Accountability During Emergency Operations*, and Section 8.5 *Members Operating at Emergency Incidents* highlight the importance of accountability and life and scene safety.

Recommendation #5: Fire departments should utilize state and local departments of transportation for additional resources.

Discussion: When roadways are closed for extended periods of time, fire departments should consider requesting additional resources and assets from state and local departments of transportation (DOT) and other agencies. DOT personnel can bring traffic control devices such as arrow boards, barricades, road closure signs and other assets to the scene. Properly equipped DOT personnel can relieve fire department personnel of traffic control, scene clean-up and other duties, allowing fire department personnel to focus on rescue, extrication, patient care and other fire service responsibilities.

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Recommendation #6: Fire departments should consider participating in the establishment of local traffic incident management committees.

Discussion: Local authorities including law enforcement, departments of transportation, fire departments, municipal leadership, businesses and other interested parties should work together to develop local traffic incident management plans that address the needs of the local community in the event of traffic disruptions. These traffic incident management plans should address a wide range of events that could affect normal roadway traffic such as traffic incidents, hazardous material spills, fires, natural disasters, inclement weather, parades, and other events. Pre-planning such events allows fire departments and other agencies and interested parties to identify needs, sources and locations of necessary assets and materials, and to develop mutual aid response agreements.

Recommendation #7: Incident management agencies (e.g., departments of transportation) should consider disseminating traffic control and road condition information to motorists utilizing local commercial and public radio and television broadcasts.

Discussion: Traffic reports on radio and television stations have been a traditional means by which motorists receive traffic information, including incident-related warnings. Radio and television stations receive the traffic information they use in their reports from a variety of sources that may include public transportation agencies or by simply monitoring emergency (police and fire) radio frequencies. Public agencies, radio, and television stations can communicate important incident-related information to motorists. This information may help motorists be more prepared for what's ahead and perhaps avoid the incident scene.

There are various means of disseminating incident-related information to affected motorists. Media used to disseminate motorist information include the following:

- Commercial radio broadcasts
- Highway advisory radio (HAR)
- Variable message signs (VMS)
- Telephone information systems
- In-vehicle or personal data assistant information or route guidance systems
- Commercial and public television traffic reports
- Internet/on-line services
- A variety of dissemination mechanisms provided by information service providers

Motorist information needs to be disseminated as soon as possible and should continue beyond the time it takes to clear an incident. It should be disseminated until traffic flow is returned to normal conditions. This may take hours if an incident occurs during a peak period, and has regional impacts.⁷

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Recommendation #8: Fire service representatives and interested parties should participate in the development of new safety standards to reduce the risk to emergency personnel providing traffic control at emergency incidents.

Discussion: The National Fire Protection Association (NFPA) Standards Council has authorized the formation of a Technical Committee on Traffic Control Incident Management. This technical committee has been assigned the responsibility of developing a professional qualification standard detailing the job performance requirements for personnel performing traffic control activities. Fire Service representatives and interested parties are encouraged to participate in this process.⁸

References

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Additional Information Sources on Safety While Working Along Roadways

- The Cumberland Valley Volunteer Firemen's Association created the Emergency Responder Safety Institute to serve as an informal advisory panel of public safety leaders committed to reducing deaths and injuries to America's Emergency Responders. Members of the Institute, all highly influential and expert in their fields, are personally dedicated to the safety of the men and women who respond to emergencies on or along our nation's streets, roads and highways. <http://www.respondersafety.com>. Date accessed: February 11, 2011.

Downloadable training programs are available at <http://www.respondersafety.com/Training/Downloads.aspx>. Date accessed: February 11, 2011.
- National Institute for Occupational Safety and Health; Hazard ID: Traffic Hazards to Fire Fighters While Working Along Roadways (2001) Publication 2001-143 - <http://www.cdc.gov/niosh/docs/2001-143/>. Date accessed: February 11, 2011.
- United States Fire Administration – Publication on Traffic Incident Management Systems – www.usfa.dhs.gov/downloads/pdf/publications/tims_0408.pdf. Date accessed: February 11, 2011.
- National Traffic Incident Management Coalition - Technical Briefs on Traffic Incident Management Topics <http://www.transportation.org/?siteid=41>. Date accessed: February 11, 2011.

Investigator Information

This incident was investigated and the report written by Richard Braddee, safety consultant under contract to the National Institute for Occupational Safety and Health, Division of Safety Research, Surveillance and Field Investigation Branch, Fire Fighter Fatality Investigation and Prevention Program. An expert technical review was provided by Mr. Steve Austin, Project Manager, Cumberland Valley Volunteer Firemen's Association, Emergency Responder Safety Institute. A technical review was also provided by the National Fire Protection Association, Public Fire Protection Division.

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Photo 1. View of the intersection where victim was standing when struck by a motor vehicle travelling in the eastbound lane of the roadway.

NIOSH Photo

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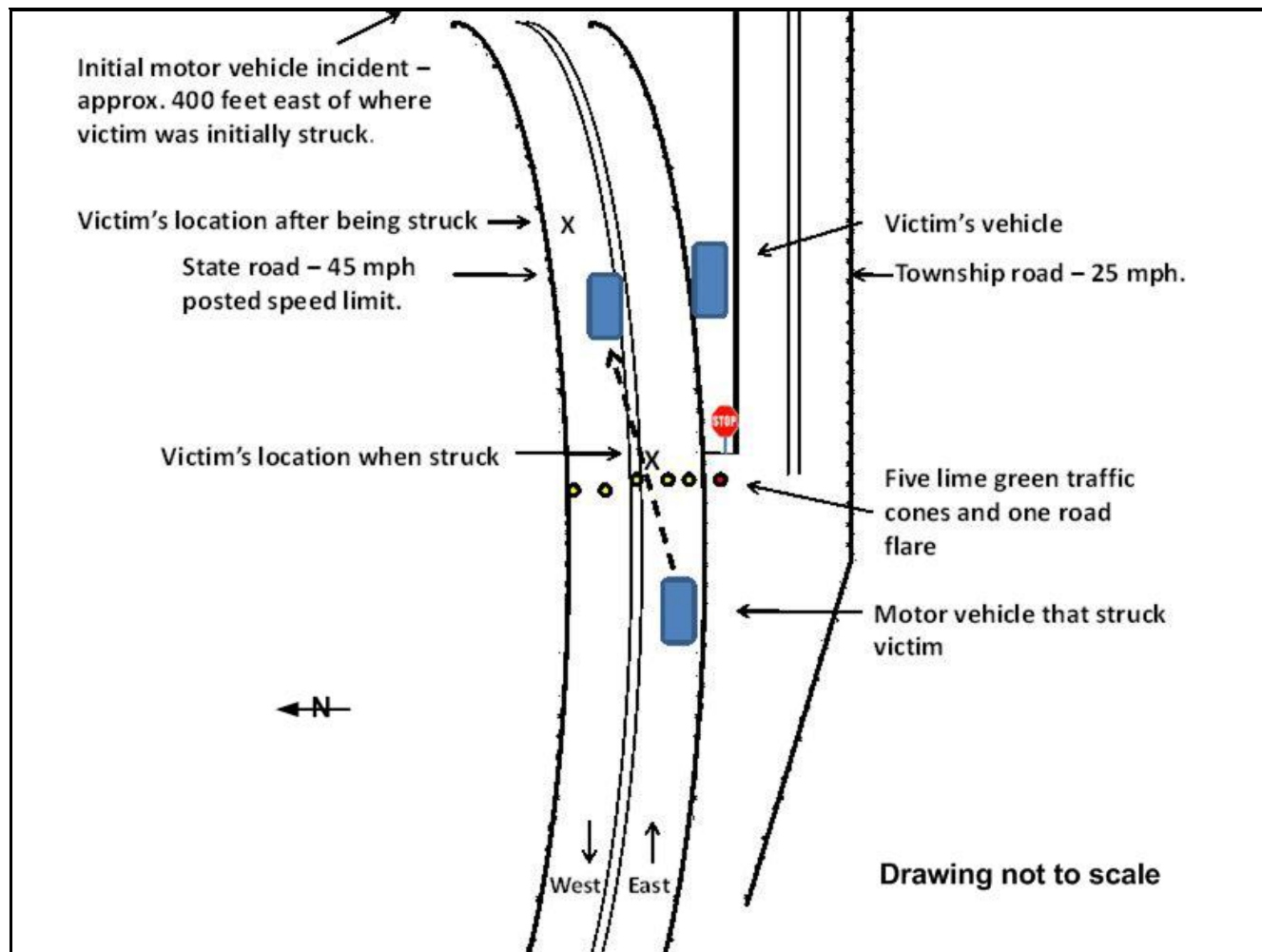


Diagram 1. Overview of the incident scene.

Adapted from sketch prepared by the Pennsylvania State Trooper Investigator.