National Transportation Safety Board

Washington, DC 20594

Highway Accident Brief

Accident Number:	HWY-04-MH-028
Accident Type:	Rear-end chain-reaction collision
Location:	Interstate Highway 30 west, near Sulphur Springs, Texas
Date and Time:	June 13, 2004, 8:39 p.m.
Vehicles:	1991 Kenworth tractor-auto transporter 2002 Hyundai Santa Fe sport utility vehicle 2000 Peterbilt tractor-semitrailer combination unit 2003 Lincoln Navigator sport utility vehicle 2000 Volvo tractor-semitrailer combination unit
Owners/Operators:	Waggoners Trucking Company (USDOT 30176) Southwest Motor Freight Pilot Logistics Private owners
Fatalities/Injuries:	5 fatalities 2 minor injuries

Accident Description

On June 13, 2004, about 8:39 p.m., a 1991 Kenworth tractor-auto transporter, traveling west on Interstate 30 (I-30), near Sulphur Springs, Texas (see figure 1), collided with a 2002 Hyundai Santa Fe sport utility vehicle (SUV) that was stopped in a 0.5-mile-long traffic queue in the right-hand lane at milepost 132.3. The force of the collision pushed the Hyundai forward, into and under the trailer of a 2000 Peterbilt tractor-semitrailer combination unit (see figure 2), which was in turn pushed forward into a 2003 Lincoln Navigator SUV. The Lincoln was subsequently pushed forward into the trailer of a 2000 Volvo tractor-semitrailer combination unit. A fire erupted, involving the Hyundai and the Peterbilt trailer. All four occupants of the Hyundai and the driver of the Kenworth truck were fatally injured. The two occupants of the Lincoln received minor injuries, and the occupants of the Peterbilt and Volvo trucks were not injured. At the time of the accident, the temperature was 80º Fahrenheit, the sky was clear with a visibility of 10 miles,[1] and winds were southeast at 5.8 mph.

[1] On June 13, 2004, sunset occurred at 8:32 p.m., and civil twilight ended at 9:01 p.m. According to the U.S. Naval Observatory, civil twilight is defined as beginning after sunset and ending when the center of the sun is geometrically 6º below the horizon. This period of time is the limit at which twilight illumination is sufficient, under good weather conditions, to clearly distinguish terrestrial objects.

The traffic queue had formed on I-30 west due to a single-vehicle crossover accident with multiple fatalities (see figure 1), which had occurred 1.5 hours earlier, at 7:09 p.m. This accident prompted the Texas Department of Public Safety (DPS) to close all eastbound and westbound lanes of I-30 and detour traffic to parallel service roads.

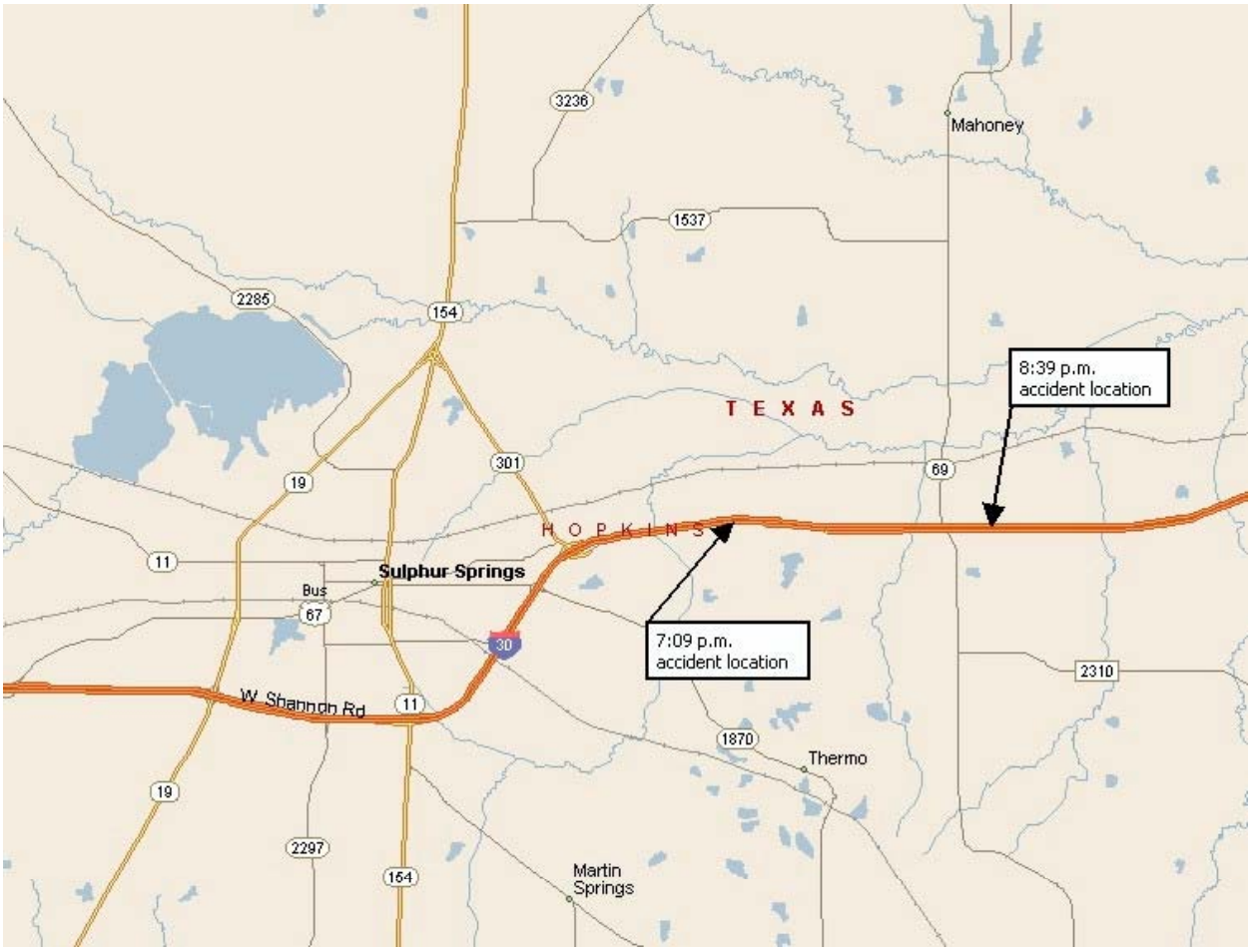

Figure 1. Locations of Sulphur Springs accidents.

Figure 2. Hyundai lodged under Peterbilt tractor-semitrailer combination unit.

Tire marks from the 8:39 p.m. accident scene indicated that the Kenworth driver began braking approximately 190 feet before colliding with the Hyundai. Taking into account the tire marks and accident sequence, investigators estimated that the speed of the Kenworth truck was 62–70 mph prior to braking. Its speed at the time of collision was estimated at 50–60 mph,[2] indicating that the driver began braking approximately 2 seconds before colliding with the Hyundai. The posted speed in this area was 70 mph during daylight and 65 mph at night. An assessment of sight distance on I-30 west indicated that the driver had at least 3,000 feet of unobstructed view, or over 29 seconds at a speed of 70 mph, before reaching the traffic queue.

Kenworth Driver

The 59-year-old driver of the Kenworth tractor-auto transporter had worked for Waggoners Trucking Company (Waggoners) since January 2004, a period of 6 months. He possessed a valid North Carolina class A commercial driver's license (CDL) issued in October 2003, with an expiration date of June 2007. A Safety Board review of his North Carolina driving record and the Commercial Driver License Information System (CDLIS)[3] indicated no

[2] Speed estimates were calculated using data stored in the Lincoln's restraint control module (RCM), the weights of all vehicles involved in the accident, and the pavement friction coefficient as inputs into a series of conservation of linear momentum equations. An RCM is an electronic system that determines whether a crash pulse warrants activation of the vehicle's occupant protection system.

[3] The CDLIS houses identification data about each licensed commercial motor vehicle driver. It enables the States to exchange information about the driving records and licenses of commercial motor vehicle drivers.

commercial or noncommercial driving-related convictions or accidents during the past 20 years. Prior to 1984, the driver's records indicated several violations, two accidents, and a period of license revocation between 1974 and 1983, none of which were associated with operation of a commercial motor vehicle. The files of the National Driver Register (NDR)[4] contained no record of license suspension or revocation for the driver at the time of the accident.

The Kenworth driver possessed a valid medical certificate issued on January 7, 2004, with an expiration date of January 7, 2005. At the time of the physical examination, the driver reported a medical history of hypertension and diabetes, for which he took medication. During the driver's preemployment medical examination for Waggoners, the examining physician detected elevated levels of sugar in his blood and urine. He requested a written statement from the driver's primary care physician that the diabetes was well controlled. On January 9, 2004, the primary care physician furnished a letter stating that the driver's "diabetes is relatively well controlled."

A 30-day review of the Kenworth driver's hours-of-service logbook and of the Qualcomm Qtracs satellite system[5] data revealed discrepancies between the two, in terms of the driver's location, sleeper berth time, and off-duty time. According to the Qualcomm data, the driver had on at least four occasions violated the Federal hours-of-service regulations set by 49 *Code of Federal Regulations* (CFR) Part 395.[6] For example, for May 14, the logbook indicated that the driver drove 567 miles in 9 hours, while the Qualcomm data indicated that he drove 870 miles in 15 hours. Additionally, the May 15 logbook entry indicated that the driver drove 551 miles in 8.75 hours, while the Qualcomm data indicated that he drove 874 miles in 15 hours.[7]

No discrepancies were found between the logbook and the Qualcomm data for June 9–11, the days prior to the accident.[8] On June 12, the Kenworth driver indicated in his logbook that he departed Fletcher, North Carolina, at 5:45 p.m., drove for 5.25 hours, and entered the sleeper berth at 11:00 p.m. in Nashville, Tennessee. His only logbook entry on June 13 indicated that he continued to stay in his sleeper berth from midnight until 10:00 a.m., when he refueled and conducted a pretrip inspection. By contrast, the Qualcomm data indicated that he departed Fletcher at 10:51 p.m. on June 12, drove 97 miles to Dandridge, Tennessee, and stopped for

[4] The NDR is a central repository of information on individuals whose privileges to drive have been revoked, suspended, canceled, or denied or who have been convicted of serious traffic-related offenses. It is also referred to as the "Problem Driver Pointer System."

[5] The Qualcomm Qtracs system uses a transmitter/receiver that allows objects to be continually tracked through global positioning satellites. The system identifies the location of each Waggoners truck every hour, as well as the corresponding time and date and whether the truck engine is running.

[6] The regulations state that a driver may be on duty for up to 14 hours, of which 11 hours can be spent driving, only after spending 10 consecutive hours off duty. A driver may not drive after accumulating 60/70 hours on duty in 7/8 consecutive days without being off duty for 34 or more consecutive hours.

[7] On December 4, 2007, the Safety Board adopted two safety recommendations on hours-of-service compliance, H-07-41 and -42, issued to the Federal Motor Carrier Safety Administration (FMCSA). (See National Transportation Safety Board, *Rear-End Chain Reaction Collision, Interstate 94 East, Near Chelsea, Michigan, July 16, 2004*, Highway Accident Brief NTSB/HAB-07/01 (Washington, DC: NTSB, 2007).)

[8] Both sources indicated that the driver worked 7.75 hours on June 9, 10 hours on June 10, and 4 hours on June 11.

3 hours; he started driving again at 3:41 a.m. on June 13. A gas receipt indicated that he refueled in Nashville at 9:13 a.m. Except for an additional refueling stop at 4:16 p.m. in North Little Rock, Arkansas, the Qualcomm data showed that the driver drove 954 miles, from Fletcher to Sulphur Springs, in about 18 hours, with only the 3-hour break mentioned above. (See figure 3.)

Research has shown that a combination of reduced sleep and fatigue from long-distance driving can significantly increase reaction time.[9] Furthermore, the longer a person is continually awake beyond 14–16 hours, the greater the occurrence and duration of attention lapses.[10] The Safety Board and others have strongly linked driver sleepiness/fatigue with commercial vehicle crashes.[11,12]

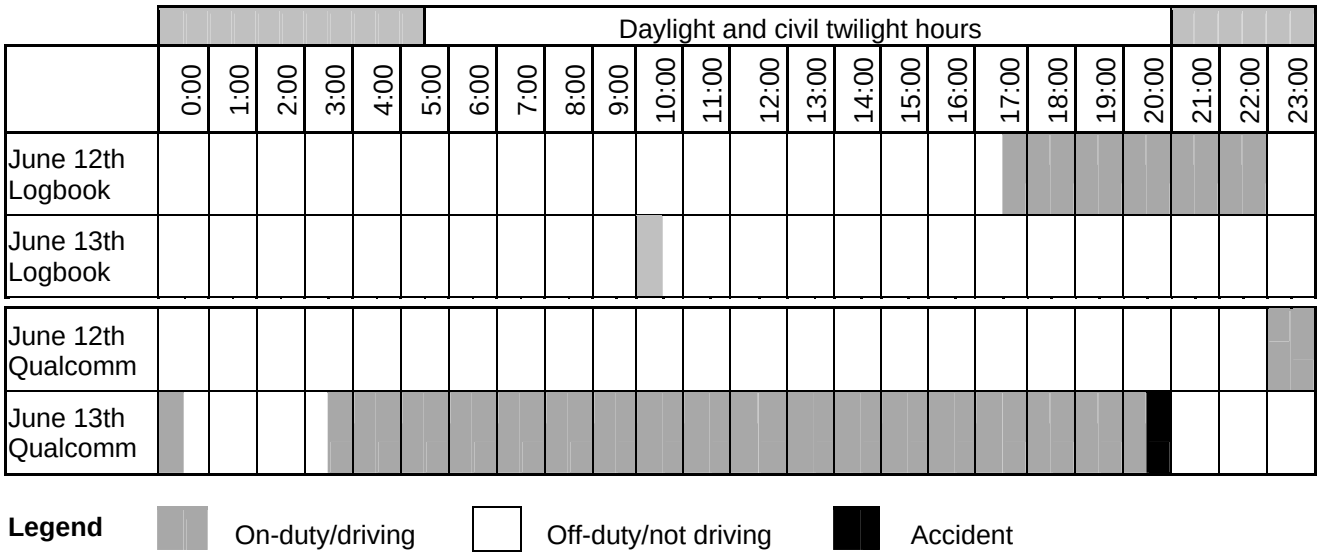

Figure 3. Comparison of Kenworth driver duty status based on logbook entries and Qualcomm Qtracs satellite data.

[9] Pierre Philip and others, "Fatigue, Sleep Restriction, and Performance in Automobile Drivers: A Controlled Study in a Natural Environment," *SLEEP*, Vol. 26, No. 3 (2003): 277–280.

[10] National Transportation Safety Board, *Fatigue Symposium Proceedings, November 1–2, 1995*, RP-95-02 (Washington, DC: NTSB and National Aeronautics and Space Administration Ames Research Center, 1995) 42.

[11] National Transportation Safety Board, *Factors That Affect Fatigue in Heavy Truck Accidents*, Safety Studies NTSB/SS-95/01 and NTSB/SS-95/02 (Washington, DC: NTSB, 1995).

[12] T. L. Bunna, S. Slavovaa, T. W. Struttmann, and S. R. Browning, "Sleepiness/Fatigue and Distraction/Inattention as Factors for Fatal Versus Nonfatal Commercial Motor Vehicle Driver Injuries," *Accident Analysis and Prevention*, Vol. 37 (2005): 862–869.

Motor Carrier

Waggoners Trucking Company is an interstate, authorized for-hire common carrier of motor vehicles, drive away/tow away, building materials, and hazardous materials. At the time of the accident, Waggoners employed 678 company drivers and had 231 leased drivers (owner/operators). Waggoners' fleet consisted of 870 tractors and 870 semitrailers.

On April 15, 2004, the FMCSA conducted a compliance review of Waggoners as part of the U.S. Department of Homeland Security review of hazardous material motor carriers. The review resulted in a satisfactory rating; at the time, Waggoners had 48 reportable accidents, for an accident rate of 0.581 per million miles traveled.[13] Following the accident, on June 30, 2004, the FMCSA conducted a compliance review of Waggoners that resulted in a conditional rating due to violations such as

- Permitting a driver to operate a commercial motor vehicle while the driver's ability or alertness is impaired,
- Scheduling a run that necessitates operating a commercial motor vehicle at speeds in excess of those prescribed, and
- Permitting a driver to drive more than 11 hours, to drive after having been on duty 14 hours, and to drive more than 70 hours in 8 consecutive days.

These violations were used by the FMCSA as part of the basis for assessing civil penalties against Waggoners.[14] A compliance review conducted on March 3, 2005, resulted in a satisfactory rating.

Roadside inspection data for the 24 months prior to June 16, 2004, indicated that Waggoners had 1,195 vehicle inspections, with 343 vehicles (28.70 percent) placed out of service. Also, the data indicated 2,523 driver inspections, with 195 drivers (7.73 percent) placed out of service. The national out-of-service averages for 2003 were 23.34 percent for vehicles and 7.62 percent for drivers.

Each of Waggoners' trucks was equipped with a Qualcomm Qtracs satellite system, which is designed to send an hourly signal to each truck to verify its location. The system also records time, date, position, and truck ignition status. Although the system can record other parameters, including engine rpm and fuel consumption, Waggoners used it only as a customer service tool to communicate with drivers and to track customer product. According to Waggoners representatives, the company did not use the Qualcomm Qtracs system to verify logbook entries or to track driver hours of service because such applications are not regulatory requirements and would have added to the administrative workload.

[13] The FMCSA has established that a motor carrier accident rate greater than 1.5 reportable accidents per million miles traveled is deficient.

[14] Waggoners challenged these penalties and won their dismissal on February 27, 2006.

In an October 2004 letter to the Safety Board, Waggoners stated that it had reexamined its operations and had instituted several safety improvements, including monitoring drivers on a real-time basis to ensure that they do not violate hours-of-service rules, randomly auditing drivers' logs on a daily basis, and using a newly developed system to ensure that drivers are meeting hours-of-service requirements before being dispatched. Since the accident, Waggoners' out-of-service rates for vehicles and drivers have decreased to 18 and 4.5 percent, respectively.

Traffic Incident Management

In the vicinity of the accidents, I-30 is a four-lane asphalt concrete roadway running east-west, divided by a 44-foot-wide depressed grassy median. The width of the paved portion of the westbound lanes is 38 feet. The paved area consists of a 10-foot-wide right shoulder, two 12-foot-wide main travel lanes, and a 4-foot-wide left shoulder. The paved portion of the eastbound lanes is identical to the westbound lanes. Two-way service roads parallel I-30, approximately 54 feet from the edge of the main travel lane shoulders. Each service road is 21 feet wide, with 7-foot graded shoulders on either side.

The Texas DPS was in charge of the traffic incident management (TIM) process following both the 7:09 p.m. single-vehicle crossover accident and the 8:39 p.m. rear-end chain-reaction collision. Other entities assisted in clearance of the initial incident,[15] including the Texas Department of Transportation (TxDOT) Paris District,[16] the Hopkins County Sheriff Department, the Hopkins County Justice of the Peace, the West Oak Funeral Home, and the Tommy Evans Wrecker Service. In a postaccident interview, a DPS trooper sergeant assigned to the area surrounding Sulphur Springs stated that local and State public safety agencies had worked cooperatively in the past and knew each others' capabilities; there were no written plans or agreements regarding emergency response to highway accidents.

The 2002 TxDOT *Maintenance and Operations Manual*, which contained policies, procedures, and guidelines for maintaining infrastructure, included a section on the importance of establishing working relationships with incident response entities.[17] It also discussed planning to ensure adequate communication, cooperation, and coordination among responding agencies. The manual did not specify whether these working relationships should be formalized in a written document, nor did it include detailed incident management procedures or guidelines that could be helpful in delineating responsibilities.

Wreckage from the 7:09 p.m. accident was strewn in the left lane of I-30 east, in the grassy median, and in the lanes of I-30 west. DPS law enforcement officers reached the scene at 7:10 p.m. A deputy from the Hopkins County Sheriff Department arrived shortly thereafter. At 7:19 p.m., the Sheriff Department contacted the TxDOT Paris District maintenance section

[15] A traffic incident is an emergency road user occurrence, a natural disaster, or another unplanned event that affects or impedes the normal flow of traffic.

[16] The Paris District, which includes the area of Sulphur Springs, is 1 of 25 TxDOT district offices.

[17] Texas Department of Transportation, *Maintenance and Operations Manual*, Section 5, "Accidents and Incidents" (Austin, TX: TxDOT, December 2002) 5-11.

supervisor about the accident. Sheriff's deputies set up temporary traffic control until TxDOT arrived on scene. They diverted I-30 east traffic onto the eastbound service road via exit 126, located 2 miles west of the accident site.[18] Westbound traffic was diverted to exit 131, which led to Farm-to-Market Road [FM] 69, connecting to the westbound service road. (See figure 4.)

TxDOT used 15 traffic cones to funnel traffic onto exit 131 and sent an attenuator truck[19] and a pickup truck with an electronic arrow board to I-30 west to help direct traffic onto the service roads. The pickup truck was positioned in the gore area leading to exit 131. (See figure 5.) No other control devices were placed upstream of exit 131 to alert motorists to the traffic backup. According to a TxDOT representative, traffic began to queue on the service road and the main lanes of I-30 west, where it extended 2,500 feet back from the exit 131 ramp. Traffic control on I-30 east was set up similarly.

The 2003 *Texas Manual on Uniform Traffic Control Devices* (Texas MUTCD), which governs the design, maintenance, and use of control devices in Texas, states, "The primary functions of temporary traffic control at an incident area are to move road users safely and expeditiously through or around the incident, and to reduce the likelihood of secondary crashes."[20] The *Maintenance and Operations Manual* defines the primary role of TxDOT in a traffic incident as providing traffic control, setting up detours, keeping traffic moving, and clearing the roadway as appropriate. Neither the Texas MUTCD nor the *Maintenance and Operations Manual* includes guidelines or procedures specifying how traffic control devices should be used to reduce the risk of secondary crashes. The *Maintenance and Operations Manual* does specify that "changeable message boards should be used to provide information to motorists for prolonged incidents,"[21] but it provides no guidance on their positioning. At the time of the Sulphur Springs accidents, the TxDOT Paris District was one of three districts that did not have a portable changeable message sign (PCMS)[22] or any other method of conveying real-time information to approaching motorists about traffic incidents or traffic queues.

[18] During a November 2006 telephone interview, the chief deputy of the Hopkins County Sheriff Department stated that deputies receive basic training at the police academy on the fundamental principles of traffic control at accident sites; they are not trained in traffic control through incident management areas in accordance with provisions of the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (national MUTCD).

[19] An attenuator truck is a vehicle with a compact crash cushion attached to its rear. The truck was not used; the driver parked on the westbound service road and helped law enforcement officers direct traffic.

[20] Texas Department of Transportation, *Texas Manual on Uniform Traffic Control Devices (Texas MUTCD)*, Chapter 6G, "Type of Temporary Traffic Control Zone Activities," Section 6G.19, "Control of Traffic Through Incident Areas" (Austin, TX: TxDOT, 2003) 6G-19.

[21] *Maintenance and Operations Manual*, 5-11.

[22] A PCMS is a temporary traffic control device with the flexibility to display messages of up to three lines of eight characters each. The components of a PCMS include a message sign panel, a control system, a power source, and mounting and transporting equipment.

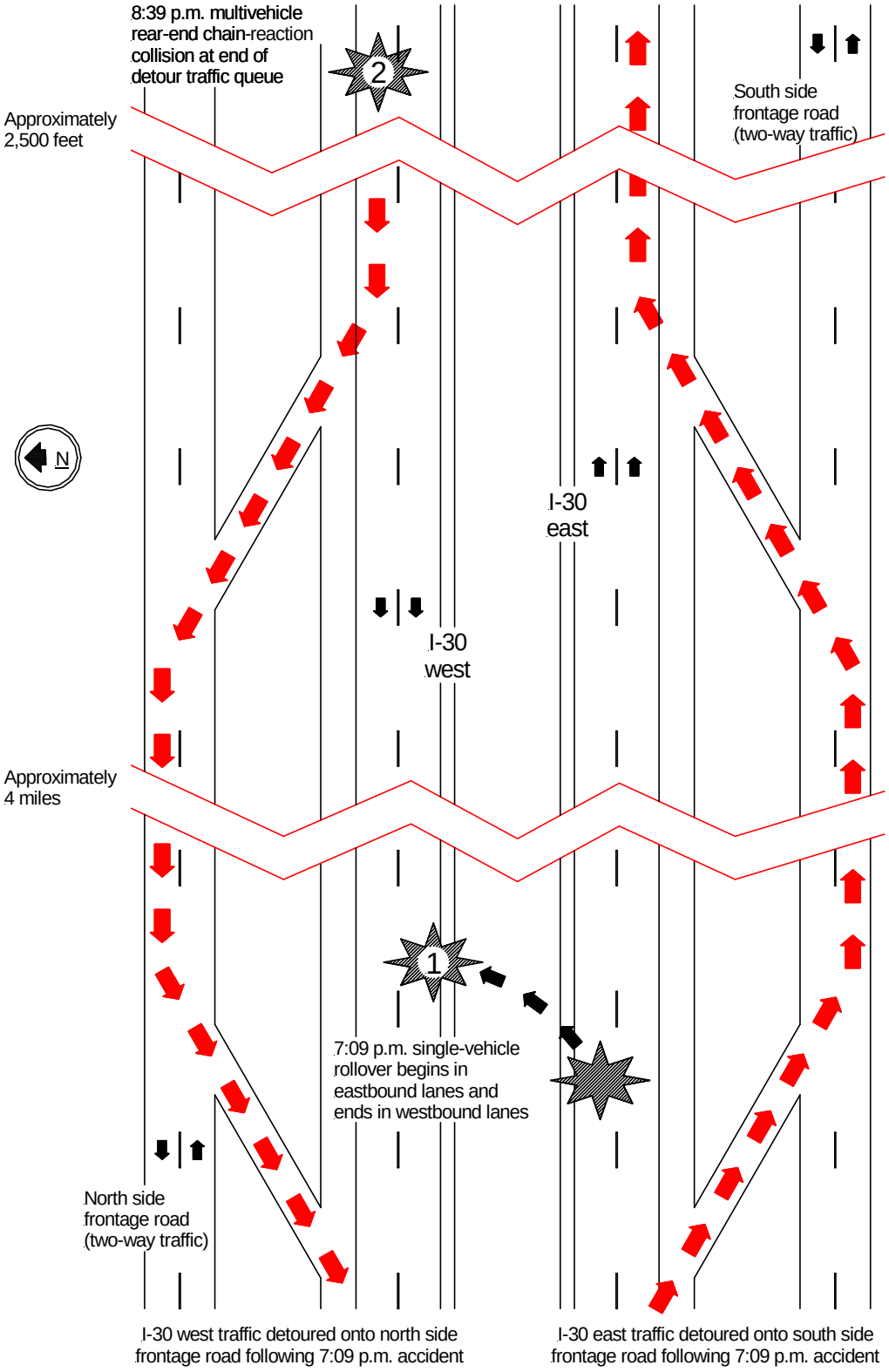

Figure 4. Detours on I-30 following 7:09 p.m. accident.

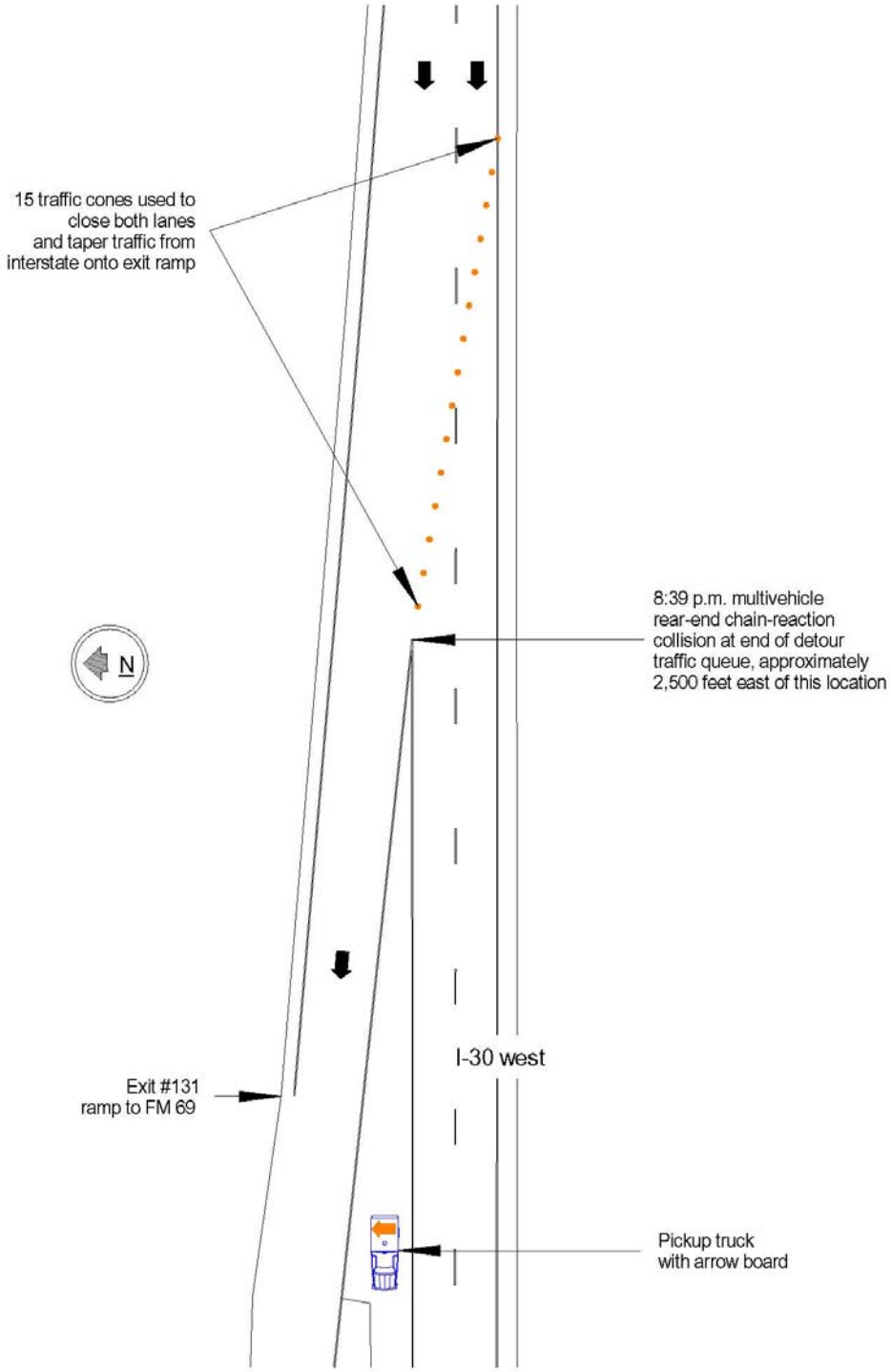

Figure 5. Traffic control devices used to detour traffic from I-30 west following 7:09 p.m. accident.

The Texas DPS officers receive training at the police academy on the fundamental principles of traffic control at accident sites. Officers are not trained to control traffic through incident management areas in accordance with provisions of the national MUTCD (codified in 23 CFR Part 655), which governs the design and use of traffic control devices on all public roads.[23] According to the national MUTCD, "temporary traffic control should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue."[24]

State traffic control procedures must substantially conform to the latest edition of the national MUTCD within 2 years of issuance; chapter 6I of the MUTCD includes guidance for monitoring the end of a traffic queue and for providing advance warning to road users approaching the end of a traffic queue.[25] At the time of the Sulphur Springs accidents, TxDOT had not yet incorporated chapter 6I into the Texas MUTCD. Interviews with maintenance staff in the TxDOT Sulphur Springs area office indicated that, at the time of the accidents, they were unaware of the TIM information contained in the national MUTCD. In February 2006, the Texas MUTCD was modified to include chapter 6I with minor changes.

It took approximately 1 hour for responders to document the 7:09 p.m. accident and remove the three victims from the left lane and median of I-30 east. The *Texas Codes of Criminal Procedure* give the DPS the authority to remove bodies from a highway accident scene to maintain traffic flow.[26] The DPS did not exercise this authority and waited 30 minutes for the Hopkins County Justice of the Peace to arrive and pronounce the state of the deceased before contacting the funeral home to remove the bodies.[27] It took another 30 minutes for representatives of the funeral home to arrive at the scene. About 8:00 p.m., the towing service was in the process of loading the accident vehicle onto a tow truck; the second accident, which is the subject of this brief, occurred about 8:39 p.m. In a postaccident interview, TxDOT personnel indicated that, even had the second accident not occurred, I-30 probably would not have been reopened to traffic until about 9:00 p.m., almost 2 hours after the 7:09 p.m. accident.

Several regions across the nation have incorporated a clearance goal of 90 minutes or less into their TIM policies.[28,29] In Dallas, Texas, first responders have met an objective of reducing the average clearance time for all types of incidents to 20 minutes. Studies have shown that quick clearance of an incident is the "most effective method to decrease first responder injuries,

[23] Telephone interview with DPS Commander of the Uniformed Services, May 17, 2006.

[24] Federal Highway Administration, *Manual on Uniform Traffic Control Devices (MUTCD)*, Chapter 6I, "Control of Traffic Through Traffic Incident Management Areas" (Washington, DC: FHWA, 2003) 6I-1–6I-3.

[25] *MUTCD*, 6I-2.

[26] *Texas Codes of Criminal Procedure*, Subchapter B, "Duties Performed by Medical Examiners," Chapter 49, "Inquests Upon Dead Bodies," Article 49.25, "Medical Examiners."

[27] The *Texas Codes of Criminal Procedure* state, "When any death under circumstances set out in Section 6 shall have occurred, the body shall not be disturbed or removed from the position in which it is found by any person without authorization from the medical examiner or authorized deputy, except for the purpose of preserving such body from loss or destruction or maintaining the flow of traffic on a highway, railroad, or airport."

[28] D. L. Helman, "Traffic Incident Management," *Public Roads*, Vol. 68, No. 3 (2004).

[29] State of Florida, *Open Roads Policy* (Tallahassee, FL: Florida Highway Patrol and Florida Department of Transportation, 2002) 2–3.

decrease secondary crashes, improve mobility, and improve the public image of response agencies."[30] There is also general agreement that generating a successful quick clearance policy depends on "developing coordinated multiagency operations."[31]

Since this accident, several events have transpired that have the potential to improve incident management response in Sulphur Springs and throughout the nation. The Paris District has installed two dynamic message board signs on I-30 and has acquired eight PCMSs to provide motorists with advance warning of traffic. The North Central Texas Council of Governments has begun offering a 16-hour course for TIM responders and managers, which is taught by local police, fire, wrecker, and transportation personnel.

Additionally, in November 2007, the National Traffic Incident Management Coalition[32] (NTIMC) formally introduced its National Unified Goal, a plan to promote, develop, and sustain multijurisdictional and multidisciplinary TIM policies at the local, State, regional, and national levels. The plan is organized around three major objectives—responder safety; safe, quick clearance; and prompt, reliable interoperable communications. Implementation strategies include the adoption of multidisciplinary policies and procedures based on detailed FHWA research and guidelines, multidisciplinary TIM training and communication, promotion of response and clearance time goals, and development of prompt, reliable traveler information systems.[33] Although implementation of the National Unified Goal strategies is not mandatory and is not funded, the plan has the support of the major first responder organizations, the FHWA, and AASHTO. Further, the NTIMC believes that standard TIM practices will promote cooperation and the pooling of resources among TIM stakeholders in pursuit of common goals.[34]

[30] John O'Laughlin and Arland T. Smith, *Traffic Incident Management: Safety and Mobility, the Incident Management Challenge* (New York, NY: PB Farradyne, 2002) 2–4.

[31] Helman.

[32] The FHWA, the American Association of State Highway and Transportation Officials (AASHTO), and organizations representing the emergency medical services, fire, law enforcement, public safety communications, towing and recovery, and transportation communities are members of the NTIMC. See <http://www.timcoalition.org>, January 22, 2008.

[33] American Association of State Highway and Transportation Officials, *National Unified Goal for Traffic Incident Management: Detailed Explanation* (Washington, DC: AASHTO, 2007). See <http://www.transportation.org/sites/ntimc/docs/NUG-4pp_11-14-07.pdf>, January 17, 2008.

[34] *National Unified Goal for Traffic Incident Management: Frequently Asked Questions*. See <http://www.transportation.org/sites/ntimc/docs/NUG-FAQ-11-07a.pdf>, January 17, 2008.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the Sulphur Springs multivehicle accident was the failure of the driver of the 1991 Kenworth tractor-auto transporter to identify and react in time to stopped traffic due to acute fatigue. Contributing to this accident were the failure of Waggoners Trucking Company, owner of the Kenworth truck, to provide adequate oversight of the driver's fitness for duty and compliance with hours-of-service requirements, and the failure of the Texas Department of Public Safety and the Texas Department of Transportation to provide clear advance warning to alert approaching traffic of the incident area and traffic queue.

Adopted: February 25, 2008