



**HUMAN PERFORMANCE GROUP CHAIRMAN'S  
FACTUAL REPORT  
HWY-09-MH-015  
Miami, OK**

(14 Pages)



**NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF HIGHWAY SAFETY  
WASHINGTON, DC 20594**

**HUMAN PERFORMANCE GROUP CHAIRMAN'S  
FACTUAL REPORT**

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**A. ACCIDENT**

LOCATION: Interstate 44 (I-44) East, Will Rogers Turnpike, at Milepost 321.5, in Ottawa County, Oklahoma, approximately 8 miles northeast of Miami, Oklahoma

VEHICLE 1: 2008 Volvo Tractor Semi-Trailer and 2009 Great Dane Refrigerated Trailer Combination Unit

OPERATOR: Associated Wholesale Grocers Inc. of Springfield, Missouri

VEHICLE 2: 2003 Land Rover SUV

VEHICLE 3: 2003 Hyundai Sonata Passenger Car

VEHICLE 4: 2004 Kia Spectra Passenger Car

VEHICLE 5: 2000 Ford Windstar Minivan

VEHICLE 6: 2004 Ford F350 Pickup Truck and 16-foot Livestock Trailer

VEHICLE 7: 2008 Chevrolet Tahoe SUV

DATE: June 26, 2009

TIME: Approximately 1:22 p.m. CDT

CASE NR: HWY-09-MH-015

## **B. HUMAN PERFORMANCE GROUP**

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## **C. ACCIDENT SUMMARY**

About 1:13 p.m. CDT on Friday June 26, 2009 an 18-year-old driver operating a 2001 Ford Focus passenger car eastbound on I-44 Will Rogers Turnpike near milepost 321.76 drifted into a parked truck tractor semi-trailer on the right-hand shoulder. After the Ford side-swiped the semi-trailer wheels the driver overcorrected, lost control and struck the concrete median barrier twice, before coming to rest in the roadway and blocking the dual eastbound lanes. Traffic began stopping and a queue developed before passing motorists could push the disabled vehicle to the right-hand shoulder. The queue of stopped and slowing vehicles extended back approximately 1500 feet to milepost 321.5.

Meanwhile, a 76-year-old truck driver operating a 2008 Volvo truck tractor and a 2009 Great Dane refrigerated semi-trailer was traveling eastbound in the outside lane. The combination unit had crested a vertical curve down a 2.75 percent grade toward the stopped traffic, approximately 1,735 feet away. Witnesses stated the combination unit was traveling about 70 mph in the posted 75 mph zone, did not brake to slow down and collided into the rear of the stopped and slow moving traffic. This accident occurred at 1:16 p.m. CDT or about three minutes after the first accident.

At initial impact, the combination unit struck a 2003 Land Rover SUV, pushing it forward into a 2003 Hyundai Sonata passenger car; the Land Rover continued off to the right where it came to rest on the right-hand grassy right-of-way. The combination unit continued forward approximately 42 feet and collided into the Hyundai, overriding it and pushing it forward about 29 feet to where the combination unit then struck and overrode a 2004 Kia Spectra passenger car. The combination unit and the two passenger vehicles continued forward into the rear of a 2000 Ford Windstar minivan, which was also partially overridden by the combination unit. The Ford minivan was pushed forward into the rear of a 16-foot livestock trailer (loaded with 10 head of sheep) being towed by a 2004 F350 pickup truck. The F350 pickup truck was then pushed forward into a 2008 Chevrolet Tahoe. The combination unit came to final rest on top of the Hyundai, Kia, and a portion of the Ford minivan. From the initial impact to final rest, the combination

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<sup>1</sup> Intern no longer with the Safety Board.

unit traveled approximately 270 feet, leaving gouges and friction tire marks on the pavement.

At the time of the accident the weather was clear and the pavement was dry.

As a result of the collision, 10 occupants in the passenger vehicles were fatally injured; nine passengers were fatally injured at the crash site and one passenger died at an area hospital and four passengers received minor to serious injuries. The driver of the combination unit received serious injuries. Four of the passenger cars were destroyed from impact. The Ford F350, livestock trailer, and Chevy Tahoe had moderate damage. The Volvo truck tractor sustained extensive damage, and the Great Dane trailer was undamaged.

#### **D. DETAILS OF THE INVESTIGATION**

The Human Performance factual investigation focused on the behavioral, medical, operational, and environmental factors associated with the 2008 Volvo tractor-semitrailer driver.

##### **1. Recent Work/Activity History**

The driver engaged in shift work.<sup>2</sup> He generally went on-duty between 2 and 3 a.m., and went off-duty before 3 p.m. (see Appendix A). He had been off work between June 6-21, having taken sick leave from June 6-13, and going on a preapproved vacation on June 15, 18-20.<sup>3</sup> He worked on Monday, June 22, and took a holiday on June 25.<sup>4</sup> He returned to work on June 26, the day of the accident.

The accident driver has declined to speak with investigators. Therefore, a full 72-hour history has not been developed for the driver.<sup>5</sup> Table 1 presents a partial 72-hour history based on his cellular phone records<sup>6</sup> and CADEC logs.<sup>7</sup>

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<sup>2</sup> Shift work is defined as regular employment outside of the normal “day work” hours. See Kryger MH, Roth T, Dement WC. *Principles and Practice in Sleep Medicine*, 4<sup>th</sup> Edition, Elsevier-Saunders, Philadelphia, PA, 2005, p. 673.

<sup>3</sup> According to an AWG transportation supervisor, the driver was normally off on Tuesdays, Wednesdays, and Sundays.

<sup>4</sup> The driver was granted a floating holiday for having worked on Memorial Day.

<sup>5</sup> Staff attempted to interview friends and family members, and could not obtain their cooperation. Staff also attempted to interview neighbors, but none knew the driver well enough to assist in reconstructing a 72-hour history for the driver.

<sup>6</sup> Human Performance Group Chairman’s Factual Report, Attachment 1.

<sup>7</sup> Refer to Motor Carrier Group Chairman’s Factual Report, Attachment 2.

Table 1. Driver activities prior to the accident. Due to the frequency of incoming and outgoing calls, only the first and last calls of each day, and calls made during work hours, are listed. Call durations are provided in parentheses for the final call of each day.

| <b>Time</b>              | <b>Location</b> | <b>Event</b>       | <b>Source</b> |
|--------------------------|-----------------|--------------------|---------------|
| <b>Monday June 22</b>    |                 |                    |               |
| 5:15am                   | Springfield MO  | depart base        | CADEC log     |
| 6:10 am                  | Springfield MO  | received call      | phone records |
| 7:40am                   | Mnt Home AR     | arrived            | CADEC log     |
| 8:26am                   | Mnt Home AR     | departed           | CADEC log     |
| 8:58am                   | Gainesville MO  | arrived            | CADEC log     |
| 9:35am                   | Gainesville MO  | departed           | CADEC log     |
| 10:22 am                 | Springfield MO  | received call      | phone records |
| 10:30am                  | Springfield MO  | made call          | phone records |
| 10:31am                  | Springfield MO  | made call          | phone records |
| 10:36 am                 | Springfield MO  | received call      | phone records |
| 10:55 am                 | Springfield MO  | received call      | phone records |
| 11:05am                  | Springfield MO  | arrived at base    | CADEC log     |
| 11:22am                  | Springfield MO  | off duty           | CADEC log     |
| 8:56 pm                  | Springfield MO  | made call (5)      | phone records |
| <b>Tuesday June 23</b>   |                 |                    |               |
| 8:50 am                  | Springfield MO  | made call          | phone records |
| 9:12 pm                  | Springfield MO  | received call (3)  | phone records |
| <b>Wednesday June 24</b> |                 |                    |               |
| 7:46am                   | Springfield MO  | made call          | phone records |
| 7:27pm                   | Springfield MO  | made call (1)      | phone records |
| <b>Thursday June 25</b>  |                 |                    |               |
| 8:30 am                  | Springfield MO  | received call      | phone records |
| 6:25pm                   | Springfield MO  | received call (12) | phone records |
| <b>Friday June 26</b>    |                 |                    |               |
| 3:00am                   | Springfield MO  | began duty time    | CADEC log     |
| 3:15am                   | Springfield MO  | departed base      | CADEC log     |
| 5:45am                   | Chouteau OK     | arrived            | CADEC log     |
| 6:11am                   | Chouteau OK     | departed           | CADEC log     |
| 6:45am                   | Muskogee OK     | arrived            | CADEC log     |
| 7:41am                   | Muskogee OK     | departed           | CADEC log     |
| 8:24am                   | Vian OK         | arrived            | CADEC log     |
| 8:51am                   | Vian OK         | departed           | CADEC log     |
| 9:37am                   | Muskogee OK     | arrived            | CADEC log     |
| 10:11am                  | Muskogee OK     | departed           | CADEC log     |
| 10:47am                  | Wagoner OK      | arrived            | CADEC log     |
| 11:31am                  | Wagoner OK      | depart             | CADEC log     |
| 11:49am                  | Chouteau OK     | arrived            | CADEC log     |
| 12:02pm                  | Tulsa OK        | received call      | Phone records |
| 12:09pm                  | Chouteau OK     | departed           | CADEC log     |
| 12:46pm                  | Tahlequah OK    | made call (22)     | Phone records |
| 1:16 pm                  | Miami OK        | accident occurred  |               |

## 2. Witness Account

According to a witness driving a refrigerated van semitrailer eastbound on I-44 around the time of the accident,<sup>8</sup> as he crested a hill, he noticed congestion and brake lights ahead near the top of the next hill. He stated that the traffic queue extended about 1/3 miles, up to the point where the accident eventually occurred. He put on his 4-way hazard flashers and began to downshift, and noticed in his left side mirror the accident truck changing from the right-hand lane to the left-hand lane in an attempt to pass. As the accident truck was passing, the witness stated that he was downshifting from 9<sup>th</sup> to 8<sup>th</sup> gear. He estimated that it took the accident truck about 6-7 seconds to complete the passing maneuver. Once the accident truck passed him, it changed back to the right hand lane, never slowed or applied his brakes, and crashed into the stopped traffic ahead. Data collected from the accident truck's electronic control module (ECM) indicated that the accident truck's cruise control was engaged and that the brakes were not applied before the accident, supporting the witness' account.<sup>9</sup> According to the witness, he continued to downshift all the way to 6<sup>th</sup> gear, and then braked hard and stopped at the point where the accident truck had struck the first stopped car. He said he thought he was traveling 66 mph and had slowed to 35-40 mph by the time the impact happened. He added that he thought the grocery truck was 300-400 feet ahead of him when the first impact occurred.

## 3. Medical Factors

### 3.1. Medical Fitness Exams

The driver's employer, Associated Wholesale Grocers (AWG), had retained all of the driver's medical examination long forms since 2000.<sup>10</sup> According to the long forms, the driver had a history of hypertension and had been taking medication to control the disease since 2005. Drivers are qualified to operate a commercial vehicle if their blood pressure is below 140/90. His 2006 fitness examination form acknowledged the driver's hypertension and noted that he was taking medication to control both his blood pressure and cholesterol. Due to his hypertension, he was only provided with a commercial driver medical fitness card that was only valid for 1 year. His January 2007 fitness examination form mentions his hypertension and certified the driver for 1 year. His January 2008 fitness examination form mentions hypertension as well as a heart murmur. The form stated that the driver needed to have an echocardiogram performed before the next exam. Medical records indicate that the driver underwent an echocardiogram on August 2008, and the test results were normal. The driver's December 2008 fitness examination form noted his hypertension, stated that his blood pressure was 136/82. It also indicated that the driver denied having sleep apnea, and checked "No" in the Health History section of the form for "sleep disorders, pauses in breathing while asleep, daytime sleepiness, loud snoring."

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<sup>8</sup> Human Performance Group Chairman's Factual Report, Attachment 3.

<sup>9</sup> See Event Data Group Chairman's factual and analysis report (HWY-09-MH-015) for more detail on output gathered from the ECM and CADEC systems.

<sup>10</sup> Refer to Motor Carrier Group Chairman's Factual Report, Attachment 10.

### 3.2. Medical History

This section duplicates information contained in the medical officer's analysis,<sup>11</sup> with a few additions. On June 5, 2009, about 3 weeks prior to the accident and after finishing a shift, the driver went to the emergency room with complaints of weakness, diarrhea, and abdominal pain. He was discharged on the same day. On June 8, the driver returned to the emergency room with complaining of chest pains. Medical records include family member statements that the driver "had been declining for 5-6 months, with less energy during the last 2 weeks." The driver underwent a stress test and echocardiogram in the hospital which were normal. The driver was discharged on June 14, and the discharge summary noted that the driver "describes excessive daytime tiredness and loud snoring at night, raising the possibility of OSA," but that he "prefers to not have evaluation for OSA." The driver was discharged with an electrocardiographic (Holter) monitor to be worn for 48 hours. The monitor noted a large number of abnormal heart beats, but no sustained abnormal heart rhythms. An entry in his medical records 2 days prior to the accident noted that the driver's energy was good, and that he had no complaints of shortness of breath or chest pain.

According to AWG representatives, they believed the driver took a week of sick leave, from June 6-13, due to a stomach virus. The representatives stated they were unaware that the driver readmitted himself to the emergency room due to chest pains. The AWG handbook states that the company may require drivers coming back from preapproved sick leave to complete a medical examination. AWG did not require the driver to submit to a medical examination on June 22, after coming back from sick leave and vacation.

The driver sustained injuries in the accident including a fractured jaw, a brain contusion, and swelling and lacerations to his face. He was hospitalized after the accident to evaluate a possible loss of consciousness. The driver had indicated during his hospitalization that "The last thing he remembers was that he saw the traffic was slowing down and he thought he was slowing down in the traffic. The next thing he remembers was that he was out of his truck and a lady was holding the left side of his face. ... He was able to remember everything functionally well after he regained his memory. ..." A comprehensive post-accident inpatient evaluation of the driver, including EEG, MRI, CT angiogram, and cardiac catheterization, among other studies, did not identify any cause for a loss of consciousness, and he was discharged home with a 30-day event monitor and another recommendation for a sleep study to evaluate the possibility of obstructive sleep apnea.

The driver participated in a sleep study consult on July 27, 2009, followed by sleep studies on August 2 and August 18. According to the sleep consult records, the driver stated that, "...When he does work, he generally was trying to get to bed around 8:00 in the evening. He is now going to bed around 10:00-ish. He falls asleep within a

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<sup>11</sup> Medical Analysis of Accident HWY-09-MH015.

few minutes. ... He is usually out of bed typically around 12:30 or 1:00 in the morning when he was working, 6:00 to 7:00 now...”

Results from the August 2 sleep study demonstrated short sleep latency (4 minutes) and “mild sleep disordered breathing,” with an apnea/hypopnea index of 14. The driver used a continuous positive airway pressure (CPAP) during the second sleep study, and demonstrated a sleep latency of 9 minutes 14 seconds, some improvement in sleep architecture, and an apnea/hypopnea index of 4.5. The driver refused to wear a CPAP device due to discomfort.

### **3.3. Vision**

Two pairs of prescription eye glasses were found on scene. One pair of untinted glasses was found above the sun shade on the driver’s side of the cab. A pair of tinted prescription glasses was found on the floor on the passenger side of the cab. The frame of the sunglasses was bent outwards at the point where the right temple met the eyeglass rims.<sup>12</sup>

The driver’s latest medical fitness short form (December 2008) indicates that he is qualified only when wearing corrective lenses. The December 2008 long form indicates that his corrected visual acuity was 20/15 in either eye, and his horizontal field of vision was 80° in either eye. 49 CFR 391.41(b)(10) states that a commercial driver must have a distant visual acuity of at least 20/40 (Snellen) in each eye without corrective lenses or visual acuity separately corrected to 20/40 (Snellen) or better with corrective lenses. The driver’s horizontal field of view must be at least 70° in each eye.

## **4. Toxicology**

A urinalysis was performed at 6:36 pm on June 26, 2009. The results of the urinalysis were negative for benzodiazepines, cocaine metabolites, opiates, phencyclidine, acetaminophen, amphetamines, barbiturates, cannabinoids, MAMP/MDMA metabolites, methadone metabolites, and tricyclic antidepressants. Alcohol was less than 0.01%.<sup>13</sup>

Toxicology results from the Oklahoma State Bureau of Investigation on blood drawn at 7:20 pm on June 26, 2009 were negative for barbiturates, benzodiazepines, cannabinoids, carisoprodols, cocaine metabolites, phenethylamines, opiates, phencyclidines, and alcohol.<sup>14</sup>

On July 2, 2009, NTSB investigators formally requested that blood samples from the accident driver be sent from the Oklahoma State Bureau of Investigation to the Civil

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<sup>12</sup> Post-accident emergency room records indicate that the driver suffered abrasions to the right ear and face.

<sup>13</sup> Refer to Motor Carrier Group Chairman’s Factual Report, Attachment 11.

<sup>14</sup> Human Performance Group Chairman’s Factual Report, Attachment 4.



Aerospace Medical Institute (CAMI) toxicology laboratory. CAMI reported that the driver's blood tested negative for alcohol and drugs.<sup>15</sup>

## **5. Operational Factors**

### **5.1. Licensing**

At the time of the crash the driver held a valid Missouri Class "A" commercial drivers license (CDL, which expired March 20, 2012. He held a passenger transportation endorsement and a doubles/triple trailer endorsement, and his current license indicated that he was subject to no restrictions.<sup>16</sup> The driver also had a current medical certificate that expired on December 2009.

### **4.2 Training / Experience**

The driver had worked at the AWG facility since 1991. Prior to working for AWG, he worked as a bus driver for both Trailways (1964-1987) and Greyhound (1987-1991).

AWG's driver training program requires its drivers to view at least one training video per year and complete the corresponding quiz. According to AWG records, the driver was up to date with his training. Most recently, on June 4, 2009, the driver passed an on-line interactive training program by Smith System on safe truck backing procedures.

Among AWG's training materials is a VHS video entitled, "The Alert Driver: a Trucker's Guide to Sleep, Fatigue, and Rest in our 24-Hour Society," published by the American Trucking Association (ATA) in 1996. The video was accompanied by a booklet that expanded on themes mentioned in the video. ATA no longer sells this video, or any other stand-alone video, on fatigue. There is no record regarding whether the accident driver chose to view this video as part of his annual training with AWG. Apart from the video, staff was not provided with material or information indicating that AWG had a formal fatigue management policy or program. Staff was only directed to the employee handbook. When asked about a fatigue policy, an AWG representative stated that if a driver feels fatigued, the driver is encouraged to pull over and call AWG to request a relief driver with no retribution or penalty.<sup>17</sup>

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<sup>15</sup> Drugs tested included amphetamine, opiates, marijuana, cocaine, phencyclidine, benzodiazepines, barbiturates, antidepressants, antihistamines, meprobamate, methaqualone, and nicotine. Human Performance Group Chairman's Factual Report, Attachment 5.

<sup>16</sup> The driver's CDL license that expired in 2002 restricts the driver to driving only with corrective lenses. This restriction was not included in the current license despite the driver wearing eye glasses in his license photo. The driver's medical card indicates that corrective lenses must be worn to operate a vehicle.

<sup>17</sup> AWG transportation supervisor, July 28, 2009.

### **4.3** Accident History

Carriers must conduct an annual review of their drivers' driving records. AWG had summaries of these reviews from 2000-2008. The records indicate that the driver had not been involved in an accident since he was hired in 1992. Medical records indicate that the driver was involved in a private automobile accident on June 11, 2009, while wearing an ambulatory device to monitor his heart; however, a record of the accident from the Missouri State Patrol indicated that the driver of the automobile was a minor, and that the truck driver was in the front passenger seat at the time of the accident.<sup>18</sup>

#### **4.3.1** Driver Schedule

According to AWG, drivers bid for routes 3 times a year. They would operate on a particular schedule for 4 months at a time. The driver had been operating on the same schedule since March 8, 2009. He lived about 17 miles from work, and his commute time was between 20 and 30 minutes. The driver generally began his shift between 2 a.m. and 3 a.m. and ended his shift before 3 p.m. As illustrated in Appendix A, there were a number of occasions when the driver would start much later than 3 a.m. and finish later than 3 p.m.

According to AWG, shifts for the bulk of their drivers begin between 12 a.m. and 5 a.m., with routes to farther locations beginning earlier in the day. Delivery schedules are based on customer demand, who prefer that deliveries arrive before stores open to allow for restocking. According to AWG, drivers are not responsible for loading and unloading product during a delivery, but may assist when needed.

## **6. Task Factors**

### **6.1.** Driver Demeanor Prior to Accident Trip

Safety Board investigators interviewed 2 coworkers who interacted with the accident driver prior to the accident trip. According to his coworkers, the driver's demeanor was normal on the day of the accident. He had coffee and socialized before his run, and provided one of the coworkers with directions to a local store. Neither coworker claimed to know much about the driver's life outside of work. A third coworker stated that he saw the driver about 2 days prior to the accident trip<sup>19</sup> and claimed that he did not notice any indication of illness or emotional problems. He felt that the driver was a good driver and was in good shape.

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<sup>18</sup> Further confirmation of this was provided by the driver of the struck vehicle.

<sup>19</sup> The driver was off work two days prior to the accident trip. This coworker most likely saw the driver on Monday, June 22, 2009, four days prior to the accident trip.

## **6.2. Internal Workload / Distraction**

### **6.2.1. Cellular Phone Calls**

A comparison of the driver's logs and cell phone records indicate that on June 22, 2009, the driver had initiated 2 phone calls and received 4 others while driving. On June 26, the driver initiated a phone call at 12:46 p.m. that was 22 minutes in duration.<sup>20</sup> This meant that it would have ended at 1:08 p.m., more than 8 minutes before the accident occurred.<sup>21</sup> According to AT&T Wireless, the times on its phone records are based on switch times, which is synchronized with the Official United States Time, as indicated by the National Institute of Standards and Technology atomic clock.

The Oklahoma Highway Patrol conducted an interview with the individual the accident driver spoke with on his cellular phone prior to the crash. The individual, who is a close family friend of the driver, stated that they talked about her children and whether she received the promotion she had hoped for at work. The individual stated that the driver was coherent and spoke in a normal fashion. She further stated that the driver did not mention anything about being sleepy or tired. The driver ended the telephone conversation after remarking that he was in traffic.

The AWG Bargaining Unit Employee Handbook states that, "The use of cell phones can lead to workplace distractions that can cause the user to put themselves or others in dangerous situations." The Handbook prohibits employees from using or handling their cell phones in any fashion while performing their jobs.<sup>22</sup>

### **5.2.2. CADEC Unit**

AWG assigns drivers to tractors. The 2008 Volvo tractor involved in the accident was purchased in January 2008, and was assigned to the accident driver at that time. Each tractor is equipped with a CADEC Mobius TTS system that tracks hours of service and acts as a messaging system between the driver and the carrier (see motor carrier field information for a more detailed description of the CADEC system). When the vehicle is in motion, the CADEC locks the driver out of virtually all interaction with the system. If the driver receives a message through the CADEC, the driver must stop the vehicle to retrieve the message. The CADEC provides an audible warning one hour before the driver exceeds the 11-, 14-, or 70-hour hours of service rules. The driver can dismiss the alarm by touching the CADEC screen.

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<sup>20</sup> This call was 9 minutes longer than any cellular call he had made since June 22.

<sup>21</sup> The CADEC reported a sudden deceleration of the accident truck at 1:19:18 p.m. on June 26, 2009. This time stamp is a GPS system time, which is derived from the Atomic Clock system in Colorado.

<sup>22</sup> *Associated Wholesale Grocers Bargaining Unit Employee Handbook, Springfield Division: Policies and Procedures*. Section 10, page 5. October 4, 2009. Refer to Human Performance Group Chairman's Factual Report, Attachment 2.

## **7. Environmental Factors**

### **7.1. Weather**

The closest weather station was located approximately 16 miles from the accident site, in Bluejacket, Oklahoma. The temperature at the time of the accident was 104 degrees Fahrenheit, with southwest winds of around 4.5 miles per hour. The sun was 77-degrees above the Eastern horizon. The police report describes the weather as clear and the roadway as straight and dry.

As stated in the vehicle chairman's factual report, three ventilation controls to the right of the accident truck's steering wheel indicated that the temperature was set to cold; the fan was set to a medium strength; and the fan was set to blow at both upper and lower vents. It could not be determined by looking at the air conditioning On/Off button if the air conditioning was on or off at the time of the accident. Accident scene photos show the truck's driver's side window was open. Additionally, a witness interviewed by the survival factors chairman stated that he noticed at the accident scene that the truck's windows were open. It is not known whether the windows were rolled down before or after the accident, or who rolled it down.

### **7.2. Sight Distance**

As detailed in the Highway Factual, the Will Rogers Turnpike eastbound from milepost 320 to milepost 321.5 is straight, with a slight 1200-ft vertical curve leading into an 1100-ft 2.75 percent downgrade and then a 600-foot-long sag vertical curve. Field measurements and observations showed that when the roadway was viewed at the accident site from an eye height of 96 inches a 2.0-foot-tall object height could be seen from the beginning of the crest vertical curve 2,335 feet away. No overpasses, signs, or billboards were present that would have obstructed the view of the driver from this point to the point where the accident occurred.

**APPENDIX A**

The table below illustrates the driver’s shift work schedule during the 60 days prior to the accident. The driver worked 23 days during this time period. On most occasions, the driver would begin work between the hours of 2 and 3 a.m. Four start times exceed this window by more than 5 minutes, and these are shown in gray within the “Start Duty” column. Generally, the driver went off duty before 3 p.m., although there were 5 occasions when the driver worked beyond this time. These are shown in gray in the “End Duty” Column.

| <b>Date</b> | <b>Work</b> | <b>Rest</b> | <b>Start duty</b> | <b>End Duty</b> | <b>Total On-duty</b> |
|-------------|-------------|-------------|-------------------|-----------------|----------------------|
| 4/28/2009   |             | x           |                   |                 |                      |
| 4/29/2009   |             | x           |                   |                 |                      |
| 4/30/2009   | x           |             | 3:01              | 15:51           | 12:50                |
| 5/1/2009    | x           |             | 3:55              | 12:12           | 8:15                 |
| 5/2/2009    | x           |             | 2:10              | 12:15           | 9:52                 |
| 5/3/2009    |             | x           |                   |                 |                      |
| 5/4/2009    | x           |             | 2:07              | 8:50            | 6:43                 |
| 5/5/2009    |             | x           |                   |                 |                      |
| 5/6/2009    |             | x           |                   |                 |                      |
| 5/7/2009    | x           |             | 2:56              | 14:47           | 11:31                |
| 5/8/2009    | x           |             | 3:02              | 14:36           | 11:34                |
| 5/9/2009    | x           |             | 2:27              | 2:01            | 10:54                |
| 5/10/2009   |             | x           |                   |                 |                      |
| 5/11/2009   | x           |             | 2:27              | 13:31           | 10:21                |
| 5/12/2009   |             | x           |                   |                 |                      |
| 5/13/2009   |             | x           |                   |                 |                      |
| 5/14/2009   | x           |             | 2:48              | 15:01           | 12:11                |
| 5/15/2009   | x           |             | 3:52              | 13:38           | 9:06                 |
| 5/16/2009   | x           |             | 1:54              | 8:33            | 6:39                 |
| 5/17/2009   |             | x           |                   |                 |                      |
| 5/18/2009   | x           |             | 2:18              | 9:48            | 6:43                 |
| 5/19/2009   |             | x           |                   |                 |                      |
| 5/20/2009   |             | x           |                   |                 |                      |
| 5/21/2009   |             | x           |                   |                 |                      |
| 5/22/2009   | x           |             | 2:31              | 14:40           | 11:17                |
| 5/23/2009   | x           |             | 2:31              | 16:01           | 12:44                |
| 5/24/2009   |             | x           |                   |                 |                      |
| 5/25/2009   | x           |             | 2:53              | 9:25            | 6:23                 |
| 5/26/2009   |             | x           |                   |                 |                      |

|           |   |   |      |       |       |
|-----------|---|---|------|-------|-------|
| 5/27/2009 |   | x |      |       |       |
| 5/28/2009 | x |   | 2:35 | 14:55 | 12:19 |
| 5/29/2009 | x |   | 2:24 | 13:59 | 11:34 |
| 5/30/2009 | x |   | 2:09 | 15:25 | 12:32 |
| 5/31/2009 |   | x |      |       |       |
| 6/1/2009  | x |   | 2:20 | 10:02 | 6:51  |
| 6/2/2009  |   | x |      |       |       |
| 6/3/2009  |   | x |      |       |       |
| 6/4/2009  | x |   | 2:48 | 15:31 | 12:18 |
| 6/5/2009  | x |   | 2:39 | 15:54 | 11:58 |
| 6/6/2009  |   | x |      |       |       |
| 6/7/2009  |   | x |      |       |       |
| 6/8/2009  |   | x |      |       |       |
| 6/9/2009  |   | x |      |       |       |
| 6/10/2009 |   | x |      |       |       |
| 6/11/2009 |   | x |      |       |       |
| 6/12/2009 |   | x |      |       |       |
| 6/13/2009 |   | x |      |       |       |
| 6/14/2009 |   | x |      |       |       |
| 6/15/2009 |   | x |      |       |       |
| 6/16/2009 |   | x |      |       |       |
| 6/17/2009 |   | x |      |       |       |
| 6/18/2009 |   | x |      |       |       |
| 6/19/2009 |   | x |      |       |       |
| 6/20/2009 |   | x |      |       |       |
| 6/21/2009 |   | x |      |       |       |
| 6/22/2009 | x |   | 5:15 | 11:22 | 5:29  |
| 6/23/2009 |   | x |      |       |       |
| 6/24/2009 |   | x |      |       |       |
| 6/25/2009 |   | x |      |       |       |
| 6/26/2009 | x |   | 3:00 | 13:16 | 9:32  |

**END OF REPORT**