



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

**Cranbury, New Jersey**

**HWY14MH012**

(16 pages)

**NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF HIGHWAY SAFETY  
WASHINGTON, D.C.**

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

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**A. CRASH INFORMATION**

Location: New Jersey Turnpike (I-95) Northbound near milepost 71.4;  
Cranbury, Middlesex County, New Jersey

Vehicle #1: 2011 Peterbilt tractor in combination with a 2003 Great Dane semitrailer

Operator #1: Wal-Mart Transportation, LLC

Vehicle #2: 2012 Mercedes Sprinter Van

Operator #2: Atlantic Transportation Services, LLC

Vehicle #3: 2011 Buick Enclave

Vehicle #4: 2011 Ford F150 pickup

Vehicle #5: 2005 Nissan Altima

Vehicle #6: 2006 Freightliner tractor in combination with a 2001 Utility semitrailer

Operator #6: 4 Way Transport, LLC

Date: June 7, 2014

Time: Approximately 1:00 a.m. EDT

NTSB #: **HWY14MH012**

**B. HUMAN PERFORMANCE FACTORS GROUP**

Dennis Collins, Senior Human Performance Investigator, Group Chairman  
NTSB Office of Highway Safety  
490 L'Enfant Plaza East, S.W., Washington, DC 20594

**C. CRASH SUMMARY**

For a summary of the crash, refer to the *Crash Summary Report* in the docket for this investigation.

## D. DETAILS OF THE HUMAN PERFORMANCE FACTORS INVESTIGATION

The crash discussed in this report involves the collision of a 2011 Peterbilt tractor in combination with a 2003 Great Dane semitrailer (hereafter the 2011 Peterbilt) and a 2012 Mercedes Sprinter Van (hereafter the 2012 Mercedes). The 2011 Peterbilt did not slow for traffic ahead and struck the rear of the 2012 Mercedes. Subsequently, there were less severe impacts involving four additional vehicles.

The Human Performance factual investigation focused on the behavioral, medical, operational, and environmental factors associated with the driver of the 2011 Peterbilt. Due to the circumstances of the crash, human performance factors associated with the drivers of the 2012 Mercedes and the other four vehicles will not be discussed in this report.

### 1. Factors Associated with the 2011 Peterbilt Driver

Following the crash, the 2011 Peterbilt driver was charged by the Middlesex County Prosecutor with death by auto and assault by auto and retained legal representation. NTSB investigators attempted to interview the driver; however, due to the pending criminal charges, the driver declined to be interviewed via his attorney. As a result, limited information on the driver was available to investigators.

The limited information developed came from the driver's logbook,<sup>1</sup> records from his cell phone service provider,<sup>2</sup> information from his employer,<sup>3</sup> information from the New Jersey State Police, and records from commercial medical examiners.<sup>4</sup>

#### 1.1. Behavioral Factors

##### 1.1.1. Activities Prior to the Crash

Using the above-mentioned sources of information, investigators generated Table 1. All times in the table are in Eastern Daylight Time (EDT) unless otherwise noted.

**Table 1** 2011 Peterbilt driver activities prior to the crash

Wednesday, June 4, 2014		
<u>Time</u>	<u>Event</u>	<u>Source</u>
N/A	Off-duty for entire day	E-log
7:42 a.m.	Driver makes outgoing call; first of day	Cell Records
4:59 p.m.	Driver makes outgoing call; last of day	Cell Records
5:10 p.m.	Call ends	Cell Records

<sup>1</sup> Please see the attachments to the Motor Carrier Group Chairman's Report in the docket.

<sup>2</sup> Human Performance Factual Report Attachment 1: 2011 Peterbilt Driver's Cellular Telephone Records.

<sup>3</sup> Includes electronic logs and video surveillance; please see the attachments to the Motor Carrier Group Chairman's Report in the docket.

<sup>4</sup> Human Performance Factual Report Attachment 2: 2011 Peterbilt Driver's Medical Examination for Commercial Driver Fitness Determination Forms.

Thursday, June 5, 2014 (continued)		
<u>Time</u>	<u>Event</u>	<u>Source</u>
12:00 midnight	Off-duty for entire day	E-log
12:55 p.m.	Driver makes outgoing call; first of day	Cell Records
3:55 p.m.	Driver makes outgoing call; last before reported time of nap	Cell Records
3:56 p.m.	Call ends	Cell Records
8:32 p.m.	Driver makes outgoing call; first after reported nap	Cell Records
8:33 p.m.	Call ends	Cell Records
11:18 p.m.	Driver makes outgoing call	Cell Records
11:23 p.m.	Call ends	Cell Records
11:25 p.m.	Driver makes outgoing call; last of day	Cell Records
11:47 p.m.	Call ends	Cell Records
Friday, June 6, 2014		
<u>Time</u>	<u>Event</u>	<u>Source</u>
12:57 a.m.	Driver receives incoming call; first of day	Cell Records
12:58 a.m.	Call ends	Cell Records
6:02 a.m.	Driver makes outgoing call	Cell Records
6:03 a.m.	Call ends	Cell Records
9:05 a.m.	Driver makes outgoing call	Cell Records
9:05 a.m.	Call ends	Cell Records
9:33 a.m.	Driver receives incoming call	Cell Records
9:34 a.m.	Call ends	Cell Records
9:41 a.m.	Driver receives incoming call	Cell Records
9:42 a.m.	Call ends	Cell Records
10:06 a.m.	Driver receives incoming call	Cell Records
10:12 a.m.	Call ends	Cell Records
10:58 a.m.	Driver arrives at Smyrna, DE terminal	Security Tapes
11:06 a.m.	Driver gets paperwork in break room	Security Tapes
11:23 a.m.	Driver makes outgoing call	Cell Records
11:39 a.m.	Call ends	Cell Records
11:43 a.m.	Driver picks up trailer	Security Tapes
11:56 a.m.	Driver departs Wal-Mart terminal	Security Tapes
12:24 p.m.	Driver receives incoming call	Cell Records
12:34 p.m.	Call ends	Cell Records
12:39 p.m.	Driver makes outgoing call	Cell Records
12:49 p.m.	Call ends	Cell Records
12:59 p.m.	Driver makes outgoing call	Cell Records
1:01 p.m.	Call ends	Cell Records
1:38 p.m.	Driver arrives at Cherry Hill, NJ Wal-Mart	E-log
1:38 p.m.	Driver begins unscheduled break	E-log
1:40 p.m.	Driver makes outgoing call	Cell Records
1:42 p.m.	Call ends	Cell Records
1:54 p.m.	Driver departs Cherry Hill for distribution center	E-log
2:29 p.m.	Driver makes outgoing call	Cell Records
2:29 p.m.	Call ends	Cell Records
2:30 p.m.	Driver makes outgoing call	Cell Records
2:30 p.m.	Call ends	Cell Records
2:31 p.m.	Driver receives incoming call	Cell Records
2:41 p.m.	Call ends	Cell Records
2:42 p.m.	Driver makes outgoing call	Cell Records
2:44 p.m.	Call ends	Cell Records
3:58 p.m.	Driver arrives at distribution center, swaps trailers	E-log
5:09 p.m.	Driver departs distribution center for Vineland, NJ	E-log
6:46 p.m.	Driver arrives at Vineland, NJ Wal-Mart	E-log

Friday, June 6, 2014 (continued)		
<u>Time</u>	<u>Event</u>	<u>Source</u>
6:55 p.m.	Driver takes break at Vineland, NJ	E-log
7:15 p.m.	Driver makes outgoing call	Cell Records
7:22 p.m.	Call ends	Cell Records
7:25 p.m.	Driver makes outgoing call	Cell Records
7:26 p.m.	Call ends	Cell Records
7:34 p.m.	Driver departs Vineland, NJ Wal-Mart for distribution center	E-log
7:46 p.m.	Driver receives incoming call	Cell Records
7:46 p.m.	Call ends	Cell Records
8:11 p.m.	Driver makes outgoing call	Cell Records
8:20 p.m.	Call ends	Cell Records
9:07 p.m.	Driver arrives at distribution center	E-log
9:56 p.m.	Driver departs distribution center for Levittown, PA	E-log
11:54 p.m.	Event recorder last event showing speed of 65.0 MPH	Cummings Engine Download
11:56 p.m.	Driver arrives at Levittown, PA Wal-Mart	E-Log
Saturday, June 7, 2014		
<u>Time</u>	<u>Event</u>	<u>Source</u>
12:02 a.m.	Driver uses cell phone; direction undetermined	Cell Records
12:08 a.m.	Call ends	Cell Records
12:20 a.m.	Driver leaves Levittown, PA Wal-Mart for Perth Amboy, NJ	E-log
12:54 a.m.	Vehicle systems indicate incident	Cummings Engine Download
12:59 a.m.	Driver places outgoing call to 911	Cell Records
<b>1:00 a.m.</b>	<b>Police-reported time of crash</b>	Police Report

## 1.2. Medical Factors

Information in this section is based on records obtained from the driver's commercial medical examiners.<sup>5</sup> A canvas of pharmacies and medical providers near the driver's reported residence in Jonesboro, Georgia and near the hotel where he regularly stayed in Smyrna, Delaware<sup>6</sup> found no records in the driver's name. The driver's personal physicians could not be identified as a result of the driver declining to be interviewed.

### 1.2.1. General Health

The 2011 Peterbilt driver was a 35 year-old male. According to his most recent Department of Transportation commercial driver physical examination (DOT Physical Exam),<sup>7</sup> the driver's height was recorded as 69 inches and his weight was recorded as 209 pounds. This corresponds to a Body Mass Index (BMI) of 30.9.<sup>8</sup>

### 1.2.2. Department of Transportation Commercial Driver Physical Examination

Commercial drivers in the United States are required by the Federal Motor Carrier Safety Regulations (FMCSRs) to be medically certified as being physically qualified to drive a

<sup>5</sup> See Human Performance Factual Report Attachment 2.

<sup>6</sup> Investigators determined the driver maintained a temporary residence at a hotel near the Wal-Mart distribution center. For additional details, please see the Motor Carrier Factors Group Chairman's Factual Report in the docket.

<sup>7</sup> See section 1.2.2 for details.

<sup>8</sup> For BMI information, see: [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html).

commercial vehicle.<sup>9</sup> These examinations result in one of four outcomes with respect to medical qualification:

- The driver is found to meet the standards in 49 CFR §391.41 and is given a 2-year certificate;<sup>10</sup>
- The driver is found to meet the standards, but requires periodic evaluation for one or more conditions and is qualified for 3 months, 6 months, or 1 year;
- The driver is temporarily disqualified due to a condition or medication; or;
- The driver is found to not meet the standards.

### 1.2.2.1. Most Recent DOT Physical Exam

The 2011 Peterbilt driver's most recent DOT Physical Exam was in December of 2013 by a physician in Dover, Delaware.<sup>11</sup> In that exam, the driver indicated "NO" to all items in the health history section and did not indicate he was taking any medications, including over-the-counter (OTC) medications. In the comments section, the medical examiner indicated the driver took no medications, did not smoke, had a surgical release of his left wrist tendon in 2007 with no current complaint, and had no other past medical/surgical history.

The driver's Snellen visual acuity<sup>12</sup> was recorded as 20/15 with his right eye, 20/15 with his left eye, and 20/13 with both eyes. His horizontal field of vision was recorded as 130 degrees with both the left and right eyes. It was noted the driver correctly distinguished between red, green, and amber colors 14 times in 14 attempts. He was noted as not having monocular vision.

With respect to hearing, an audiometer was used to check the driver's hearing. It was noted the driver had the following hearing loss (in decibels):

**Table 2** Driver Hearing Loss as Measured During Most Recent CDL Medical Exam

Right Ear		Left Ear	
Frequency (Hz)	Hearing Loss (dB)	Frequency (Hz)	Hearing Loss (dB)
500	5	500	5
1000	5	1000	5
2000	0	2000	5
Average	3.3	Average	5

The driver's blood pressure was recorded as 138/81 and his pulse rate was 62. Urinalysis showed no leukocytes, nitrites, protein, blood, ketone bodies, bilirubin, or glucose.

<sup>9</sup> 49 Code of Federal Regulations §391.41.

<sup>10</sup> For more information on who must be examined and the examination process, please see 49 CFR §391.43 and 49 CFR §391.45.

<sup>11</sup> See Human Performance Attachment 2.

<sup>12</sup> Snellen fractions are a measure of visual acuity (sharpness of sight). In the Snellen fraction, the first number represents the test distance (20 feet) and the second represents the distance at which the average eye could see the letters on a certain line of the chart. A fraction of 20/20 is considered normal vision.

The performing physician did not note any abnormalities in any of the driver's body systems. The physician indicated in his notes a normal exam and that the driver was slightly overweight. The driver was qualified for two years.

#### **1.2.2.2. Previous DOT Physical Exam**

Investigators located a prior DOT Physical Exam for this driver, performed in May of 2013 by a physician in Orlando, Florida.<sup>13</sup> In that exam, the driver indicated "NO" to all items in the health history section and did not indicate he was taking any medications, including over-the-counter (OTC) medications. The performing physician noted a history of surgery in 2007 for tendonitis repair of the left wrist with intact range of motion and no residual issues reported. The physician also notes the driver is not taking any medications.

The driver's Snellen visual acuity<sup>14</sup> was recorded as 20/20 with his right eye, 20/20 with his left eye, and 20/20 with both eyes. His horizontal field of vision was recorded as 85 degrees with both the left and right eyes. It was noted the driver correctly distinguished between red, green, and amber colors. He was noted as not having monocular vision.

With respect to hearing, the driver was noted to be able to hear a forced whispered voice at a distance of five feet with the right ear and at a distance of five feet with the left ear.

The driver's blood pressure was recorded as 139/89 and his pulse rate was 70 and regular. Urinalysis showed no protein, blood, or glucose.

The physical exam noted no abnormalities in any of the driver's body systems. His height was recorded as 71 inches and his weight was recorded as 216 pounds, which corresponds to a BMI of 30.1. The driver was qualified for two years.

#### **1.2.3. Vision**

The driver declined to be interviewed by NTSB investigators and therefore did not provide any information about his vision. The driver's two most recent CDL medical exams did not reveal any vision problems.

#### **1.2.4. Hearing**

As a result of the driver declining to be interviewed by NTSB investigators, no information was gathered from him on his hearing. The driver's two most recent CDL medical exams did not reveal any vision problems.

#### **1.2.5. Medications (Prescription, Over-the-Counter, Other)**

The driver declined to be interviewed and therefore did not provide any information on medications he takes regularly or any information on medications he took in the days prior to the

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<sup>13</sup> See Human Performance Factual Report Attachment 2.

<sup>14</sup> Snellen fractions are a measure of visual acuity (sharpness of sight). In the Snellen fraction, the first number represents the test distance (20 feet) and the second represents the distance at which the average eye could see the letters on a certain line of the chart. A fraction of 20/20 is considered normal vision.

accident. The driver's two most recent CDL medical exams both indicated he was not taking any medications.<sup>15</sup>

### **1.2.6. Alcohol and Drug Consumption**

The driver declined to be interviewed and provided no information on his alcohol and/or drug consumption.

### **1.2.7. Post-crash Toxicology<sup>16</sup>**

Following the crash, the 2011 Peterbilt driver provided a urine sample on June 7, 2014 for toxicological testing in accordance with Department of Transportation (DOT) regulations. The driver's sample was tested for marijuana, cocaine, amphetamines, opiates, 6-Monoacetylmorphine, PCP, and Ecstasy. The testing resulted in negative results for all substances.

The driver also underwent a breath alcohol test on June 7, 2014 at 8:46 a.m. local time, approximately seven hours and 46 minutes after the crash. The test was administered under DOT regulations using a Lifeloc Technologies Phoenix 6.0 testing device with software version 8.1.10. The test resulted in a reading of 0.000.

### **1.2.8. Psychological Factors**

The driver declined to be interviewed and did not provide any information regarding stress or recent life changes.

### **1.2.9. Sleep Habits**

The driver declined to be interviewed and as a result, no information could be gathered on his regular sleep habits or the quality of his sleep.

As documented in the police crash report,<sup>17</sup> the driver of the 2011 Peterbilt stated to a responding State Trooper "I fell asleep". Subsequently, the driver was transported to the Cranbury State Police Station and provided a second statement. Citing the pending criminal charges, the prosecutor has declined to provide any documentation of that interview.

On Tuesday, June 5, 2014, the driver was at his residence in Jonesboro, Georgia. Video surveillance from the Wal-Mart shows the driver arriving there at 10:58 a.m. on June 6, 2014. The estimated driving time from his residence to the distribution center ranges from 11 hours and 49 minutes to 13 hours and 18 minutes.<sup>18</sup> As a result of the driver declining to be interviewed, no additional information on his activities prior to arriving at the Wal-Mart facility in Delaware was obtained.

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<sup>15</sup> See Human Performance Factual Report Attachment 2.

<sup>16</sup> Please see the attachments to the Motor Carrier Group Chairman's Factual Report in the docket.

<sup>17</sup> Please see the New Jersey Police Crash Investigation Report in the docket for both driver statements.

<sup>18</sup> Estimates generated using MapQuest; <http://www.mapquest.com/>.



The complaint warrant against the driver charges him with operating his vehicle recklessly, specifically by operating his vehicle without having slept for a period in excess of 24 hours resulting in a motor vehicle accident.<sup>19</sup>

### **1.3. Operational Factors**

#### **1.3.1. Licensing**

The driver of the 2011 Peterbilt held a Florida Class A CDL with the "T" and "X" endorsements<sup>21</sup> and no restrictions at the time he was hired by Wal-Mart. His Florida license was issued in March of 2010 and would have expired in December of 2016. The driver surrendered his Florida license when he obtained a Georgia license.

At the time of the crash, the driver of the 2011 Peterbilt held a Georgia Class A<sup>20</sup> Georgia commercial driver's license (CDL) with the "T" and "X" endorsements<sup>21</sup> and no restrictions, issued in April of 2014 and expiring in December of 2017.

Due to the driver declining to be interviewed, no information on when he first obtained a license of any kind and when he first obtained a commercial license was available.

#### **1.3.2. Training / Experience**

In his application for employment with Wal-Mart, the driver of the 2011 Peterbilt listed two previous positions as a commercial driver.<sup>22</sup> These two positions consisted of a total of approximately 3 years of driving experience. The driver was hired by Wal-Mart in his current position in February of 2014, and therefore had approximately four months experience working for Wal-Mart.

As part of his employment, the driver completed training in February 2014 on the following subjects:

- Collision avoidance system;
- Distracted driving policy;
- Drug & alcohol awareness;
- Electronic onboard recording; and
- Hours of service.

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<sup>19</sup> Human Performance Factual Report Attachment 3: Complaint Warrant.

<sup>20</sup> The Georgia Class A CDL is required to operate a combination vehicle with a Gross Vehicle Weight Rating (GVWR) of 26,001 or more pounds, if the trailer(s) has a GVWR of 10,001 pounds. It allows the operation of all lesser vehicles, except motorcycles, with the proper endorsements.

<sup>21</sup> The "T" endorsement allows the operation of Double/Triple-Trailers and the "X" endorsement allows the operation of Tank Vehicles and placarded Hazardous Material hauling.

<sup>22</sup> For more detail, please see the Motor Carrier Group Chairman's Factual report in the docket.

### **1.3.3. Crash / License History**

A check of the 2011 Peterbilt driver's driving history with the state of Florida<sup>23</sup> indicated he surrendered his license to the state of Georgia in April of 2014. A check of the 2011 Peterbilt driver's driving history with the state of Georgia<sup>24</sup> indicated he first received a Georgia driver's license in April of 2014; this was a commercial license. Georgia shows his medical certification expiring in December of 2015. No driver history was on file.

A check with the National Driver Register Problem Driver Pointer System (NDR PDPS) did not show the driver as suspended or revoked.<sup>25</sup>

### **1.3.4. Crash Trip**

At the time of the crash, the 2011 Peterbilt was en route from a Wal-Mart location in Levittown, Pennsylvania to a Morton Salt Company location in Perth Amboy, New Jersey. The approximate distance to travel would have been 51 miles. According to the driver's e-log,<sup>26</sup> he departed Levittown at 12:20 a.m. and the crash occurred at 12:54 a.m. At the time of the crash, the 2011 Peterbilt had traveled approximately 25 miles of that 51 mile distance and had approximately 26 miles to go.

Due to the driver declining to be interviewed, no information on his experiences leading up to the crash could be gathered.

### **1.3.5. Workload / Distraction**

As a result of the driver declining to be interviewed, no information could be gathered directly from him on his workload and distraction as he approached the crash scene. The 2011 Peterbilt driver was in possession of his personal telephone at the time of the crash; records from his service provider indicate he was not using his phone at or near the time of the crash.<sup>27</sup>

As detailed below and in the Highway Factors Group Chairman's Factual Report, the accident occurred at the edge of traffic congestion resulting from a construction project north of the crash location. The NTSB Highway Factors Group Chairman<sup>28</sup> travelled the approach to the accident scene and did not note any unusual or distracting features in the environment at the crash scene. Video from the dashboard camera of a NJSP car responding to the accident was reviewed. The roadway was observed to be straight and level approaching the location of the crash. Roadway markings, such as lane and shoulder lines, were clear and visible. Cultural lighting was observed to both sides of the roadway.

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<sup>23</sup> Human Performance Factual Report Attachment 4: Florida Driver Record for 2011 Peterbilt Driver.

<sup>24</sup> Human Performance Factual Report Attachment 5: Georgia Driver Record for 2011 Peterbilt Driver.

<sup>25</sup> Human Performance Factual Report Attachment 6: National Driver Register Report for 2011 Peterbilt Driver.

<sup>26</sup> Please see the attachments to the Motor Carrier Group Chairman's Factual Report in the docket.

<sup>27</sup> See Human Performance Attachment 1.

<sup>28</sup> The Human Performance Factors investigator was not sent to the crash scene.

## 2. Other Factors

### 2.1. Environmental Factors

#### 2.1.1. Accident Location

Investigators were provided the following Global Positioning System (GPS) coordinates for the crash scene:

Latitude: 40.352950 N

Longitude: 74.471925 W

#### 2.1.1. Construction/Work Zone

At the time of the crash, contractors were performing work on a large, overhead sign approximately 2.7 miles north (ahead, in the direction of travel of the 2011 Peterbilt AT MP 74.1) of the crash location. In the vicinity of this sign work, the right and center lanes of the roadway were closed. Various steps were taken to direct traffic away from the closed lanes, into the remaining open lane.<sup>29</sup> A traffic queue had formed; the crash occurred at the end of this queue. Various advisory, warning, and regulatory signs and devices were employed to inform motorists of the lane closures. The signs placed prior to the crash location are listed in Table 3.

**Table 3** Construction-related Signs South of Crash Location

Mile Post	Signage	Distance Before Crash
71.4	N/A (Crash location)	0.0 miles
71.0	2 signs; "Speed Limit 45", one placed on each side of road	0.4 miles
70.6	Black and white regulatory signs, "Traffic Fines Doubled"	0.8 miles
70.5	2 warning signs, " Right 2 Lanes Closed Ahead", one on each side for road	0.9 miles
49	Overhead Variable Message Sign (VMS) reduces speed limit from 65 MPH to 55 MPH	22.4 miles

#### 2.1.2. Astronomical Factors

Using the GPS coordinates listed above, astronomical data for the crash location and date was downloaded from the United States Naval Observatory (USNO).<sup>30</sup> According to the USNO, at 1:00 a.m. on June 7, 2014 in Cranbury, NJ, the moon was at an altitude of 8.4, an azimuth of 258.5 east of true north, and was 0.63 illuminated.

<sup>29</sup> For complete details, please see the Highway Factors Group Chairman's Factual Report in the docket.

<sup>30</sup> <http://www.usno.navy.mil/USNO/astronomical-applications>

### 2.1.3. Weather

Historical data for weather station KNJCRA3, located on Dey Road in Cranbury, New Jersey, approximately four miles from the crash site, was retrieved and examined. Observations for June 7, 2014 near the time of the accident are shown in the table below.<sup>31</sup>

**Table 4** Weather Data from KNJCRA3

Time (EDT)	12:50 a.m.	1:00 a.m.	1:05 a.m.
Temperature	57.6° F	57.5° F	57.5° F
Heat Index	N/A	N/A	N/A
Dew Point	53.5° F	53.4° F	53.6° F
Humidity	82%	82%	83%
Pressure	29.95 in	29.95 in	29.95 in
Rainfall Rate	0.00	0.00	0.00
Wind Dir.	Calm	Calm	Calm
Wind Speed	6.9 mph	6.9 mph	5.8 mph
Wind Gust Speed	N/A	N/A	N/A
Precipitation	N/A	N/A	N/A
Conditions	Clear	Clear	Clear

### 2.2. 2011 Peterbilt Driver's Residence

Investigators attempted to confirm the driver's place of residence in Jonesboro, Georgia. Investigators visited eight houses located adjacent to or on the same street as the driver's reported residence. One house was vacant; no contact was made with the resident in one house, despite repeated attempts; the residents of three houses stated they did not know the driver or his family and could not provide any information; and the residents of three houses indicated the driver and his family had lived in the house for five or six months.<sup>32</sup> All three neighbors reported limited interaction with the driver - some only having seen the driver once - but substantially more with his family. One neighbor reported he had last seen the driver's car on Thursday, June 5th. Another was able to provide a name and telephone number for the driver's wife.

Investigators searched public property records and determined the driver's residence was a rental property. Investigators then contacted utility providers and determined water service remained in the name of the property owner; electrical service was in the name of a person with the same surname as the driver; and cable service was in the name of a person similar to the name on the electrical service account but with a different surname than the driver.<sup>33</sup>

### 2.3. 2011 Peterbilt Driver's Regular Schedule

From a review of the 2011 Peterbilt driver's log books performed by the Motor Carrier Factors Group Chairman,<sup>34</sup> it was seen that the driver did not work on Thursdays from May 8, 2014 through June 5, 2014. In addition, the driver did not work on Wednesday, June 4, 2014. Hotel records indicate the driver stayed at a hotel in Smyrna, Delaware on May 8th, 15th, 22nd,

<sup>31</sup> Data obtained from <http://www.wunderground.com>.

<sup>32</sup> See Human Performance Factual Report Attachment 7: Narratives of Investigative Interviews.

<sup>33</sup> See Human Performance Factual Report Attachment 8: Property and Utility Records (Official Use Only).

<sup>34</sup> Please see the Motor Carrier Factors Group Chairman's Report for additional details.

and 29th. According to his logbooks, it was the driver's normal practice to utilize the sleeper berth when sleeping between adjacent shifts.

#### **2.4. 2012 Mercedes Driver Statement**

Following the crash, the driver of the 2011 Mercedes provided a written statement to the New Jersey State Police. In that statement, the Mercedes driver said he had seen the 2011 Peterbilt near exit six and described it as swerving in the right lane, then moving left without using a signal. The 2011 Mercedes passed the 2011 Peterbilt and continued until the crash occurred.

NTSB investigators also interviewed the driver of the 2011 Mercedes. In that interview, the driver stated that he came up on the Wal-Mart truck between exits four and five. Both vehicles were in the right lane and the 2011 Mercedes driver stated he saw the Wal-Mart truck “wobble”. The Wal-Mart truck wobbled a second time and went “completely to the left”. The 2011 Mercedes passed the Wal-Mart truck on the right after it went left. The Mercedes driver estimated this was approximately 10 minutes before the crash.

#### **2.5. Physical Evidence**

Following the crash, the NTSB Vehicle Factors Group Chairman conducted a detailed mechanical inspection of the 2011 Peterbilt. That inspection included removal of the truck's steering gear box, which was subsequently disassembled and examined. The examination concluded the steering gear had sustained an impact load when the steering wheel was rotated 170 degrees into a left steer, which would have corresponded to the front wheels being at an angle of 8.3 degrees to the left at the time the gear was subject to the impact load.<sup>35</sup>

The NTSB Technical Reconstruction Group Chairman examined the physical evidence (including vehicle damage and roadway evidence) from the accident scene following the crash and was able to determine the 2011 Peterbilt was oriented approximately six degrees toward the left, relative to the travel lane, at impact and was also partially in the left lane. Friction marks, consistent with a brake application, were also found.<sup>36</sup>

Staff notes the New Jersey State Police indicate in the crash investigation report that the driver of the 2011 Peterbilt attempted to avoid the collision by swerving to the left.<sup>37</sup>

### **3. Literature Review**

#### **3.1. Human Sleepiness and Fatigue**

Sleep is the naturally periodic suspension of consciousness during which the powers of the body are restored.<sup>38</sup> The length of sleep that an individual needs each night is difficult to

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<sup>35</sup> For additional information on the vehicles involved in this crash, please see the Vehicle Factors Group Chairman's Factual Report in the docket.

<sup>36</sup> For additional information on the Technical Reconstruction, please see the corresponding factual reports in the docket.

<sup>37</sup> Please see the New Jersey Police Crash Investigation Report in the docket.

determine, as it varies with genetics, circadian timing, and sleep debt, among other factors.<sup>39</sup> The National Sleep Foundation believes that adults (over age 17) typically need between 7 and 9 hours of sleep a night,<sup>40</sup> a belief generally shared by the scientific community. Obtaining less sleep than needed results in the development of fatigue; as fatigue increases, performance decreases and can result in impairment.

Factors other than the quantity of sleep can affect the development of fatigue. Some systems in the human body fluctuate in cycles of approximately 24 hours. Called “circadian rhythms”, affected systems include body temperature, heart rate, blood pressure, hormone excretion, and “sleepiness”, among others.<sup>41</sup> At low points in this cycle, subjective sleepiness is most pronounced and human performance is most degraded.<sup>42</sup> Although the major circadian low is in the early hours (2:00 to 6:00 a.m.), a second low (the “post-lunch dip”) occurs from 2:00 p.m. to 4:00 p.m.<sup>43</sup> In addition to low points in the circadian rhythms, fatigue issues can arise when a person's schedule is in conflict with their circadian rhythms. This is called circadian dysrhythmia and typically occurs as a result of shift work.

The length of time a person has been awake and their time on task have been associated with increased fatigue and accident risk. Continuous time awake exceeding 16 hours has been found to result in psychomotor deficits equivalent to those seen in individuals with blood alcohol content (BAC) values between 0.05% and 0.1%.<sup>44</sup> With respect to time on task, studies have shown that the risk of an accident increases exponentially beyond the 8th or 9th hour at work.<sup>45</sup>

Many medical conditions can result in increased fatigue; of particular concern for commercial drivers is Obstructive Sleep Apnea, or OSA.<sup>46</sup> A joint task force of the American College of Chest Physicians, American College of Occupational and Environmental Medicine,

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<sup>38</sup> Merriam-Webster Dictionary, available at <http://www.merriam-webster.com/dictionary/sleep>, accessed September 12, 2014.

<sup>39</sup> M. Carskadon and W. Dement. (2005). “Normal Human Sleep: An Overview”. In M. Kryger, T. Roth, and W. Dement, (eds.) *Principles and Practice of Sleep Medicine, 4<sup>th</sup> Edition*. Elsevier-Sanders: Philadelphia, Pennsylvania.

<sup>40</sup> National Sleep Foundation, "How Much Sleep Do We Really Need?" Available at <http://www.sleepfoundation.org/article/how-sleep-works/how-much-sleep-do-we-really-need>. Accessed November 23, 2010.

<sup>41</sup> K. Kroemer, H. Kroemer, and K. Kroemer-Elbert, *Engineering Physiology: Bases of Human Factors/Ergonomics*, 2<sup>nd</sup> ed. New York: Van Nostrand Reinhold, 1990, p.176.

<sup>42</sup> H.P.A. Van Dongen, and D. Dinges, “Circadian Rhythms in Sleepiness, Alertness, and Performance”, In M. H. Kryger, T. Roth and W.C. Dement (Eds.) *Principles and Practice of Sleep Medicine, 4<sup>th</sup> Edition* (March 2005).

<sup>43</sup> R. Dewar and P. Olson, *Human Factors in Traffic Safety*, 2<sup>nd</sup> edition. Tuscon, AZ: Lawyers & Judges Publishing Company, Inc., 2007, p. 108.

<sup>44</sup> (a) D. Dawson and K. Ried. "Fatigue, alcohol, and performance impairment". *Nature* 1997, Vol. 388, p. 235; (b) A. M. Williamson and A. M. Feyer. "Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication". *Occupational and Environmental Medicine*, 2000, Vol. 57, pp. 649-655.

<sup>45</sup> K. Hanecke, S. Tiedemann, F. Nachreiner, and H. Crzech-Sukalo. "Accident risk as a function of hour at work and time of day as determined from accident data and exposure models for the German working population: *Scandinavian Journal of Work, Environment, and Health*, 1998, No. 24 supplement 3, pp. 43-48.

<sup>46</sup> Obstructive Sleep Apnea is a medical condition characterized by repetitive episodes of upper airway obstruction that occur during sleep, usually associated with a reduction in blood oxygen saturation. American Academy of Sleep Medicine (2001). *The International Classification of Sleep Disorders, Revised: Diagnostic and Coding Manual*. Westchester, Illinois: American Academy of Sleep Medicine, pp. 52–8.

and the National Sleep Foundation indicated that a Body Mass Index (BMI) greater than or equal to 35 is one warning suggesting an individual needs to be screened for OSA.<sup>47</sup> The Federal Motor Carrier Safety Administration (FMCSA) Medical Review Board (MRB) has recommended OSA screening for all drivers with a BMI over 30, among other criteria.<sup>48</sup>

When humans are impaired by fatigue, they are more susceptible to lapses in judgment and performance errors related to slowed reaction time,<sup>49</sup> reduced vigilance,<sup>50</sup> sustained attention,<sup>51</sup> lane tracking ability,<sup>52</sup> and impaired cognitive processing.<sup>53</sup> As an individual becomes increasingly sleep deprived, sleep propensity increases and the individual may experience microsleeps.<sup>54</sup> Research has shown that individuals are not good at predicting either their levels of fatigue or at predicting the onset of microsleeps before they occur.<sup>55</sup> Mood changes, including increased sleepiness, fatigue, irritability, difficulty concentrating, and disorientation are commonly reported during periods of sleep loss.<sup>56</sup>

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<sup>47</sup> N. Hartenbaum and others, "Sleep Apnea and Commercial Motor Vehicle Operators: Statement from the Joint Task Force of the American College of Chest Physicians, American College of Occupational and Environmental Medicine, and the National Sleep Foundation," *Journal of Occupational and Environmental Medicine*, vol. 48, no. 9 (supplement) (2006), pp. S4-37.

<sup>48</sup>Federal Motor Carrier Administration Office of Medical Programs. *Medical Review Board Meeting Summary, January 28, 2008*. Accessed on April 25, 2012. Available from: [http://www.mrb.fmcsa.dot.gov/documents/Final\\_Meeting\\_Minutes\\_Jan\\_2808\\_MRB\\_Meeting\\_Revised\\_Updated\\_9\\_3008.pdf](http://www.mrb.fmcsa.dot.gov/documents/Final_Meeting_Minutes_Jan_2808_MRB_Meeting_Revised_Updated_9_3008.pdf).

<sup>49</sup> (a) N. Kleitman (ed). "Deprivation of Sleep." *Sleep and Wakefulness*, 215-229, 1963; (b) H. Babkoff, T. Caspy, and M. Mikulincer. "Subjective sleepiness ratings: The effects of sleep deprivation, circadian rhythmicity and cognitive performance." *Sleep*, 14, 534-539, 1991.

<sup>50</sup> M. Glenville, R. Broughton, A. M. Wing, and R. T. Wilkinson. "Effects of sleep deprivation on short duration performance measures compared to the Wilkinson auditory vigilance task." *Sleep*, 1, 169-176, 1978.

<sup>51</sup> D. F. Dinges. "Performance effects of fatigue." *Proceedings of the NTSB/NASA Fatigue Symposium*, 41-46, 1995.

<sup>52</sup>N. Lamond and D. Dawson. "Quantifying the performance impairment associated with fatigue." *Journal of Sleep Research*, 8, 255-262, 1999.

<sup>53</sup> D. Dinges and N. Kribbs, "Performing While Sleepy: Effects of Experimentally Induced Sleepiness," in T. Monk, ed., *Sleep, Sleepiness, and Performance* (Chichester, UK: John Wiley & Sons, 1991), pp. 98–128.

<sup>54</sup> A microsleep is an episode lasting up to 30 seconds during which external stimuli are not perceived. Microsleeps are associated with excessive sleepiness and automatic behaviors. American Academy of Sleep Medicine, *International Classification of Sleep Disorders Diagnostic and Coding Manual*, page 343, 2001.

<sup>55</sup> L. Boyle and others, "Driver Performance in the Moments Surrounding a Microsleep," *Transportation Research, Part F, Traffic Psychology and Behavior*, vol. 11, no. 2 (March 2008), pp. 126-136.

<sup>56</sup> M. H. Bonnet. (2005). "Acute Sleep Deprivation". In M. Kryger, T. Roth, and W. Dement, eds. *Principles and Practice of Sleep Medicine, 4<sup>th</sup> Edition*. Elsevier-Sanders: Philadelphia, Pennsylvania.

## **E. DOCKET MATERIAL**

The following attachments are included in the docket for this investigation:

### LIST OF ATTACHMENTS

- Human Performance Attachment 1: 2011 Peterbilt Driver's Cellular Telephone Records
- Human Performance Attachment 2: 2011 Peterbilt Driver's Medical Examination for Commercial Driver Fitness Determination Forms
- Human Performance Attachment 3: Complaint Warrant
- Human Performance Attachment 4: Florida Driver Record for 2011 Peterbilt Driver
- Human Performance Attachment 5: Georgia Driver Record for 2011 Peterbilt Driver
- Human Performance Attachment 6: National Driver Register Report for 2011 Peterbilt Driver
- Human Performance Attachment 7: Narratives of Investigative Interviews
- Human Performance Attachment 8: Property and Utility Records (Official Use Only)<sup>57</sup>

### END OF REPORT

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<sup>57</sup> The provided documentation was stamped "CONFIDENTIAL" and therefore is placed in the Official Use Only side of the docket.