July 14, 2026 HIR-26-05

Multivehicle Work Zone Collision and Postcrash Fire on Interstate 95

Kenly, North Carolina
July 24, 2024

On Wednesday, July 24, 2024, about 1:22 p.m., a Freightliner combination vehicle operated by Leonard's Express was traveling north in the right lane of Interstate 95 (I-95) near Kenly, Wilson County, North Carolina.[1] The driver did not slow as the vehicle approached a slow-moving traffic queue that had formed due to a temporary work zone and lane closure about 1.7 miles north. The combination vehicle struck the rear of a slow-moving 2013 Chevrolet Tahoe at an estimated speed of 70 mph, resulting in a crash sequence that involved three other vehicles in the queue. A postcrash fire ensued and consumed the combination vehicle, which came to final rest in the left lane (see figure 1). Five people died and three sustained minor injuries.

Figure 1. Final rest position of Freightliner combination vehicle. (Source: Mangum Towing and Road Services)

[1] (a) In this report, all times are eastern daylight time. (b) Visit ntsb.gov to find additional information in the public docket for this NTSB accident investigation (case number HWY24MH010). Use the CAROL Query to search safety recommendations and investigations.

Location	I-95 North near Kenly, North Carolina (see figure 2)
Date	July 24, 2024
Time	1:22 p.m.
Involved vehicles	5 (2020 Freightliner combination vehicle, 2013 Chevrolet Tahoe sport utility vehicle, 2017 Toyota RAV4 sport utility vehicle, 2025 Kenworth T680 combination vehicle, 2014 International LF687 combination vehicle)
Involved people	8
Injuries	5 fatal (Chevrolet driver and 1 passenger, Toyota driver and 2 passengers) and 3 minor (Freightliner driver, Kenworth driver, and International driver)
Weather	Dry, clear, and daylight
Roadway information	4-lane divided highway with 2 northbound and 2 southbound lanes divided by a center earthen median. The left northbound lane was closed north of the crash location for tree clearing and mulching work in the median. The posted speed limit was 70 mph.

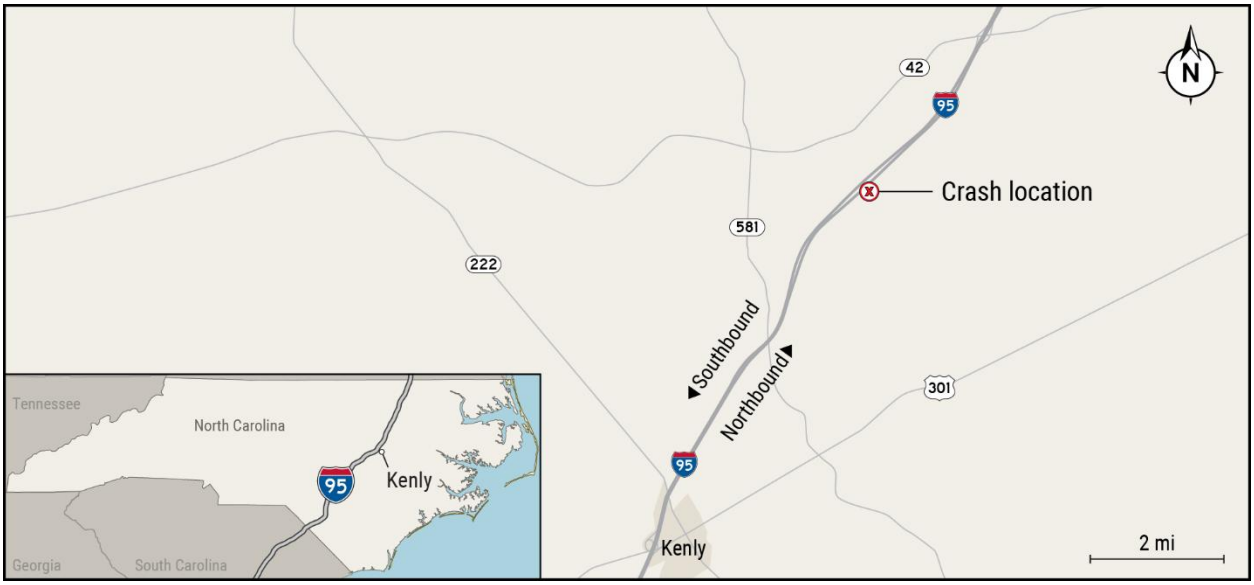

Figure 2. Map showing crash location on I-95 North near Kenly, North Carolina. (Source: Google Maps; annotated by NTSB)

1. Factual Information

1.1 Event Sequence

On Wednesday, July 24, 2024, about 1:22 p.m., a 2020 Freightliner truck-tractor in combination with a 2022 Wabash refrigerated semitrailer (Freightliner), operated by Leonard's Express, was traveling north in the right lane of I-95, near Kenly, Wilson County, North Carolina, when it struck the rear of a 2013 Chevrolet Tahoe (Chevrolet) at an estimated speed of 70 mph.[2] Occupied by a 51-year-old driver, the Freightliner had departed Florence, South Carolina, at 10:14 a.m. that morning.

A slow-moving traffic queue had formed because of a lane closure associated with a temporary work zone about 1.7 miles north of the crash location. The Chevrolet was traveling at a recorded speed of 7 mph when the Freightliner struck it.[3] Impact damage to the Chevrolet was offset toward the driver's side. After the initial crash with the Chevrolet, the Freightliner continued forward, and a crash sequence ensued involving three additional vehicles in the queue. The other vehicles included a 2017 Toyota RAV4 (Toyota), a 2025 Kenworth T680 truck-tractor in combination with 2018 Great Dane 53-foot refrigerated van semitrailer (Kenworth), and a 2014 International truck-tractor in combination with 2003 semitrailer (International).

As the Chevrolet continued to be pushed forward by the Freightliner, it started rotating to the right and collided with the right rear of the Toyota. The Toyota was traveling at a recorded speed of 6.2 mph at impact.[4] The impact occurred about 36.5 feet north of the initial crash. The Toyota was pushed forward, started rotating to the left (counterclockwise), and collided with the rear of the Kenworth, displacing the rear underride guard of the Kenworth's semitrailer forward. The Kenworth was traveling at a recorded speed of 5 mph when it was struck.[5] Figure 3 shows the approximate positions of the vehicles after this initial crash sequence. At this time, the first four vehicles (the Freightliner, Chevrolet, Toyota, and Kenworth) had been involved in the crash and the International had not yet been struck.

[2] No event data were available for the Freightliner. Its velocity was estimated using impulse-momentum theory. The calculation of the Freightliner's impact speed is discussed further in section 2.1.

[3] Speed data for the Chevrolet were retrieved from the vehicle's event data recorder (airbag control module).

[4] Speed data for the Toyota were retrieved from the vehicle's event data recorder (airbag control module).

[5] Speed data for the Kenworth were obtained from the vehicle's onboard fleet management system.

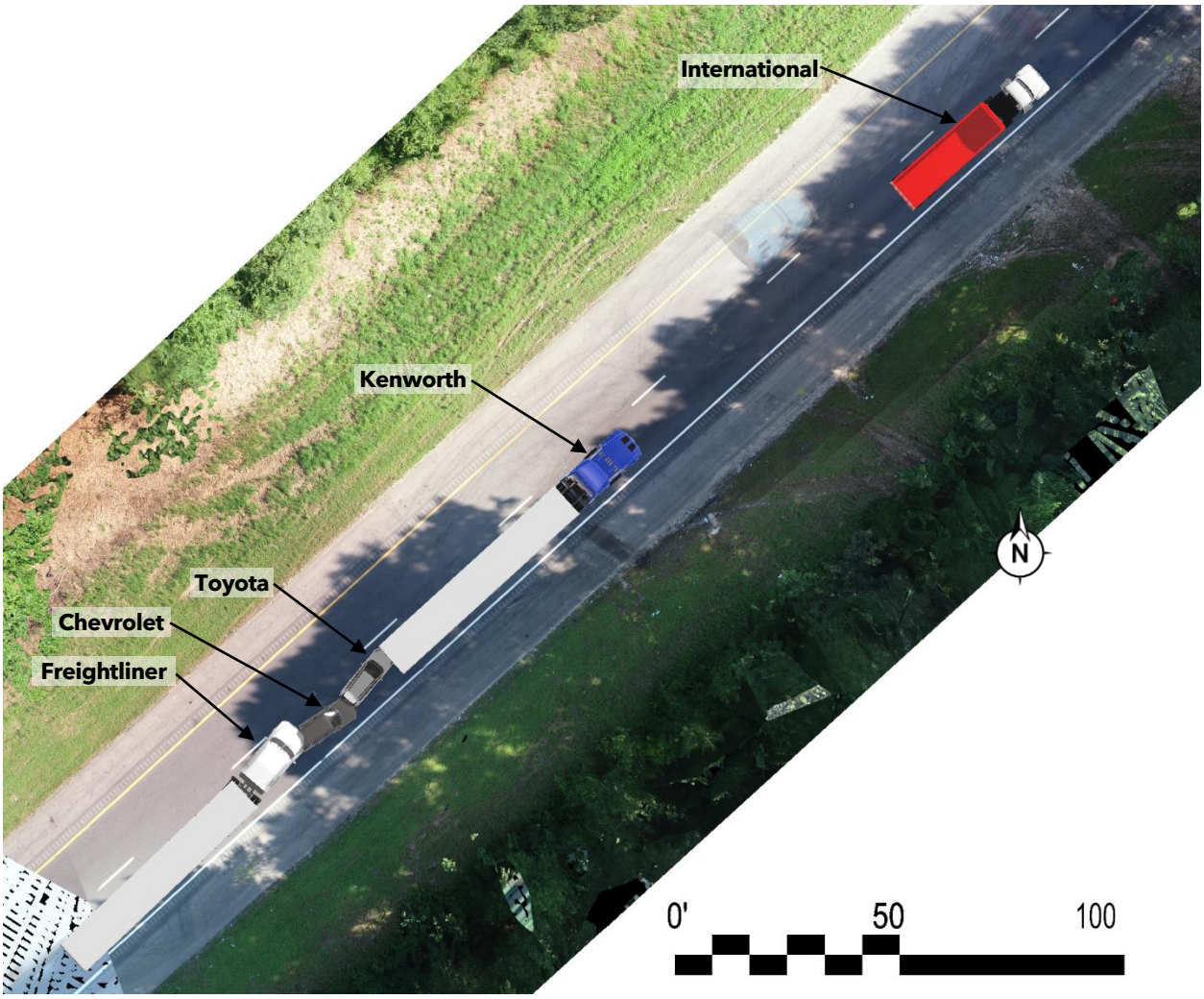

Figure 3. Illustration of initial impact involving Freightliner, Chevrolet, Toyota, and Kenworth. Vehicle separation distances are approximate.

The Chevrolet separated from the Freightliner and the Toyota, veered to the right, traveled about 148 feet, and came to rest beyond the right shoulder of the highway. The front right of the Freightliner struck the Toyota, which continued rotating counterclockwise and being forced farther underneath the Kenworth. The Toyota became entangled with the right side of the Freightliner. The Freightliner then struck the left-rear corner of the Kenworth. After this impact, the Freightliner was redirected leftward, sideswiping the left side of the Kenworth. The Kenworth was redirected off the roadway to the right. The Toyota overturned and traveled on its roof about 60 feet from its point of impact with the Kenworth to its final position of rest on the right shoulder of I-95. A postcrash fire initiated on the Freightliner near the rear of its truck-tractor and beneath the forward portion of its semitrailer.

The final impact occurred when the Freightliner continued forward and collided with the rear of the International. This impact caused the Freightliner to jackknife, with its truck-tractor rotating to the right while crossing into the left travel lane, where it came to

final rest. The postcrash fire, which had begun after the Freightliner sideswiped the Kenworth, consumed the Freightliner. The International departed the roadway to the right, where it came to final rest. Figure 4 shows the initial impact point where the Freightliner first struck the Chevrolet as well as the final rest positions of all five vehicles.

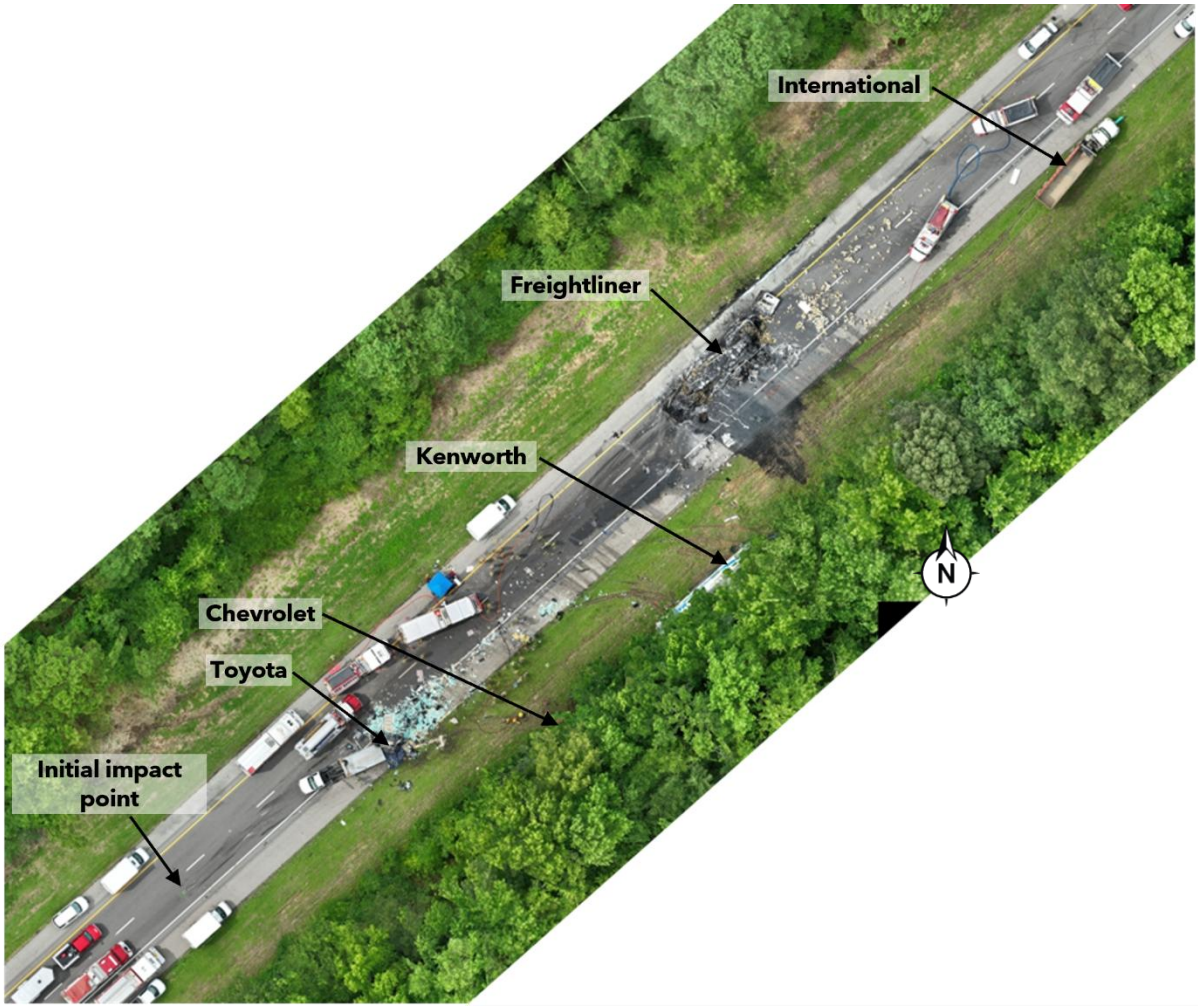

Figure 4. Two-dimensional orthomosaic image from crash site, generated from North Carolina State Highway Patrol aerial photographs, showing point of initial impact and positions of vehicles at final rest.

1.2 Injuries, Occupant Protection, and Emergency Response

The two occupants of the Chevrolet and the three occupants of the Toyota died in the crash. Seat belt status data from event data recorders and physical evidence from these vehicles indicated that the front-seat passengers' seat belts were buckled. First

responders found the rear passenger in the Toyota to be unrestrained.[6] The drivers of the three combination vehicles (the Freightliner, Kenworth, and International) sustained minor injuries. Inspection of the seat belt for the Freightliner was not possible due to fire damage. Although physical inspection of the seat belts for the Kenworth and International did not show evidence of loading, both drivers reported wearing their seat belts at the time of the crash.[7]

The Wilson County 911 Emergency Communications Center (WCECC) was notified of the crash about 1:22 pm.[8] Upon notification from the WCECC, the North Carolina State Highway Patrol (NCSHP) responded to the crash about 1:26 p.m. and arrived on scene about 1:44 p.m. Multiple fire departments and emergency medical services (EMS) agencies responded, the first being dispatched at 1:24 p.m. and arriving on scene at 1:32 p.m. The three surviving drivers of the combination vehicles were transported to the Wilson Medical Center, about 9.4 miles from the crash scene, and arrived at 2:36 p.m. According to the volunteer fire department on scene, I-95 North was re-opened shortly after 5:00 p.m.

1.3 Additional Information

1.3.1 Highway Factors

General. In the area of the crash, I-95 consisted of two northbound and two southbound travel lanes with contiguous left and right shoulders divided by a center earthen median. The posted speed limit was 70 mph. The crash sequence began in the northbound lanes, near mile marker 113.5. About 1,100 feet south of the crash location, the roadway had a vertical curve with a crest for motorists traveling north.[9] The grade transition over the length of the curve had a relatively flat vertical alignment that did not obstruct the driver's sight line toward the area of impact.

Work Zone. Road work on I-95 involving median tree clearing and mulching began on June 17, 2024 (about 5 weeks before the crash), closing sections of the left

[6] The Chevrolet's and Toyota's supplemental restraint systems both deployed during the crash. The Chevrolet was equipped with side, thorax, roof rail, and head curtain airbags, which deployed during the crash, as well as frontal airbags, which did not deploy. The Toyota was equipped with frontal, side, side curtain, driver's knee, and front passenger seat cushion airbags, which deployed during the crash. The Freightliner, Kenworth, and International truck-tractors were not equipped with supplemental restraint systems.

[7] Occupant loading marks on seat belts are often consistent with seat belts being worn.

[8] After the initial 911 call, the WCECC received two Apple iPhone automatic crash notifications. These notifications were recorded 45 seconds and 1 minute and 38 seconds after the dispatcher received the first call.

[9] A *vertical curve* or *vertical crest curve* is a curve that connects inclined sections of roadway, forming a crest.

northbound lane over a total length of about 4,000 feet. While this work was being completed, the work zone and associated section of the lane closure was being shifted north along the interstate. At the time of the crash, the closure began about 9,140 feet (1.7 miles) north of the crash location (see figure 5). The 70-mph speed limit in the vicinity of the crash was not lowered for the temporary work zone.

Temporary Traffic Control. The North Carolina Department of Transportation (NCDOT) contracted with a company to place temporary traffic control signage ahead of the temporary work zone to warn drivers of the lane closure. The contract required the company to use the 2018 NCDOT *Standard Specifications for Roads and Structures* to determine the appropriate temporary traffic control plan, including roadway signs placed ahead of the work zone (NCDOT 2018).[10] On the day of the crash, the signage consisted of two arrow board signs on the left shoulder (one at the start of the lane closure and the other about 2,000 feet in advance of the closure); two "Left Lane Closed" signs (one on each side of the northbound lanes, about 1,000 feet in advance of the lane closure); two merge-right signs (one on each side of the northbound lanes, about 2,500 feet in advance of the lane closure); two "Left Lane Closed Ahead" signs (one on each side of the northbound lanes, about 5,280 feet or 1 mile in advance of the lane closure); and a portable changeable message sign (PCMS; located about 10,480 feet or about 2 miles from the start of the lane closure) with the alternating messages "Left Lane Closed" and "Merge Right" (see figure 5). The only sign that the Freightliner driver encountered before the crash was the PCMS, located about 1,340 feet or about 0.25 miles in advance of the crash location. The other signs were north of the crash location. A truck-mounted attenuator, not depicted in figure 5, was located north of the temporary traffic control signage and within the closed lane.

[10] (a) For additional information, see the *Highway Factors Attachment – North Carolina Department of Transportation Specifications for Lane Closures* in the public docket for this investigation. (b) The 2024 NCDOT specifications would have required that a second PCMS be installed (about 4 miles before the first PCMS) with the alternating messages "Roadwork 6 Miles Ahead" and "Left Lane Closed" (NCDOT 2024). Preexisting NCDOT contracts were not updated to reflect the more recent NCDOT specifications.

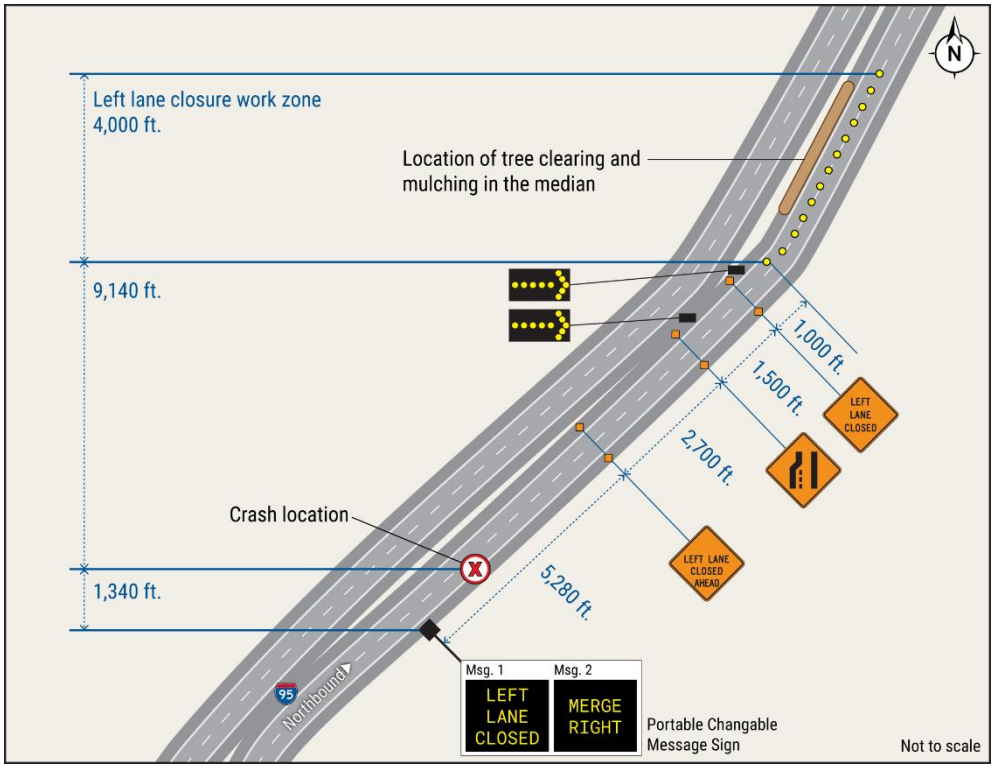

Figure 5. Temporary traffic control signs in advance of lane closure on day of crash.

1.3.2 Striking Vehicle Driver Information

1.3.2.1 Licensing, Experience, and Driving History

The driver of the striking combination vehicle, the Freightliner, was a 51-year-old male with a Nevada commercial driver's license issued in October 2023 and set to expire in September 2031. At the time of the crash, he had a valid 2-year medical certificate with an expiration date in September 2024. According to the driver's employment application, he had worked as a commercial driver since April 2015.

A review of the driver's records from the Commercial Driver's License Information System (CDLIS) and a Level 3 Commercial Vehicle Safety Alliance inspection in California included the following:[11]

- September 2014: a reported crash in Texas while driving a commercial motor vehicle (CMV);

[11] (a) The CDLIS is a nationwide computer system, administered by the Federal Motor Carrier Safety Administration (FMCSA), that enables state driver licensing agencies to ensure that each commercial driver has only one driver license and one complete driver record. (b) The Level 3 Inspection, also known as a Driver-Only or Credential Inspection, is a roadside inspection conducted by the FMCSA and state enforcement. Level 3 inspections focus strictly on the driver's qualifications, documentation, and behavior.

- September 2020: driving a passenger vehicle while under the influence of alcohol in California, with a blood alcohol concentration over 0.08 grams per deciliter, resulting in a driver's license suspension from September 2021 until November 2022 and a CDL disqualification from July 2021 until July 2022;
- September 2020: concurrent with the offense of driving under the influence of alcohol, a refusal to submit to an implied-consent chemical test, resulting in a driver's license suspension from July 2021 until November 2022; and
- January 2024: placement out of service for providing a false record-of-duty status.

1.3.2.2 Toxicology

The Freightliner driver's blood sample tested negative for impairing substances by the North Carolina State Crime Laboratory. At the request of the NTSB, the Federal Aviation Administration (FAA) Forensic Sciences Laboratory performed toxicological testing of the driver's blood.[12] The test was negative for tested-for substances. Although the motor carrier, Leonard's Express, was also required to have its driver submit to postcrash US Department of Transportation testing for alcohol and controlled substances due to his involvement in a fatal crash, the driver did not submit to this testing because he was in police custody.[13]

[12] The FAA Forensic Sciences Laboratory tested for drugs of abuse (Barbiturates, Benzodiazepines, Cannabinoids, Cocaine, Fentanyl, Methamphetamine, Opiates, and Phencyclidine (PCP)) as well as basic and acidic/neutral drugs.

[13] Federal regulations require employers of commercial drivers who are involved in a fatal crash to test the drivers for alcohol and controlled substances, with certain exemptions. For more information, see 49 *Code of Federal Regulations* Part 382.303.

1.3.2.3 Cell Phone Use and Other Potential Distractions

The NCSHP stated that the Freightliner driver had two phones in the vehicle, a primary cell phone and a prepaid cell phone. The prepaid phone was destroyed in the postcrash fire. The NCSHP did not retain the driver's primary phone after the crash; law enforcement did not perform a cell phone download or forensic examination. NTSB investigators obtained cell phone records from the driver's cell phone provider for the phone number associated with his primary phone, according to employee records. The cell phone records were reviewed from July 13 to July 24, 2024. The records showed that incoming and outgoing regular phone calls and regular text messages routinely took place during periods of logged driving.[14] The driver's prepaid cell phone number was not disclosed to investigators.

On the date of the crash, at 1:21:18 p.m., the driver received a text message from a five-digit shortcode number; the sender of this message was unknown. At 1:22:26 p.m., an outgoing Real Time Text (RTT) phone call to an out-of-service number with a "252" area code (1 minute and 16 seconds in duration) was made by the driver's phone.[15] An outgoing call to 911 (53 seconds in duration) was made by his phone 1 second later. The times of the outgoing calls were consistent with automatic iPhone crash notification calls received by the WCECC after the crash. The two outgoing calls were active simultaneously, and both ended at 1:23:42 p.m. The driver's cell phone manufacturer, Apple, has an automatic crash detection feature that uses sensors to detect severe car crashes. When a crash is detected, the phone emits an auditory alarm and visual alert for about 10 seconds. The phone displays an emergency call icon to call 911. If the user does not respond within 30 seconds, the system automatically calls emergency personnel to report a detected crash.[16]

Video evidence from outward-facing cameras on the Kenworth and the International showed no unusual or distracting environmental conditions leading up to the crash.

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[14] (a) *Regular phone calls* are telephone calls using the traditional telephone network and not including phone calls through the internet. *Regular text messages* are text messages sent and received through mobile carriers using short message service (SMS) or multimedia messaging service (MMS) protocols, and do not include any text messages sent or received via software applications, which use mobile data over the internet. (b) The use of handheld devices while operating a commercial vehicle is prohibited, according to 49 *Code of Federal Regulations* 392.82.

[15] (a) Area code 252 covers northeastern North Carolina (AllAreaCodes 2024), but no rate center was associated with the called number's prefix of 511, meaning that it was an unallocated number not belonging to a business or individual that could be called intentionally (Local Calling Guide 2026). (b) RTT is commonly used for transmission of text, including emergency messages sent to 911 dispatchers (AT&T 2025). This was the only RTT call made by the phone during the evaluated period.

[16] For more information, see 2024 Crash Detection on iPhone or Apple Watch.

1.3.2.4 Precrash Activities

The NTSB obtained limited information about the Freightliner driver's precrash activities. The driver provided to the NCSHP a brief written statement that he had been involved in a crash but did not provide details about his precrash activities. The driver also declined the NTSB's interview requests. His primary phone records and electronic logging device (ELD) records were obtained and used to determine his precrash activities, including sleep opportunity.

According to his ELD records, on Tuesday, July 23, 2024, the evening before the crash, the driver stopped driving in Florence, South Carolina, and entered sleeper berth status at 11:29 p.m. At the beginning of his sleeper berth status on July 24, at 12:33 a.m., he received a call on his primary phone lasting 4 minutes and 19 seconds, ending at 12:38 a.m. Although the phone records showed that the driver received six text messages between 1:26 a.m. and 1:28 a.m., he did not respond to the messages or make or receive any phone calls. Except for the unanswered text messages, there was no calling or texting activity between 12:38 a.m. and 9:29 a.m., when the driver sent a text message, meaning that he accumulated up to about 9 hours of continuous sleep opportunity.[17]

1.3.3 Motor Carrier Information

Leonard's Express, of Farmington, New York, a for-hire interstate carrier of property, was the operating carrier for the Freightliner combination vehicle that initiated the crash sequence. At the time of the crash, the Federal Motor Carrier Safety Administration's (FMCSA) Motor Carrier Management Information System profile for the carrier did not highlight any Behavioral Area Safety Improvement Category (BASIC) indicators in alert status.[18]

After the Kenly, North Carolina, crash, the FMCSA completed a postcrash compliance review of Leonard's Express. The carrier was cited for violating the following Federal Motor Carrier Safety Regulations (FMCSR):

- April 26, 2023: Failing to report a negative return-to-duty test, 49 *Code of Federal Regulations* (*CFR*) 382.705 (b)(1)(ii);
- September 18, 2024: Unsafe driving (crash driver), 49 *CFR* 392.2;

[17] Sleep opportunities were identified as time periods with no active cell phone activity (calling or texting).

[18] The FMCSA uses BASICs to determine a motor carrier's safety performance and compliance relative to other carriers for the purpose of prioritizing interventions such as compliance reviews. The seven BASICs are Unsafe Driving, Crash Indicator, Hours-of-Service Compliance, Vehicle Maintenance, Controlled Substances/Alcohol, Hazardous Materials Compliance, and Driver Fitness. For more information, see the Safety Measurement System (SMS) Methodology.

- July 3, 2024: 70-hour rule violation (crash driver), 49 *CFR* 395.3 (b)(2);
- July 22, 2024: False report regarding duty status (crash driver), 49 *CFR* 395.8 (e)(1); and
- July 24, 2024: False record-of-duty status (crash driver), 49 *CFR* 395.8 (e)(1)

1.3.4 Vehicle Information

1.3.4.1 Striking Vehicle

The striking vehicle was a 2020 Freightliner truck-tractor in combination with a 2022 Wabash semitrailer. The truck-tractor and semitrailer were severely damaged and/or consumed by the postcrash fire. The fire damage also prevented access to stored data from the truck's electronic control module. Maintenance records for the vehicle, from February 22, 2020, through May 13, 2024, indicated that the carrier had completed preventative maintenance servicing tire and brake replacements, as well as general minor repairs. The vehicle was equipped with an aftermarket driver monitoring system that was destroyed during the postcrash fire; no data were retrieved. The vehicle was not equipped with advanced driver assistance systems.[19]

1.3.4.2 Passenger Vehicles in the Traffic Queue

All five fatally injured individuals were occupants of the two struck passenger vehicles in the traffic queue. The first struck vehicle in the queue, the Chevrolet, had two primary areas of impact, one in the rear and one in the front. The vehicle body structure was displaced forward into the occupant compartment. The second-row seating was displaced forward on the driver's side, resulting in some forward deformation of the driver's seatback. The front side of the vehicle exhibited rearward displacement of the fender, hood, and underlying components at the left-front corner. The vehicle exhibited lateral counterclockwise bowing (see figure 6, left). According to data recorded by the vehicle's airbag control module, the Chevrolet was decreasing speed, slowing from 19 mph to 7 mph during the 5 seconds before the crash. The data indicated no throttle application and constant brake switch activation during this time.

The second struck vehicle in the queue, the Toyota, had multiple areas of impact, including evidence of having overturned onto its roof. Significant damage occurred in the front of the vehicle, where there was evidence of underride. The A-pillar was displaced rearward and downward. Damage extended over a substantial portion of the vehicle's vertical height. The hood was displaced rearward. The vehicle also exhibited lateral counterclockwise bowing (see figure 6, right). According to data recorded by the

[19] When the vehicle was manufactured, the Detroit Assurance Safety Suite, Version 5.0, was available for the truck-tractor. The motor carrier, Leonard's Express, stated that the truck-tractor was acquired in a merger and that this advanced collision technology was not requested by the previous owner.

vehicle's airbag control module, the Toyota was gradually decreasing speed, slowing from 11 mph to 6.2 mph during the 5 seconds before the crash. Data also showed no throttle application and constant brake switch activation during this time.

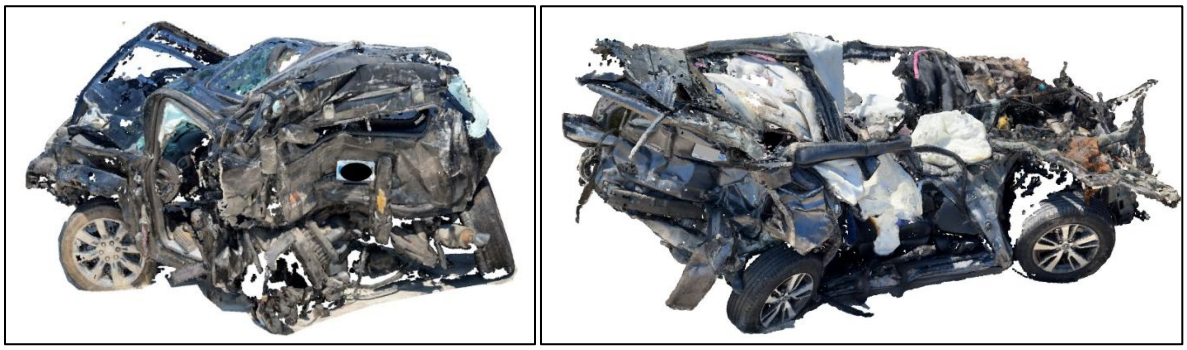

Figure 6. 3D laser scan images showing postcrash damage to Chevrolet (left) and Toyota (right) at time of examination by NTSB.

1.4 Postcrash Actions

Leonard's Express reported to the NTSB that it has implemented changes to its internal policies and procedures to help ensure compliance with FMCSRs. The motor carrier is revising its hiring policies to institute a cap on the number of FMCSR violations allowed for employment eligibility. The carrier is also auditing drivers' records daily, instead of weekly, to examine potential issues and discrepancies in record-of-duty status.

1.5 NTSB Study of Work Zone Crashes Involving Heavy Trucks

As part of its investigation of the Kenly, North Carolina, crash, the NTSB examined rear-end fatal crashes in the United States involving heavy trucks (weighing 26,000 pounds or more) between 2010 and 2022. During this period, 3,385 heavy trucks were involved in crashes where the front of the heavy truck collided with the back of another vehicle. About 70% of these crashes (2,366) occurred on high-speed roads with speed limits of 60 mph or higher.[20] Of the 3,385 crashes, 446 (or about 13%) occurred in work zones. The number of heavy-truck-involved, rear-end fatal crashes occurring in work zones averaged about 34 per year, with the highest number in 2019 (55 crashes) and the lowest in 2011 (22 crashes).

[20] (a) Crash data analysis used the Fatality Analysis Reporting System (FARS). FARS is a census of fatal motor vehicle traffic crashes within the 50 states, the District of Columbia, and the Commonwealth of Puerto Rico. (b) For additional information, see the *Specialist's Factual Report* in the public docket for this investigation.

2. Analysis

Weather and visibility were not factors in the Kenly, North Carolina, crash. The weather was clear, the roadway was dry, and the crash occurred during daylight. Roadway design was not a factor in this crash. Although there was a slight incline in the roadway near the area of the crash, the driver's sight line toward the area of impact was not obstructed. The condition of the striking Freightliner combination vehicle also was not a factor in this crash, as indicated by records of completed preventative maintenance. The driver of the striking vehicle was licensed to operate it, had a valid medical certificate, had experience operating CMVs, and completed toxicology tests that were negative for tested-for substances. There were no distracting environmental conditions in the area.

The emergency response to the crash was timely and adequate. Multiple fire departments and EMS agencies responded to the crash, arriving within 10 minutes. Surviving vehicle occupants arrived at the hospital within 1 hour.

2.1 Crash Sequence and Driver Actions

The crash occurred when the Freightliner driver did not respond effectively as he approached a slow-moving traffic queue that had formed due to a temporary work zone and lane closure about 1.7 miles north. The Freightliner struck the rear of a slow-moving Chevrolet at an estimated speed of 70 mph and then struck three other slow-moving vehicles in the queue.

Traffic control in advance of the crash location included a PCMS on the right shoulder alternating the messages "Left Lane Closed" and "Merge Right." The traffic control strategy followed the 2018 NCDOT Standard Specifications for Lane Closures, which included additional signage leading up to the lane closure that the Freightliner driver had not yet encountered when the crash occurred. The driver passed the PCMS approximately 1,340 feet south of the crash site. Although he may have developed the expectation of encountering free-flow traffic conditions on I-95, the PCMS notified approaching motorists about the changing conditions ahead. Further, data indicated that the Chevrolet, the rearmost vehicle in the traffic queue, had its brake lights activated for at least 5 seconds before the crash, providing additional visual cues about the speed reduction that the Freightliner driver was encountering.

Relative vehicle separation and time-to-collision values were calculated using the 5 seconds of precrash data recorded by the Chevrolet and assuming a constant approach speed of 70 mph for the Freightliner. The speed of the Freightliner at the time of impact with the Chevrolet, 70 mph, was calculated using the published masses of the vehicles, their relative directions of travel, and the impact speed and change-in-velocity data recorded by the Chevrolet. The offset orientation of the Freightliner at the point of impact with the Chevrolet was consistent with the Freightliner driver either beginning to

make a lane change or initiating an evasive swerving maneuver. The NTSB was unable to determine from the available data which of these two actions the Freightliner driver was taking. Regardless, the driver did not properly respond to the visibly slow-moving vehicles at the end of the traffic queue caused by the temporary lane closure ahead.

2.2 Driver Inattention

Although the Freightliner driver's lack of appropriate response to the traffic queue was consistent with being inattentive, the reason for his unsafe driving performance could not be determined from available information.

Evidence was insufficient to establish that distraction from cell phone use was a factor in the crash. Although an incoming SMS message was received by his primary cell phone less than a minute before the crash, at 1:21:18 p.m., it is unknown if the driver's attention was drawn to the incoming notification. Studies on the effects of cell phone notifications on human performance have found that these notifications, even when not viewed or responded to, can have a detrimental effect on performance for attention-demanding tasks such as driving (Stothart, Mitchum, and Yehnert 2015). An outgoing RTT call at 1:22:26 p.m. from the driver's primary cell phone was likely related to an automatic crash notification made 1 second later to 911. Although reported as two separate calls by the cell phone provider, they were active at the same time and they ended at the same time. Both calls were initiated after the crash, and according to records from the cell phone provider, the truck driver was not engaged in a phone conversation before or at the time of the crash using the native calling or texting features of his primary phone. His use of third-party applications on his primary phone or any activity on his prepaid phone was unknown, as neither of the cell phones were available for forensic examination. Also, due to the postcrash fire, data from the driver monitoring system installed on the Freightliner were unavailable.

Evidence was also insufficient to establish whether fatigue was a factor in the crash. The FMCSA postcrash compliance review found that the Freightliner driver was in violation of hours-of-service regulations, including a 70-hour rule violation, a false report regarding duty status, and a false record-of-duty status. Although the NTSB estimated that the driver had 9 hours of sleep opportunity on the evening before the crash, information about the driver's precrash activities, sleep quality, and use of his prepaid phone during this period was incomplete. After the Kenly, North Carolina, crash, the motor carrier for the Freightliner, Leonard's Express, updated its policies to ensure compliance with FMCSRs, including more frequent audits of drivers' record-of-duty statuses.

2.3 Occupant Protection

The Freightliner was traveling about 70 mph when it struck the Chevrolet and then the Toyota. The struck vehicles were traveling less than 10 mph at the time of

impact. Both sport utility vehicles sustained significant crush damage during the crash sequence due to vehicle incompatibility. Vehicle incompatibility refers to design differences—such as speed, bumper height, and weight differences—between vehicle types that result in disproportionate damage patterns stemming from crashes (Acierno and others 2004). Due to significant crash forces and a reduction of survival space, it is unlikely that the injuries to the Chevrolet's occupants could have been mitigated. Similarly, it is unlikely that seat belt use would have changed the injury outcome for the unrestrained occupant in the Toyota.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the Kenly, North Carolina, crash was the Freightliner driver's inattention and failure to respond, for unknown reasons, to the visibly slow-moving vehicles at the end of a traffic queue caused by a temporary work zone and associated lane closure ahead. Contributing to the severity of the crash and occupant injuries were the speed, weight, and bumper height differentials between the striking vehicle and the slow-moving vehicles in the traffic queue.

3.2 Lessons Learned: Preventing Rear-End Work Zone Crashes Involving Commercial Motor Vehicles

Work zones are high-risk areas where changes in traffic patterns, lane reductions, and sudden slowdowns increase crash risk (FHWA 2023). The NTSB's examination of fatal, rear-end crashes in work zones involving heavy vehicles shows that the incidence of these crashes has varied annually, with a high of 55 such crashes in 2019. Also, the majority of these crashes occur on high-speed roads, with the Kenly, North Carolina, crash on I-95 being one example.

The NTSB continues to advocate for comprehensive strategies to prevent rear-end crashes, including crashes involving CMVs and other heavy vehicles. For example, our safety recommendations call for the establishment of federal regulations for in-vehicle technologies such as forward collision warning systems in commercial vehicles (H-15-5); onboard monitoring systems to aid driver training and ensure driver compliance with regulatory requirements essential for safe operation (H-22-4); and driver monitoring systems that detect risky driving behavior, including but not limited to driver inattention, and that provide instantaneous feedback that communicates to the driver the need to bring attention back to the driving task (H-25-20). We have also issued safety recommendations to amend national guidance for work zone projects on freeways and expressways to advise traffic engineers on the use of supplemental traffic control strategies to mitigate crash events involving heavy vehicles (H-15-16).

The FMCSA has launched a national safety campaign, "Our Roads, Our Safety." One of the campaign's focus areas is distracted driving. With this campaign, the FMCSA encourages CMV drivers to put phones away, set navigation and routes before starting to drive, and get adequate rest before a trip.[21] The FMCSA's work zone safety campaign, a second focus area, calls for CMV drivers to pay attention, slow down, and be aware of lane closures, among other safety tips.[22]

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[21] See Distracted Driving Awareness Resources | FMCSA.

[22] See Work Zone Safety Outreach Resources | FMCSA.

NTSB investigators worked with the **Federal Motor Carrier Safety Administration, North Carolina Department of Transportation, North Carolina State Highway Patrol, and Daimler Truck North America** throughout this investigation.

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