August 31, 2026 Highway Investigation Report HIR-26-08

Rear-End Collision Between Combination Vehicle and Sport Utility Vehicle on Interstate 80 — Swanton Township Toll Plaza

Swanton, Ohio
August 15, 2024

Abstract: On Thursday, August 15, 2024, about 5:29 a.m. eastern daylight time, a 2015 Toyota Highlander sport utility vehicle (SUV), occupied by the driver and three passengers, was traveling east on the Ohio Turnpike, Interstate 80 near Swanton Township, Lucas County, Ohio. The SUV was traveling in the left lane and decelerated while changing lanes across the path of a 2019 Mack combination vehicle to exit to the low-speed toll booth lanes at the Swanton Township Toll Plaza. The combination vehicle, occupied by the truck driver, struck the SUV, veered to the right, struck a concrete barrier dividing the high- and low-speed toll lanes, and overturned. As a result of the collision, two SUV passengers died, the driver and one passenger were seriously injured, and the driver of the combination vehicle was seriously injured. Hazardous materials onboard the combination vehicle spilled out onto the roadway. The safety issues in this investigation were the lack of seat belt use and the risk of rear-end crashes at hybrid toll plazas due to unsafe merging/lane changing and large speed differentials. The National Transportation Safety Board makes new recommendations to the Federal Highway Administration; the Ohio Turnpike and Infrastructure Commission; Springfield Township; and the International Bridge, Tunnel and Turnpike Association. The NTSB also reiterates and classifies a recommendation to the state of Ohio.

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Acronyms and Abbreviations

Abbreviation	**Name**
ADAS	advanced driver assistance systems
AEB	automatic emergency braking
BRT	brake response time
CDL	commercial driver's license
CFR	*Code of Federal Regulations*
CMV	commercial motor vehicle
EDR	event data recorder
ELD	electronic logging device
EMS	Emergency Medical Services
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
GVWR	gross vehicle weight rating
I-80	Interstate 80
IBC	intermediate bulk container
IBTTA	International Bridge, Tunnel and Turnpike Association
mph	miles per hour
MUTCD	*Manual on Uniform Traffic Control Devices for Streets and Highways*
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
ODOT	Ohio Department of Transportation

Abbreviation	Name
OSHP	Ohio State Highway Patrol
OTIC	Ohio Turnpike and Infrastructure Commission
PCMB	portable changeable message board
rpm	revolutions per minute
SOP	standard operating procedure
STFD	Springfield Township Fire Department
SUV	sport utility vehicle
TIM	traffic incident management
USDOT	US Department of Transportation

Executive Summary

What Happened

On Thursday, August 15, 2024, about 5:29 a.m. eastern daylight time, a 2015 Toyota Highlander sport utility vehicle (SUV), occupied by the driver and three passengers, was traveling east on the Ohio Turnpike, Interstate 80 (I-80) near Swanton, Ohio. The SUV was traveling in the left lane of I-80, in the high-speed toll lanes, and decelerated and changed lanes across the path of a 2019 Mack truck-tractor in combination with a semitrailer (combination vehicle) to exit to the low-speed toll booth lanes at the Swanton Township Toll Plaza (Swanton Toll Plaza). The combination vehicle was occupied by the driver. The combination vehicle struck the SUV on its left rear corner, veered to the right, struck a concrete barrier dividing the high- and low-speed toll lanes, and overturned onto its right side across the low-speed toll lanes. After impact, the SUV rotated clockwise and overturned, continued through the gore area and low-speed toll lanes, and came to rest upright next to the roadway. As a result of the crash, two of the SUV passengers died, the driver and one passenger were seriously injured, and the driver of the combination vehicle (truck driver) was seriously injured. Hazardous materials carried by the combination vehicle were spilled during the impact with the barrier and the overturn; no one was injured from exposure to the hazardous material.

The collision between the SUV and the combination vehicle and the subsequent emergency response required closing the travel lanes on the turnpike, and traffic queues began to form in both directions.[1]

For a brief history of roadway tolling systems, see appendix C.

What We Found

We found that none of the following led to the initial crash: weather and lighting; the mechanical condition of the involved vehicles; the SUV driver's licensing, general health, use of alcohol or other tested-for drugs, or cell phone use; the safety policies of the motor carrier; and the truck driver's licensing, experience, medical conditions, fatigue, use of alcohol or other tested-for drugs, familiarity with the vehicle and route, or cell phone use. We found that the load securement of the hazardous materials was not causal to the crash and did not contribute to the injuries. Further, we found that although some first responders had inadequate access to the turnpike, the overall emergency response was adequate. Also, emergency response

[1] Two subsequent multivehicle collisions occurred shortly after the primary collision, affecting traffic management efforts, and are further detailed in sections 1.1.1 and 1.3.2.

delays might be occurring in other areas of the Ohio Turnpike, and the Ohio Turnpike and Infrastructure Commission (OTIC) is responsible for ensuring efficient access in all those locations. In addition, we found that traffic incident procedures in place after the initial Swanton crash were consistent with the state traffic incident management plan, and no deficiencies in such procedures contributed to the secondary crashes.

We found that the SUV driver's attempt to enter the low-speed toll lanes created a rapidly increasing speed differential between the two vehicles, and although the SUV was likely visible to the truck driver, the magnitude of the speed difference between the two vehicles would have been difficult for him to determine.

We found that the SUV driver was experiencing loss of situation awareness, likely as the result of fatigue, and that the truck driver did not have enough time to react to her lane incursion and rapid deceleration. Also, we found that proper seat belt use would have likely reduced the injuries to the occupants in both vehicles, including one of the fatal injuries, and that primary enforcement of seat belt use by the state of Ohio would increase the likelihood that all vehicle occupants are belted. We found that hybrid toll plaza designs still have inherent safety risk, and that better presentation of toll payment options to drivers would have made it less likely that the SUV driver would have changed lanes across the path of the combination vehicle. Also, had the Swanton Toll Plaza been configured for fully electronic tolling, the crash would have been avoided. Finally, we found that current standards do not address current tolling capabilities, such as fully electronic tolling, because no updates have occurred since 2009, and federal guidance updates could provide toll road operators with better information to safely upgrade their tolling configurations.

The National Transportation Safety Board determines that the probable cause of the Swanton crash was the sport utility vehicle (SUV) driver's deceleration and lane change into the eastbound right lane of the turnpike high-speed lanes and across the path of the combination vehicle. Contributing to the SUV driver's performance was reduced situation awareness, likely due to fatigue. Contributing to the SUV driver's decision to change lanes was the lack of signage stating that missed tolls could be paid online. Contributing to the severity of the crash was the large speed differential between the two vehicles, which did not give the truck driver sufficient opportunity to slow down or avoid the collision. Contributing to the severity of injuries, including death, was the lack of seat belt use by several occupants.

What We Recommended

As a result of this investigation, we recommended that the Federal Highway Administration update the standards and guidance pertaining to traffic control devices for motorists at toll facilities, including signage about fully electronic tolling options, and update guidance on current best practices for toll road operators that addresses the benefits of fully electronic tolling. We also recommended that OTIC and Springfield Township work together to expedite completing the planned turnpike access point to improve emergency response times. Further, we recommended that OTIC determine whether additional access points are needed on the Ohio Turnpike to improve emergency response times, and to make the results available to the public; also, that if OTIC determines that additional access points are needed to improve emergency response, to build them; further, that OTIC implement safety improvements consistent with recent guidance at four toll plazas to reduce unsafe driver behaviors; and that OTIC implement fully electronic high-speed tolling, permanently close the low-speed lanes, and inform the NTSB of the timeframe. Finally, we recommended that the International Bridge, Tunnel and Turnpike Association inform its members of the circumstances of this crash and the unsafe driver behaviors at hybrid toll plazas, the need to monitor toll plazas for such behaviors, the need to ensure efficient access points for emergency responders, ways to inform drivers about all payment options in advance of the toll plazas, and the safety benefits of closing low-speed lanes and converting to a fully electronic toll collection system. In addition, we reiterated and classified a recommendation to the state of Ohio to enact legislation for primary enforcement of seat belt use.

1 Factual Information

1.1 Crash Narrative

On Thursday, August 15, 2024, about 5:29 a.m. eastern daylight time, a 2015 Toyota Highlander sport utility vehicle (SUV) was traveling east on the Ohio Turnpike, Interstate 80 (I-80), approaching the Swanton Township Toll Plaza (Swanton Toll Plaza) near mile post 49 in Swanton Township, Lucas County, Ohio.[2] As shown in figure 1, the eastbound lanes leading up to the toll facility consisted of two express lanes for electronic toll collection (high-speed lanes) with a 70-mph speed limit and two conventional lanes for toll collection (low-speed lanes) with a 10-mph speed limit posted at the entry channels to the individual toll booths. The high-speed toll lanes and low-speed toll booth lanes were separated by a painted gore area, which transitioned to a concrete barrier wall on approach to the toll plaza.

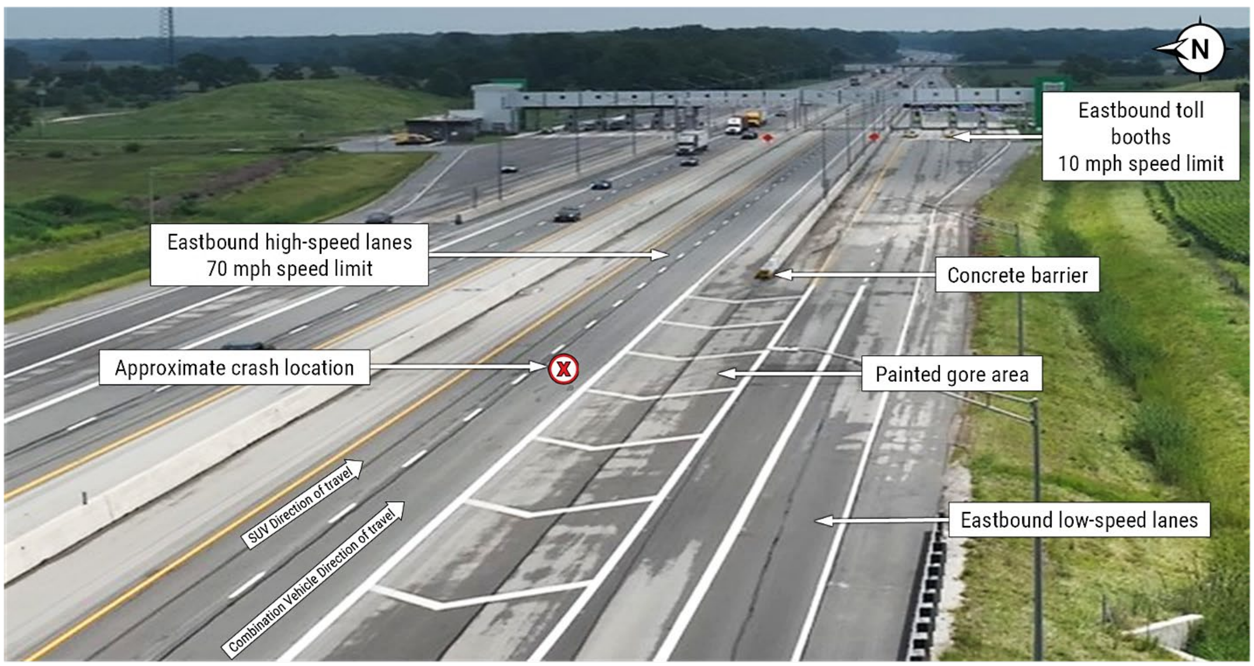

Figure 1. View of the crash scene with the crash location, high- and low-speed lanes, direction of travel, gore area, and concrete barrier annotated. (Source: Ohio State Highway Patrol; annotations by NTSB)

The SUV was traveling in the leftmost high-speed lane approaching the toll plaza. In an interview with NTSB investigators, the SUV driver said she was driving about 70 mph when she became aware that she had to change lanes to access the low-speed toll, and she recalled slowing to about 50 mph. Electronic data from the

[2] Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case number HWY24MH013). Use the CAROL Query to search safety recommendations and investigations.

SUV showed that 4.75 seconds before the crash the SUV was traveling at 43.5 mph and decelerating while steering to the right, entering the right high-speed travel lane and ultimately slowing to a speed of 14.9 mph at the time of the crash. The SUV was struck from the rear by a 2019 Mack Anthem truck-tractor in combination with a 2009 Great Dane van-style semitrailer (combination vehicle). The combination vehicle was traveling at a recorded speed of 69.6 mph in the right high-speed toll lane just before the crash and was carrying 41,687 pounds of total cargo, including 24,365 pounds of hazardous materials.[3]

The area of impact, as determined by roadway evidence, was about 1,238 feet west of the toll plaza adjacent to the gore area and about 250 feet past the beginning of the gore area between the high-speed and low-speed toll lanes.[4] After impact, the SUV rotated clockwise and overturned; continued through the gore area, the two conventional toll lanes, and the right shoulder; and came to rest upright in a culvert adjacent to the right eastbound shoulder (figure 2). The combination vehicle also veered right and struck the crash attenuator and concrete barrier wall at the end of the gore area separating the high-speed toll lanes and low-speed toll booth access lanes. The truck-tractor then overturned, causing the release of its cargo.

The truck-tractor was occupied by a 43-year-old male driver. During his extrication from the vehicle, he told the Springfield Township Fire Department (STFD) responders that the combination vehicle was hauling “sulfuric acid.”[5] The responders then began referencing available material safety data sheets, contacted the Environmental Protection Agency, and established a containment zone.[6]

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[3] Hazardous materials included toxic materials (methanol solution), flammable materials (acetone and toluene), and corrosive materials (liquid amines and sulfonic acids).

[4] The camera at the Swanton Township Toll Plaza on August 15, 2024, at 5:29 a.m. was out of focus and did not depict the crash sequence.

[5] The cargo load contained sulfonic acids, which the truck driver misidentified as sulfuric acid.

[6] On arrival at the crash scene, the STFD responders did not immediately recognize that hazardous material had spilled; the responders received supplemental training in May 2025 to better recognize spills and reduce potential exposure.

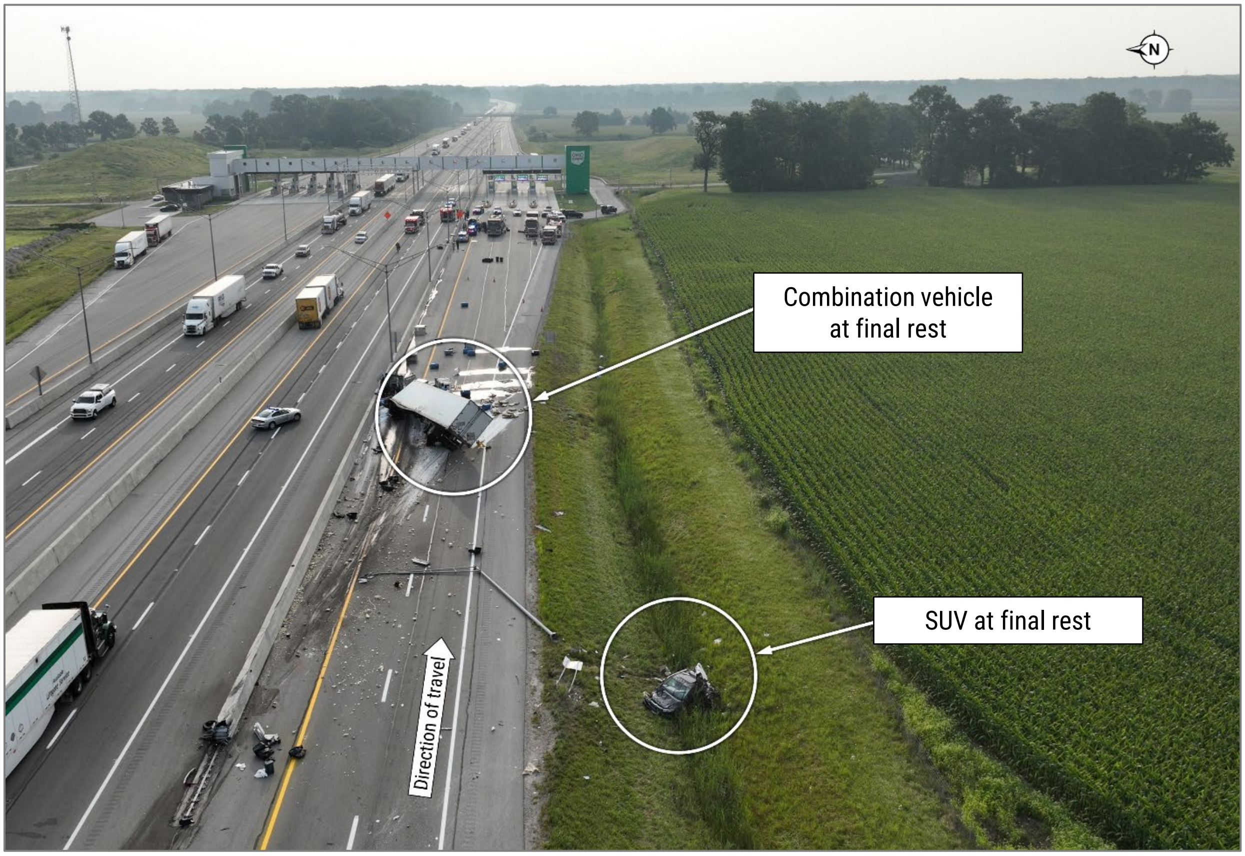

Figure 2. Final rest positions of the combination vehicle and SUV. (Source: Ohio State Highway Patrol; annotations by NTSB)

The SUV was occupied by a 58-year-old female driver and three second-row rear-seated passengers: a 46-year-old, an 11-year-old, and a 9-year-old. The SUV was equipped with a folding third row, which was folded down and loaded with luggage. At the time of the crash, it was dark, with highway lighting present in the vicinity of the toll plaza. The weather was clear and the roadway was dry.

1.1.1 Secondary Crashes

Following this collision, the I-80 east- and westbound lanes were closed due to the hazardous materials spill and to accommodate patient transport via helicopter and ambulance. A traffic queue began to form in the eastbound lanes of I-80 leading up to the crash site. At 5:54 a.m., a second crash involving five commercial motor vehicles and one passenger car occurred in the eastbound traffic queue near mile post 48, about a mile west of the initial crash. A third crash in the westbound lanes of I-80 occurred at 6:24 a.m. about 2 miles east of the toll plaza. Figure 3 shows the locations of all three crashes in relation to the toll plaza.

The NTSB gathered basic information about these secondary collisions to examine potential safety issues associated with traffic incident management (TIM; also see section 1.3.2, Traffic Incident Management Response). Determining the cause of these secondary crashes was not within the scope of our investigation.

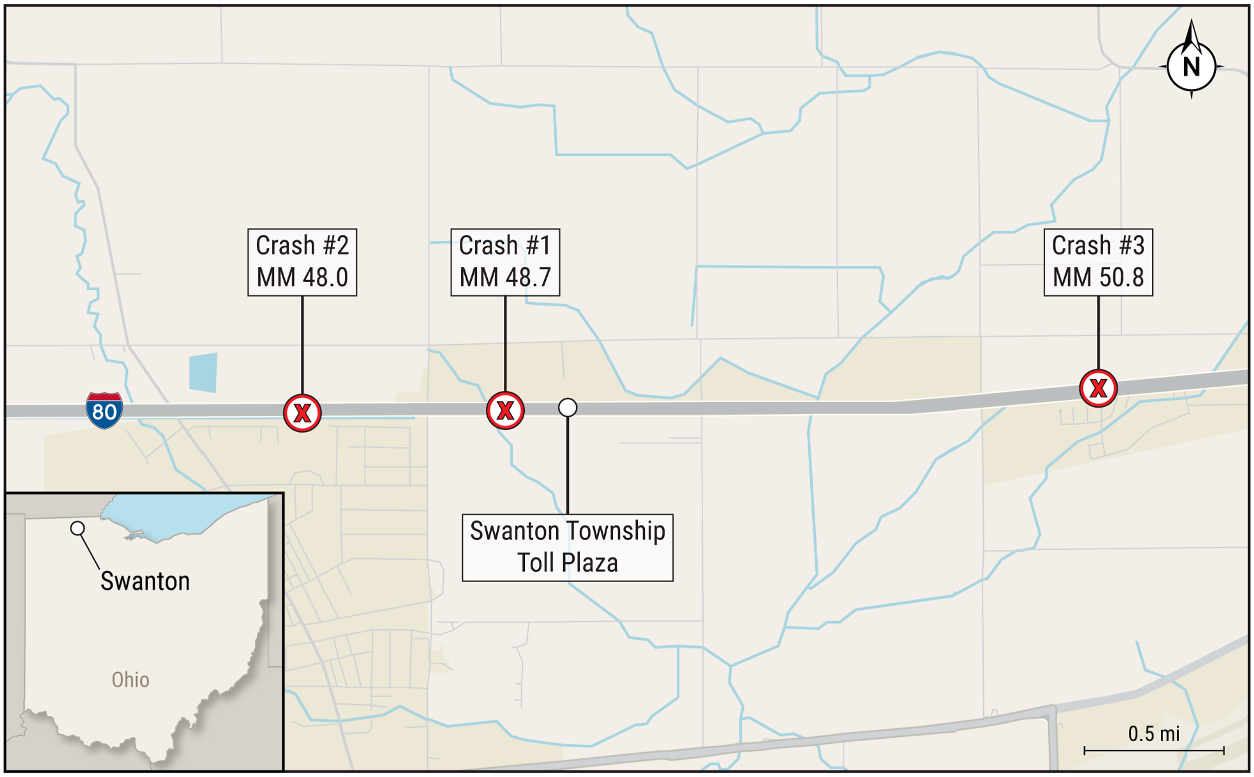

Figure 3. Diagram of the three crash locations in relation to the Swanton Township Toll Plaza.

1.2 Injuries, Occupant Protection, and Emergency Response

1.2.1 Injuries and Restraints

The driver of the combination vehicle (truck driver) reported that he was not wearing his lap/shoulder belt at the time of the crash.[7] Emergency Medical Services (EMS) personnel extricated him from the cab of the truck-tractor in which he was pinned due to the collision damage, and he was transported by ambulance from the scene and treated for serious injuries. He told investigators that he did not remember anything about the collision other than he "hit something."

[7] Federal regulations at 49 *Code of Federal Regulations* 392.16 require commercial drivers to wear seat belts: [49 *CFR* 392.16 -- Use of seat belts.] State laws also require it. In addition, see the Federal Motor Carrier Safety Administration (FMCSA) website on seat belt use by commercial motor vehicle (CMV) drivers: [Buckle Up: CMV Seat Belt Usage Awareness | FMCSA].

According to the recovered electronic data from the SUV, the driver was lap/shoulder-belted; she sustained serious injuries and was transported from the scene via ambulance. The driver's seat belt pretensioners and airbags did not deploy during the crash, which is consistent with their design not to activate in rear-end collisions.[8] The SUV driver told investigators that no passenger was seated in the front passenger seat leading up to the crash; all three passengers were seated in the second row of the SUV (figure 4). All of the seating positions in the SUV were equipped with lap/shoulder belts. The three rear-seated passengers were ejected as a result of the crash; none of them was belted. The left- and right-side rear-seated passengers died on scene, and the center rear-seated passenger sustained serious injuries and was transported by helicopter from the scene.

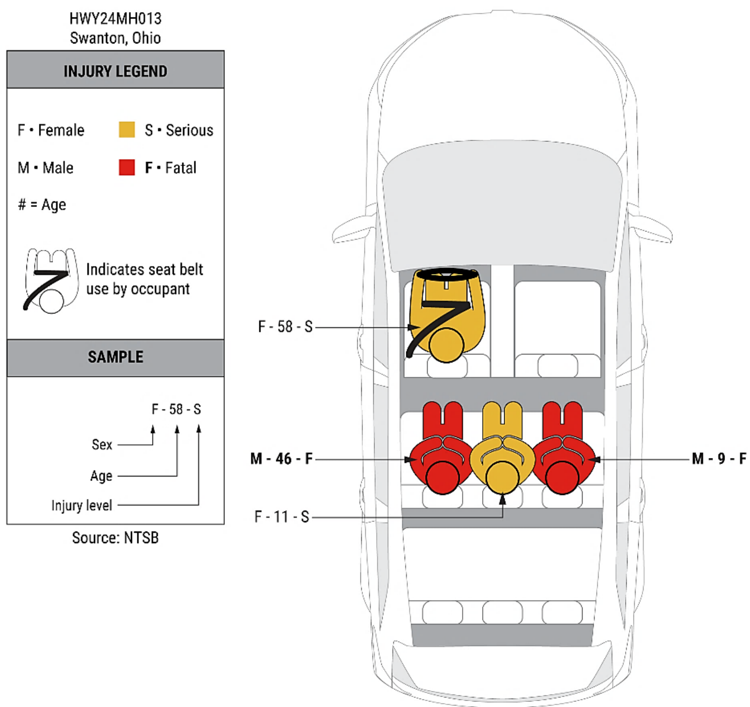

Figure 4. Diagram of the SUV occupants' seating positions, seat belt use, and injury severity.

1.2.2 Emergency Response

First responders were initially notified of the crash via a 911 call at 5:31 a.m. The first Ohio State Highway Patrol (OSHP) units arrived at 5:37 a.m., with three other

[8] In rear-end collisions, the struck vehicle's frontal airbags typically do not deploy because the impact forces come from behind, not from the front where frontal airbags are designed to respond.

police agencies also responding.[9] Five fire rescue and EMS agencies responded to the crash, with the first units arriving on scene at 5:51 a.m.[10] The center rear-seated passenger was transported to a local hospital via helicopter at 6:15 a.m. According to first responders, the SUV driver wanted to stay on scene with one of the fatally injured passengers and was therefore not transported via ambulance to the hospital until 7:02 a.m. The cleanup of the crash scene was conducted by an environmental services contractor under the direction of the Ohio Environmental Protection Agency. On-scene cleanup began on the day of the crash and was completed the next day.[11]

In interviews with NTSB investigators, members of the STFD, one of the responding fire rescue agencies, stated that despite their close proximity to the crash location, the STFD did not have direct access entrance points to the I-80 turnpike in the same manner as the OSHP.[12] The STFD was notified of the crash at 5:31 a.m. and was enroute at 5:35 a.m. Due to limited access entrance points in the area of the crash, the STFD traveled 7 miles to gain access to the turnpike; the total travel time was about 16 minutes. In comparison, OSHP units were notified at 5:34 a.m., traveled less than 1 mile to the crash scene via direct access to the turnpike, and were on scene in 3 minutes.

1.3 Highway Factors

1.3.1 Toll Plaza Description

Leading up to the Swanton Toll Plaza, I-80 consisted of two 12-foot-wide travel lanes in each direction, divided by a grass median. The speed limit in the travel lanes was 70 mph. About 1 mile from the Swanton Toll Plaza, the east and westbound lanes were divided by a concrete median barrier, and a third 12-foot-wide travel lane opened up, which subsequently opened further into three lanes in the eastbound direction to allow drivers to conduct manual transactions at the toll plaza. Figure 5 shows an annotated image of the roadway configuration.

[9] The responding police departments were the Ohio State Highway Patrol, the Holland Police Department, the Lucas County Sheriff's Office, and the Toledo Police Department.

[10] The responding fire rescue and EMS agencies were the Springfield Township Fire Department, the Monclova Township Fire Department, the Providence Township Fire & Rescue Department, the Richfield Township Fire Department, and the Toledo Fire & Rescue Department.

[11] Although not exposed directly to the hazardous materials, responders were downwind of the spill and inside what would become the containment zone. As a precaution, six individuals underwent decontamination procedures.

[12] OSHP units had direct access to the turnpike about 0.5 miles from the toll plaza; the STFD responders had to travel 7 miles to an access point. In addition, the STFD—at the time—did not have toll transponder devices from the Ohio Turnpike and Infrastructure Commission. (Also see section 1.8.1.)

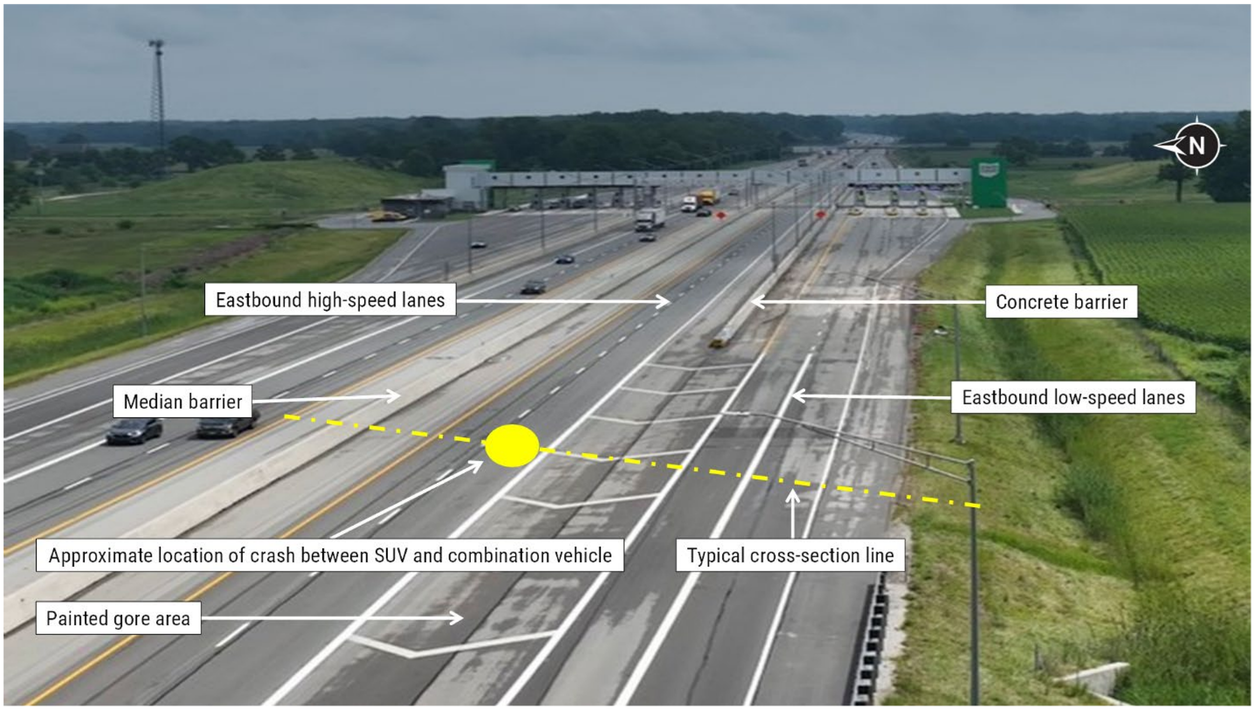

Figure 5. Annotated image of the roadway configuration at the Swanton Toll Plaza, with the approximate location of the SUV and combination vehicle crash noted.

In the immediate vicinity of the toll plaza, the I-80 eastbound direction consisted of two high-speed lanes and two low-speed lanes separated by a painted gore area about 950 feet long. The gore area terminated into a 23-foot-long crash attenuator attached to a concrete barrier separating the high- and low-speed lanes and that extended 960 feet to the toll plaza (the crash attenuator was dislocated in the crash and therefore not shown in figure 5). Each of the high-speed and low-speed lanes was about 12 feet wide. A paved shoulder was adjacent to the low-speed lanes on the right side and was about 10 feet wide. Figure 6 illustrates the typical cross-section in the eastbound direction near the toll plaza.

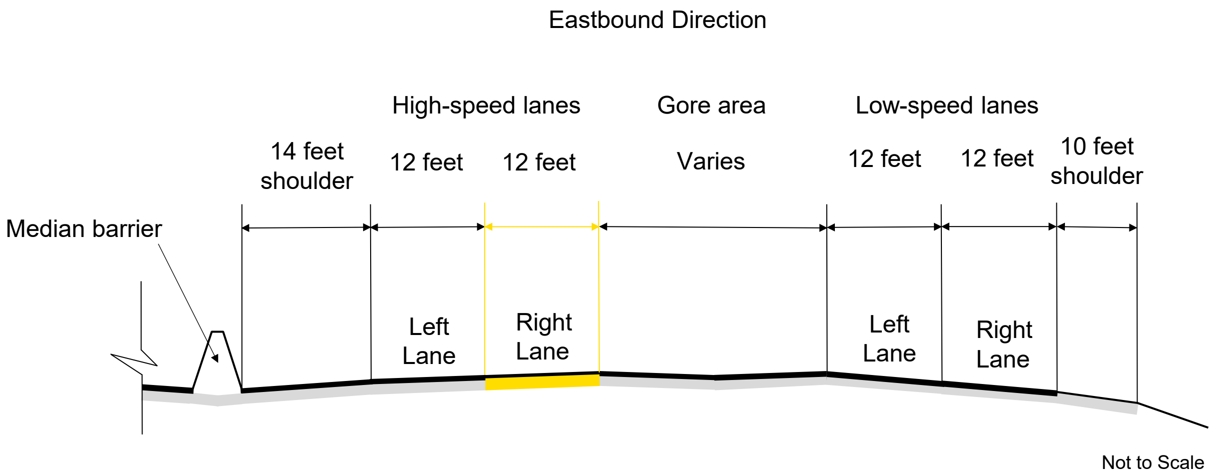

Figure 6. Cross-section of the lanes approaching the Swanton Toll Plaza.

1.3.1.1 Swanton Toll Plaza: New Payment Collection System

The crash occurred near the eastbound Swanton Toll Plaza on the Ohio Turnpike, I-80, near mile post 48.7. The original design of the Swanton Toll Plaza had been upgraded to a hybrid facility and opened for public use on April 10, 2024, about 4 months before the crash. The hybrid toll design allows for high-speed toll collection capabilities in the main travel lanes and includes separate low-speed toll collection lanes.[13] As part of the upgrades, toll collection equipment includes both toll transponder and camera-based license plate-reading technologies. A toll transponder is an electronic device attached to the vehicle that is associated with a payment account, allowing motorists to pay tolls electronically. A camera-based license plate recognition system uses high-speed cameras and infrared lighting to read and record vehicle license plates, including at high speeds and during nighttime conditions, allowing the state to bill motorists to collect tolls.

Before April 10, 2024, the Swanton Toll Plaza was configured as a conventional plaza in which traffic in all lanes was required to stop and conduct manual toll transactions. Planning for the conversion from a conventional toll plaza to the hybrid design began in 2016. Similarly designed toll plazas were also opened on the Ohio section of the turnpike at Westgate, Newton Falls, and Eastgate.

1.3.1.2 Lane Designation

Figure 7 illustrates the Swanton Toll Plaza and the lane designations in the east and westbound directions of travel. The eastbound toll booth lanes are configured such that the two low-speed toll booth lanes expand to three low-speed toll lanes numbered 1–3. Toll lanes 5 and 6 are located to the left adjacent to the median

[13] *High-speed toll lanes* can also be called *open road tolling* (ORT) *lanes*.

barrier in the high-speed lanes. The Ohio Turnpike and Infrastructure Commission (OTIC)—which handles all matters pertaining to the toll road, including maintenance, construction, toll plaza management, and traffic incident management—considers the shoulders open-road or high-speed tolling lanes.[14] OTIC has toll equipment above the shoulders identical to the travel lanes, and the shoulders are designated as lanes 4 and 7 in the eastbound direction. The westbound toll booth lanes (8–16) are configured in a similar manner with the numbering system ordered sequentially from south to north, and the shoulders numbered as travel lanes.

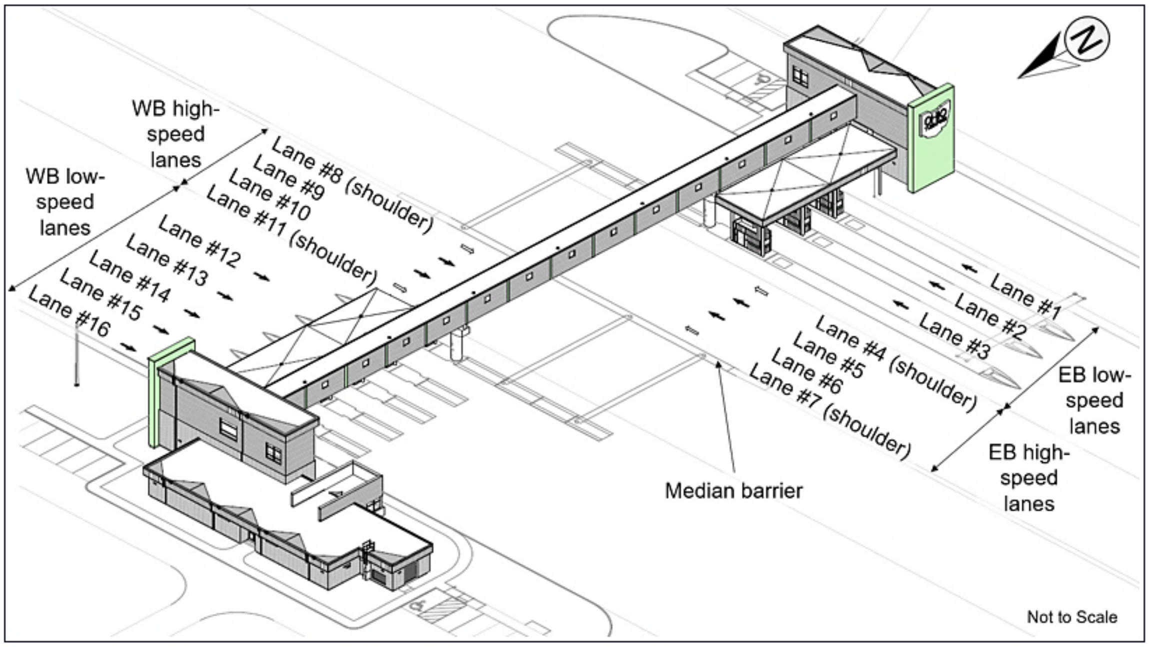

Figure 7. Swanton Toll Plaza and the lane designation in the eastbound and westbound directions of travel. (Source: Ohio Turnpike and Infrastructure Commission, revised)

1.3.1.3 Markings and Signage

As shown earlier in figures 1, 5, and 7, the highway marking separating the paved shoulder from the eastbound left lane of the high-speed lanes consisted of a permanent 6-inch-wide solid yellow line. The highway markings separating the two eastbound high-speed lanes consisted of permanent 6-inch-wide broken white lines with a pattern consisting of 10-foot-long dashes with 30-foot spacing. The highway marking separating the paved gore area from the eastbound right lane of the high-speed lanes consisted of a permanent 12-inch-wide solid white line. The paved gore area consisted of permanent 24-inch-wide solid white chevron lines. The highway marking separating the paved gore area from the eastbound left lane of the

[14] (a) OTIC is a separate organization from the Ohio Department of Transportation (ODOT), which maintains state and federal roadways in Ohio, other than the turnpike. (b) The crash trip involved travel through several states; each state manages its section of the toll road separately.

low-speed lanes consisted of a permanent 12-inch-wide solid white line. The two eastbound low-speed lanes were separated by a permanent 12-inch-wide solid white line. The highway marking separating the paved shoulder from the eastbound right lane of the low-speed lanes consisted of a permanent 6-inch-wide solid white line.

Before the toll booth in the eastbound direction, two portable variable message signs were located in the median about 5.6 miles and 2.7 miles from the toll plaza. Fixed/permanent signage consisted of a 2-mile advance overhead warning sign, a 1-mile guide sign, a ½-mile guide sign, and an overhead exit area guide sign. For the low-speed lanes, a 10-mph speed limit sign was posted at the nose of each island separating the channelized lanes as motorists approached the transaction booth. On the right roadside, 1.3 miles east of the toll plaza, was a sign with information to pay the toll online for drivers who missed the toll.

The SUV driver stated that there was light fog in the area at the time of the crash; no other sources of information reported fog or other reductions in visibility. NTSB investigators conducted a nighttime scene drive-through of the crash site in the eastbound direction on August 18, 2024, under similar lighting conditions to the crash, which showed the reflectivity of the signs and highway pavement markings were in excellent condition.

1.3.2 Traffic Incident Management Response

Traffic incident management is a multi-disciplinary process to respond to and clear traffic incidents as quickly as possible. Local transportation agencies implement response plans using guidance and tools provided by the Federal Highway Administration (FHWA). OTIC publishes its traffic *Incident Management Playbook*, which includes communication plans, traffic diversion locations, alternate route maps, and plans for portable changeable message boards (PCMBs) to inform motorists about traffic diversion (OTIC 2024). General guidance in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) advises that responders arriving at a traffic incident should estimate its magnitude, its expected duration, and the expected vehicle queue length, and then set up the appropriate temporary traffic controls based on these estimates. The guidance also states that traffic control devices—including upstream warning devices to alert traffic approaching the queue—should be "available so that they can be readily deployed for all major traffic incidents" (FHWA 2023).

After the initial Swanton crash occurred, traffic queues began to form in the eastbound direction, and by 6:09 a.m., OTIC communications reported that both eastbound and westbound lanes of the turnpike were closed to through traffic to accommodate the hazardous material containment zone and helicopter transportation of the injured persons. In response to the initial crash, authorities took the following actions to close the eastbound travel lanes (refer to figure 3 for a map of the area):

- At 5:48 a.m., diversion notifications on message boards were activated before exit 39, about 9 miles east of the Swanton Toll Plaza.
- At 5:51 a.m., westbound-facing message boards were turned eastbound at mile post 38.9 to warn motorists "Road Blocked, Traffic Must Exit." PCMBs were also used in the median east of exit 39 to provide diversion messaging.
- At 5:52 a.m., the Western Division Superintendent of Maintenance requested available patrol staff to come to the ramps at eastbound exit 39 to divert traffic onto State Route 109 to protect the rear of the traffic queue.

The two secondary crashes, at 5:54 a.m. and 6:24 a.m., occurred in traffic queues formed in the eastbound and westbound directions. After these secondary crashes, changes to the eastbound and westbound traffic incident management were as follows:

- At 6:12 a.m., eastbound traffic was diverted off I-80 at exit 39.
- At 6:18 a.m., OTIC contacted an incident response service unit located at exit 34, and advised to protect the back of the traffic queue until the eastbound diversion was in place, then provided end-of-queue protection at the exit 39 diversion.
- At 6:31 a.m., OTIC incident response was contacted and advised to protect the rear of the queue, and PCMBs were used to provide diversion messaging before and at toll exit 52, along with traffic warning before the diversion.
- At 6:45 a.m., all westbound traffic was diverted off I-80 at exit 52.

The turnpike remained closed for several hours; call logs at 10:47 a.m. show that the turnpike was still closed at that time, with traffic continuing to be diverted.

1.3.3 Gore Excursions at Crash Location

OTIC provided NTSB investigators with video footage from one of the cameras at the Swanton Toll Plaza, covering 21 days leading up to the crash, from July 25, 2024, through August 14, 2024. The video footage showed the eastbound gore area leading to the toll plaza, where the collision occurred. The SUV driver was maneuvering to cross through the gore area, a maneuver called a gore excursion, to reach the low-speed lanes when the SUV was struck. A gore excursion occurs when a vehicle crosses the triangular-shaped area denoted by solid white chevron lines where a roadway meets an exit or entrance ramp.[15] NTSB investigators reviewed the video footage for obvious and clear gore excursions, excluding OTIC and law enforcement vehicles. If a gore excursion was not clearly visible due to nighttime visibility limitations or larger vehicles blocking the view, the excursion was not counted. In total, 1,099 gore excursions were observed in the video footage, an average of 52 per day.

1.3.4 Traffic Characteristics and Crash History

Table 1 shows average daily traffic volume and crashes in the vicinity of the Swanton Toll Plaza from 2019 to 2023, before it reopened as a hybrid design.

Table 1. Average daily traffic volumes and total crashes in the vicinity of the Swanton Toll Plaza from 2019 to 2023.

Year	Average Daily Traffic Volumes	Crashes
2023	25,614	54
2022	25,370	53
2021	25,311	65
2020	20,720	64
2019	23,512	81

OTIC provided updated crash numbers for the year after the toll plaza was opened, which are included in table 2. These numbers span about 1 year from 2024 and 2025; a total of 51 crashes were reported in that period.

Table 2. Crashes near the Swanton Toll Plaza after it reopened in hybrid configuration in April 2024.

Year	Months	Crashes
2025	January 1 to April 30	16
2024	April 10 to December 31	35

[15] Crossing a gore area is an illegal maneuver in most states, including Ohio. See Ohio Revised Code Section 4511.33.

1.4 Driver Factors

1.4.1 Truck Driver

1.4.1.1 Licensing, Medical Certification, and Experience

The truck driver was a 43-year-old male with an Illinois Class A commercial driver's license (CDL) issued as a renewal in August 2024 and valid until 2028.[16] The license had a corrective lens restriction and endorsements for passengers, double and triple trailers, hazardous materials, and tank vehicles.[17] The truck driver had a current 2-year US Department of Transportation (USDOT) medical examiner's certificate issued on October 10, 2022. At his medical exam on that date, he reported no medical conditions or medications and was not found to have any issues with corrected visual acuity, peripheral vision, or hearing. In addition, records of the truck driver's postcrash medical care did not identify any pertinent past medical history or medication use.

The truck driver completed his initial commercial driver training and obtained his initial CDL in 2012. He began employment with CJJ Industries in September 2017 and completed company training and a road test with the carrier in November 2017.

The truck driver was involved in a November 2023 crash while stopped at a highway offramp; a second vehicle attempted to pass and collided with the truck and a wall. The truck driver was not cited in the incident but did undergo required drug and alcohol screenings and his driving credentials were checked.

1.4.1.2 Duties

The truck driver's primary duty was the transportation of mixed loads of hazardous materials between Brenntag facilities in Chicago, Illinois, and Toledo,

[16] An *Illinois Class A commercial driver's license* permits the holder to operate, in commerce, a commercial vehicle with a gross vehicle weight rating (GVWR) of 26,001 pounds or more in combination with a trailer with a GVWR of 10,000 pounds or more. *Gross vehicle weight rating* is the total maximum weight that a vehicle is designed to carry when loaded, including the weight of the vehicle itself plus fuel, passengers, and cargo.

[17] (a) A *corrective lens restriction* requires the driver to wear corrective lenses while driving; the truck driver told investigators that he was wearing his prescription contact lenses at the time of the crash, which corrected his vision "close to 20/20" (his medical form also confirmed that the lenses corrected his vision to 20/20); (b) a *passenger endorsement* permits the license holder to operate a vehicle with more than 15 passenger seats; (c) *Double/triple endorsements* permit the license holder to operate a combination vehicle with two or three trailers where allowed; (d) A *hazardous materials endorsement* permits the holder to operate a vehicle transporting hazardous materials in a quantity that requires placarding. (e) A *tank endorsement* permits the holder to operate a vehicle with a bulk tank container that exceeds 1,000 gallons (combined).

Ohio, Monday through Friday. He made the same trip daily, beginning his shift around 12:20 a.m. departing from the Chicago facility and returning around 2:00 p.m. the same day. In the two trips before the crash, the truck driver arrived at the Ohio facility at 5:41 and 5:49 a.m., departing at 7:39 and 7:15 a.m. respectively. The route between the Chicago and Toledo facility is 245 miles and takes 3 hours and 54 minutes in normal driving conditions; it is done in a single shift with only short breaks and stops for loading and unloading. The truck driver had traveled through the crash location 5 days per week for 4–5 years, primarily in the same vehicle and about the same time of day.

1.4.1.3 Precrash Activities

The truck driver's precrash activities were evaluated using electronic logging device (ELD) data, toll plaza data, cell phone data, and an interview of the driver, conducted by NTSB investigators, at CJJ Industries on September 3, 2024.

During the evaluated period, the truck driver did most of his driving between about midnight and early afternoon. He reported sleeping at home, either in his bed or on a couch, between shifts, and he kept his nocturnal wake/sleep schedule on his days off. By evaluating ELD data as well as the truck driver's phone records for August 12 to August 15, investigators could determine the periods that he had available to sleep in the 3 days before the crash.

NTSB investigators identified the truck driver's off-duty periods, during which his mobile phone was not in use according to phone records, as periods available for him to rest (table 3). Investigators were unable to account for home internet and media usage. The quality of any sleep he obtained during the available periods was not determined.

Table 3. Sleep opportunity for the truck driver (August 12–15, 2024).

Shift[a]	Longest Contiguous Period [hh:mm][b]	Accrued Sleep Opportunity [hh:mm][b]
8/12/2024	28:00	>47:00
8/13/2024	6:45	6:45
8/14/2024	8:00	8:00
8/15/2024	10:15	10:15

[a] Sleep opportunity periods reflect the time from the previous to the current shift. [b] The time is accrued in 15-minute increments for periods 30 minutes or more. The truck driver had more than 47 hours of sleep opportunity leading up to and including August 12 because the sleep opportunity included his days off on August 10–11, 2024.

The native calling and messaging applications were not in use at the time of the crash or otherwise during the crash trip.[18] The truck driver stated that he was listening to a podcast via his phone through the truck-tractor radio at the time of the crash.[19]

1.4.1.4 Toxicology

At the request of the NTSB, the Federal Aviation Administration (FAA) Forensic Sciences Laboratory performed toxicological testing of specimens collected from the truck driver during his hospital care shortly after the crash. This testing did not detect ethanol or other tested-for drugs.[20]

1.4.2 SUV Driver

1.4.2.1 Licensing and Experience

The SUV was driven by a 58-year-old female driver with a valid Minnesota Class D non-commercial driver's license.[21] She told NTSB investigators she first obtained a driver's license in 2015 or 2016 while living in Ithaca, New York, and had not been involved in any previous traffic crashes as a driver, which the NTSB verified via driver records.

The SUV driver worked in St. Louis Park, Minnesota, and would drive to and from work, which was about 15 miles north of her home in Prior Lake, Minnesota. Her drives to and from work covered a mixture of roadway types, including a freeway. She owned the SUV and had driven it since she purchased it new. She was not aware of any mechanical issues with the vehicle. The brakes were replaced about 2–3 months before the crash.

[18] *Native applications* on cell phones are software designed specifically for a particular operating system. Cell phone records show only native messaging and calling activity.

[19] During the crash trip on August 15, the truck driver sent an outgoing text message at 5:17 a.m. while driving. Text messages can be sent via hands-free options such as voice to text, and the investigation did not determine which method the truck driver used to send the text message.

[20] Urine was first collected from the truck driver at 7:18 a.m., and venous blood was collected from him at 7:25 a.m. on August 15. Urine testing included screening for certain volatile substances (including ethanol), certain drugs of abuse (amphetamines/methamphetamines, barbiturates, benzodiazepines, buprenorphine, cannabinoids, cocaine, fentanyl, opiates, and phencyclidine), as well as general drug screening that included many classes of abused, prescription, and nonprescription drugs. Blood testing for carboxyhemoglobin, a marker of carbon monoxide exposure, was also performed. For additional information, see the laboratory's methodology webpage: Methodology | Federal Aviation Administration.

[21] A *Minnesota Class D license* is a regular driver's license required to operate a vehicle weighing 26,000 pounds or less.

The SUV driver told NTSB investigators that she had no precrash health issues and was not prescribed any medications. She was alert and communicating with first responders and hospital staff following the crash. In addition, records of her postcrash medical care did not identify any pertinent past medical history or medication use.

1.4.2.2 Precrash Activities

An evaluation of the SUV driver's precrash activities was conducted by interviewing her and analyzing her toll records and cell phone records. NTSB investigators interviewed the SUV driver in person on August 16, 2024, and by phone on December 4, 2024. The SUV driver stated that she went to bed about 9:00 p.m. on August 13 and woke about 6:00 a.m. on August 14. She prepared for the day and drove to work, where she began her shift at 8:00 a.m. She returned home about 5:00 p.m. and packed for a trip to Ithaca, New York. About 7:30 p.m., the SUV driver began the trip, driving for the first 2 hours before switching driving duties with the adult male passenger. While the adult male was driving, the SUV driver slept in the front passenger seat. Beginning in Minnesota, the trip continued through Wisconsin, Illinois, Indiana, and Ohio before the crash.

According to the SUV driver, during the trip, they made two or three stops for fuel before they stopped on the side of the road at an unknown location between 2:30 and 3:30 a.m. on August 15 to switch drivers. The SUV driver recalled feeling rested when she resumed driving.

When she started this leg of the trip, the adult male was in the left second-row seat, the female child was seated in the middle second-row seat, and the male child was seated in the right second-row seat. The SUV driver stated that she thought the passengers were wearing their lap/shoulder belts. Her cell phone was in a mount on the dashboard to the right of the steering wheel, open to a navigation application. She was not listening to the radio or other media.

The SUV was not equipped with a toll road transponder, which would have enabled automatic toll payment at toll plazas in four of the states on the trip.[22] The SUV driver recalled stopping at two toll plazas while driving on the morning of August 15 to pay the toll via cash/credit card. NTSB investigators reviewed video footage collected from other toll plazas the SUV traveled through during the crash trip.

Images were captured of the SUV traveling through toll plazas in Illinois; however, the images did not show the SUV driver. The payment type was documented as "violation" for all Illinois toll plazas because the vehicle was not

[22] The route through Wisconsin was not tolled.

equipped with an Illinois tollway transponder. Each of the toll plazas in Illinois that the SUV passed through were originally equipped with both high- and low-speed toll lanes, but the low-speed toll lanes were all permanently closed.

During the 2:25 a.m. toll-plaza entry in Portage, Indiana, a camera at the facility captured an image depicting the front of the SUV. The driver of the vehicle appeared to be an adult male. The right-front seatback appeared to be upright, but no other occupants were visible in the image. No photo accompanied the toll transaction details for the 4:43 a.m. toll-plaza entry in Angola, Indiana. All toll plazas in Indiana were conventional, low-speed plazas in which all drivers had to slow to 5 mph regardless of payment method.

Video of the SUV using the cash/credit lanes at the Ohio Turnpike Westgate Toll Plaza in Edon, Ohio, at 4:51 a.m. did not show the driver; however, from an overhead view of the vehicle, an unoccupied front passenger seat was visible. The Westgate Toll Plaza was a hybrid configuration similar to the crash location at Swanton. The driver paid the toll to an operator at cash/credit toll booth #4, which serviced the left low-speed lane (cash/credit). The headlights and tail lamps of the SUV were illuminated while the vehicle was at the Westgate Toll Plaza. After the driver paid the toll at the Westgate Toll Plaza, the SUV continued east about 45 miles to the crash location.

The SUV passed through toll plazas as listed in table 4.

Table 4. SUV toll plaza entries on August 15, 2024.

Time [EDT]	Location	Roadway	Toll Plaza	Toll Type
12:56 a.m.	Roscoe, Illinois	Interstate 90 eastbound	1-71	High-speed only (E-ZPass and online payment)[a]
1:22 a.m.	Hampshire, Illinois	Interstate 90 eastbound	7-71	High-speed only (E-ZPass and online payment)[b]
1:34 a.m.	Almora, Illinois	Interstate 90 eastbound	9-63	High-speed only (E-ZPass and online payment)[c]
1:53 a.m.	Rosemont, Illinois	Interstate 90 eastbound	19-53	High-speed only (E-ZPass and online payment)[a]
2:25 a.m.	Portage, Indiana	Interstate 80 eastbound	Westpoint	Low-speed only (E-ZPass and manual transaction)
4:43 a.m.	Angola, Indiana	Interstate 80 eastbound	Eastpoint	Low-speed only (E-ZPass and manual transaction)
4:51 a.m.	Edon, Ohio	Interstate 80 eastbound	Westgate	High-speed (E-ZPass) and low-speed (manual transaction) lanes

[a] Three low-speed toll lanes were present but were closed to through traffic by striping. [b] Low-speed lanes were closed to through traffic by striping across the exit lane. [c] Four low-speed toll lanes were closed to through traffic by striping with one low-speed lane for vehicles exiting to Illinois 31 south.

1.4.2.3 Phone Records

The NTSB analyzed the SUV driver's cell phone records, which covered the period from August 12 to August 15, 2024. No calling and messaging applications were in use at the time of the crash, and no active phone use was recorded on August 15. Active use of the cell phone by the SUV driver could not be determined from data usage alone, and specific periods of sleep opportunity could not be established.[23]

1.4.2.4 Toxicology

Specimens from the SUV driver's hospital care on August 15, 2024, were tested by the FAA Forensic Sciences Laboratory.[24] The hospital specimens were negative for tested-for drugs, except for one drug that medical personnel administered after the crash, before the specimens were collected.

[23] Although mobile data use was included in the phone records, insufficient information about precrash driving times and patterns of use were available to investigators.

[24] Samples were collected from the SUV driver at 7:35 a.m. on August 15.

1.5 Vehicle Information

For uniform description in this report, "left" refers to the driver's side of the vehicle(s), and "right" refers to the passenger/curbside of the vehicle(s).

1.5.1 2019 Mack Truck-Tractor

The 2019 Mack truck-tractor was pulling a 2009 Great Dane semitrailer. The semitrailer cargo consisted of a mix of hazardous and non-hazardous materials, described further in section 1.6.

As shown in figure 8, the truck-tractor sustained severe crash damage. Both drive axles were torn from the vehicle mounts and separated from the vehicle. The vehicle cooling system, engine, batteries, and electrical cables all sustained crash damage. The truck cab was completely separated from the vehicle's frame rails and sustained extensive crash damage. All electrical wiring and air lines to the cab were severed. The steering column, dashboard, instrument cluster, and center stack were all displaced rearward into the cab area. The NTSB postcrash examination did not show any out-of-service indicators or other non-crash deficiencies in the truck-tractor.

Figure 8. Photo of the crash-damaged Mack truck-tractor, viewed from the front left. During recovery, the truck-tractor's separated rear drive axle was located and secured in front of the damaged cab.

The control modules with event data recording (EDR) capabilities were removed from the vehicle and imaged on October 7, 2024, by a forensics laboratory at the request of NTSB investigators.[25] The EDR contained 60 seconds of data; during

[25] The term EDR is used for consistency when discussing the two crash-involved vehicles. Heavy vehicle EDR systems are not standardized, and data was collected from multiple systems: the vehicle electrical control unit, the engine electronic control unit, and the antilock braking system's electronic control unit. Investigators downloaded the airbag control module from the SUV.

the first 58.5 seconds the combination vehicle was alternating between a speed of 69.6 and 70.2 mph, with the service brake set to off. Table 5 shows data recorded from the EDR systems in 250-millisecond intervals for elapsed time, speed, brake activation, and engine revolutions per minute for the final 1.5 seconds of recorded data. The vehicle cruise control was active and set at 70 mph at the time of the crash and the service brake was recorded as off until 0.75 seconds before the end of the recorded data. Typically, the crash is recorded at time 0 in electronic data; in this crash, time 0 corresponds to the impact of the combination vehicle with the concrete barrier and/or crash attenuator, which occurred after the crash with the SUV.

Table 5. EDR data from the combination vehicle.

Time	Speed (mph)	Brake Switch (on/off)	Engine RPM
-1.5	69.6	Off	1,510
-1.25	67.1	Off	1,430
-1.0	64.6	Off	1,350
--0.75	64.6	On	1,410
-0.5	63.4	On	1,300
-0.25	57.8	On	1,200
0	62.1	On	1,090

According to the build sheet, the truck-tractor was equipped with Mack Road Stability Advantage by Bendix, which includes the Bendix Electronic Stability Program and Roll Stability Program. The truck-tractor was not equipped with Bendix Wingman Fusion, a suite of advanced driver assistance systems (ADAS) technologies that was optional equipment for the truck-tractor.[26]

A review of maintenance records in the months leading up to the crash indicated that the carrier had completed preventive maintenance servicing, tire and brake replacements, and general repairs. The most recent annual/USDOT inspection was conducted on June 25, 2024, with no defects reported. No recalls applied to the truck-tractor.

1.5.1.1 Video Evidence

The truck-tractor was equipped with a dual-facing camera that monitored the environment forward of the vehicle through the windshield, as well as the cab interior. The dual-facing camera connected to a gateway module located in the vehicle cab. Although the gateway module used to transmit video and data to the manufacturer/vendor was not damaged in the crash, the windshield-mounted

[26] The Bendix Wingman system includes features such as automatic emergency braking, adaptive cruise control, and road/lane departure warnings. See Bendix® Wingman® Fusion™ for more information.

camera, which stored data, was not recovered after the windshield was ejected from the vehicle in the crash. No crash-related video or data had been transmitted by the gateway module, which did not store video or telematics data. Thus, no forward-facing or interior-facing video or associated data were recovered for the truck-tractor.

1.5.2 2009 Great Dane Semitrailer

The front portion of the semitrailer, extending back about 13 feet, was damaged in the crash and missing along with the upper portion of the trailer's fifth wheel assembly. A fifth wheel assembly consists of upper and lower skid plates, apron, king pin, and locking jaws that attach a semitrailer to the truck-tractor. The upper portion of the fifth wheel assembly remained attached to the truck-tractor. Several locations along both sides of the trailer showed signs of precrash corrosion intruding through the outside sheet metal toward the interior cargo area of the trailer. The stainless steel frame around the cargo doors was cracked at both lower corners. The trailer's electrical and brake systems were damaged in the crash.

The most recent annual USDOT inspection was conducted on July 11, 2024, with no defects reported. Investigators found precrash defects in two different right-side brakes on the trailer. The front right brake had a cracked brake chamber and the clevis jam nut was backed off into the face of the brake chamber.[27] The right rear brake chamber was cracked around both mounting bolts and the brake chamber was loose. The right rear trailer tires exhibited damage to the sidewalls precrash, but the damage was not sufficient to be considered an out-of-service defect.

1.5.3 2015 Toyota Highlander

1.5.3.1 Damage

As shown in figure 9, the SUV was significantly damaged in the crash. The rear cargo hatch and roof were displaced forward, and the roof was peeled along the top, up to the sunroof, and then folded forward over the driver's door. The left rear was crushed forward past the left-rear second row passenger seat. The left-rear passenger door was crushed, and the exterior sheet metal skin was missing. The left B-pillar was displaced to the left. The right-front tire was deflated, and the outboard wheel flange was broken in one location. The front bumper cover was dislodged from its mounted position and was partially on the ground. The hood, fenders, roof, and driver's door

[27] *Brake chambers* are round metal containers that comprise part of an air brake system on heavy trucks, trailers, and commercial motor vehicles. They convert compressed air into mechanical force to activate the brakes.

had numerous scratches. The hood was crushed downward, and the windshield was shattered.

Figure 9. Photo of the front (left image) and rear (right image) of the crash-damaged SUV.

1.5.3.2 Electronic Data

The OSHP retrieved data from the SUV's EDR on August 19, 2024, and provided it to NTSB investigators.[28] The EDR recorded six events, with the first trigger event matching the rear impact collision between the SUV and the combination vehicle. Each event was about 5 seconds, with data recorded in 500-millisecond intervals and including elapsed time, speed, brake activation, accelerator pedal percentage, engine rpm, and steering input in degrees. A negative steering input corresponds to rightward steering. Table 6 shows the recorded data; time 0 in this table is likely the collision between the SUV and the combination vehicle.

Table 6. EDR data from the SUV.

Time	Speed (mph)	Brake Switch (on/off)	Accelerator Pedal (%)	Engine RPM	Steering Input (degrees)
-4.75	43.5	On	0	1,200	-1.50
-4.25	40.4	On	0	1,100	-1.50
-3.75	37.3	On	0	1,000	-1.50
-3.25	34.2	On	0	900	-1.50
-2.75	31.1	On	0	800	-1.50
-2.25	27.3	On	0	1,000	-1.50
-1.75	23.6	On	0	900	-4.50
-1.25	19.9	On	0	800	-4.50
-0.75	16.8	On	0	900	0.00
-0.25	15.5	On	0	800	-10.50
0	14.9	On	0	800	-12.00

[28] EDR is used again for consistency; data were collected from the SUV's airbag control module.

1.6 Hazardous Materials: Freight Load and Securement

According to the bill of lading for the shipment, the combination vehicle carried four types of hazardous materials along with other non-hazardous materials. The hazardous materials included a liquid methanol solution (windshield washer fluid blend concentrate), N.O.S. (acetone, toluene), liquid amines (N.O.S. monoisopropanolamine), and liquid aryl sulfonic acids.[29] Table 7 lists the quantities, hazard class, packaging materials, and gross weight for each product. The shipment on the trailer contained four types of hazardous materials packaging, including welded stainless steel intermediate bulk containers (IBC), steel drums, composite IBCs, and plastic drums.[30] Postcrash inspection of the spilled cargo showed that, as a result of the crash, two of the five welded stainless steel IBCs were breached, one of the four steel drums was found to be leaking, one of the two composite IBCs was found to be breached, and one of the nine plastic drums was leaking. All packaging had appropriate hazard classification and UN identification labeling affixed.

Table 7. Hazardous material quantities, packaging, and gross weight.

Product	Hazard Class	Total Quantity	Crash Damaged	Packaging	Gross Weight (pounds)
Methanol Solution	Class 3 Flammable Liquids	5	2	2,257 lb. Welded Stainless Steel IBC	13,785
Flammable Liquids, (Acetone, Toluene)	Class 3 Flammable Liquids	4	1	55 Gallon Steel Drum	1,673
Amines, Liquid, Corrosive	Class 8 Corrosive Materials	2	1	2,150 lb. Composite IBC	4,560
Aryl Sulfonic Acids	Class 8 Corrosive Materials	9	1	460 lb. Plastic Drum	4,347

[29] "N.O.S." is a USDOT abbreviation for Not Otherwise Specified. It is applied to groups of substances not referenced by a single technical name in USDOT Hazardous Materials Regulations.

[30] (a) *Intermediate bulk containers* or IBCs are reusable containers for storing and transporting liquids. (b) The welded stainless steel IBCs onboard the combination vehicle were suitable for UN1230 flammable liquid transport; the composite IBCs consisted of a rigid plastic inner receptacle and outer steel cage on a steel pallet suitable for UN2735 corrosive materials transport. The steel drums were suitable for UN1993 flammable liquid transport, and the plastic drums were suitable for UN2586 corrosive liquid transport. (c) The United Nations' Committee of Experts on the Transport of Dangerous Goods assigns four-digit hazardous materials codes, which are globally recognized numbers identifying hazardous materials and dangerous goods during international transport.

1.6.1 Standard Operating Procedures

The shipper's *Load Securement* standard operating procedure (SOP) described the company's recommended practices for loading and securing packages, drums, and totes/IBCs on their trailers for safe transportation in compliance with Federal Motor Carrier Safety Administration (FMCSA) regulations. The most recent version of the SOP was issued on February 9, 2024, and specifies that warehouse personnel are responsible for becoming familiar with all load-securing equipment for operation and application, as well as for following recommended practices.

The SOP specifies that load-securement measures be applied every second pallet row (or 8 feet), at a minimum, and caveats that this is the minimum and that circumstances may require securement in more places. In the case where no dunnage is used, the procedure specifies that load-securement measures should be applied after every row of totes.[31] Additionally, in the case where void space is used to distribute weight, the procedure specifies that an adjustable locking bar and ratchet strap be applied forward of the void and that an adjustable locking bar also be applied behind the void before the next row of cargo.

With regard to loading single totes or pallets of material, the SOP states that loading such materials in the center of the trailer should be avoided. It also states that the "Best Practice" is to secure a single tote or pallet to one side of the trailer with two ratchet straps, or to incorporate the use of dunnage on one side of the pallet and then use an adjustable locking bar or ratchet strap to secure the row. The procedure states that "single drums must be secured to the wall utilizing a ratchet strap." Lastly, the SOP states that "[t]wo ratchet straps should be applied behind the final row of product; the van trailer doors, alone, are not sufficient securement."

In addition to the *Load Securement* SOP, the company's *Customer Pickups/Loading/Refusing Loading* SOP, which was issued in September 2015, also includes cargo-loading procedures. The stated objective of this procedure is to ensure that product picked up by a customer or carrier arrives at its destination safely. The SOP instructs users to ensure that containers are "loaded tightly to minimize motion between containers." The procedure also specifies that the load should be "properly blocked and braced" in accordance with 49 *Code of Federal Regulations* (*CFR*) Part 177.834(a).

[31] *Dunnage* is padding or packaging material—such as cardboard, foam padding, wood, or airbags—used to secure cargo during transport.

1.6.2 Load Securing

The mix of freight was loaded by a shift supervisor from the shipper's company before the crash trip. In an interview with NTSB investigators, the shift supervisor stated that cargo gets loaded into the trailer "fitting as tightly as possible to ensure that nothing shifts, falls over, or has any complications." The shift supervisor stated that the trailer was about 80% full, which was considered typical. To balance the trailer and fill empty space in the trailer, the forward end of the trailer was loaded with empty pallets. He also indicated that he would normally fill the rear of the trailer with empty totes, but did not have any available at the time, so there was open space in the rear of the trailer. He attached a fabric ratchet strap to the rail on the side of the trailer behind the load, attached the other end of the strap to the rail on the opposite side of the trailer, pulled it tight, and cranked the latch to secure the load from moving. The shift supervisor stated that the trailers typically have two straps; however, the crash-involved trailer had only one. He told investigators that he put cardboard sheets between bags of non-hazardous cargo and drums, but no other cushions or buffers were used on this load.[32]

1.6.3 Federal Oversight

FMCSA regulations found in 49 *CFR* Parts 393.100–114 outline the general requirements for cargo securement on commercial motor vehicles to prevent against loss and shifting of load; 49 *CFR* Part 177.834 covers hazardous material securement regulation. The regulations outline the performance criteria for tiedown assemblies and other fastening devices to secure cargo, standards for cargo-securement devices and systems, general requirements for securing articles of cargo, requirements for determining working load limits of tiedowns, minimum number of tiedowns, and adjustability of tiedowns, and requirements for front end structures used as part of cargo securement systems. The regulations are intended to prevent both loss of load and shifting of load under typical operating conditions and do not specifically address spillage due to crash forces or damage to containers from crash impacts.

1.7 Motor Carrier Factors

The motor carrier in this crash was Best National Industries Incorporated doing business as CJJ Industries Inc. (CJJ) of Lombard, Illinois. The FMCSA had issued CJJ USDOT number 2927244. CJJ was registered as a for-hire, interstate carrier of property that specifically carried general freight and chemicals. According to CJJ's MCS-150 that was filed on April 23, 2024, the carrier owned one truck-tractor and

[32] The load also included a pallet of shrink-wrapped bags of citric acid, which is not designated as a hazardous material.

eight semitrailers, and leased two straight trucks and three truck-tractors.[33] CJJ leased the truck-tractor involved in this crash from M&K National Lease; the lease was most recently renewed on August 5, 2024.

1.7.1 Carrier Policies and Procedures

CJJ provided its drivers with written policies and procedures as well as a driver's handbook. All drivers were required to sign an acknowledgement form for both the handbook and policies.[34] CJJ officials also stated that the carrier conducted three to four safety meetings per year, covering topics relating to safe operation, hazardous materials, and winter driving.

The carrier did not have a formal fatigue management policy for safe commercial vehicle operation. CJJ officials stated that they informed their drivers to pull over if they were tired but that the carrier had not experienced "any issues with that." CJJ officials reported that drivers were typically local and worked fixed schedules that were within the hours-of-service restrictions, allowing them to sleep at home when off-duty.

1.7.2 Hours of Service

In December 2017, the FMCSA required carriers to install and maintain electronic logging devices (ELDs) to track drivers' hours of service.[35] An ELD is a device or technology that automatically records driving time and facilitates the accurate recording of drivers' hours of service.

CJJ used Samsara as the provider for its ELDs.[36] Samsara is on the FMCSA's approved list of self-certified device providers. CJJ provided both electronic and printed ELD information for the truck driver. Review of his ELD logs and statements from the carrier indicated that he typically worked from about 12:30 a.m. to 1:30 p.m. Monday through Friday, driving about 9.5 hours during his shift. The truck driver did not have any hours-of-service violations in the ELD data.

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[33] MCS-150 is a Motor Carrier Identification Report.

[34] Policies included pre-trip inspections, accident reporting procedures, cell phone use policy, safe driving, hazardous materials safety plans, and alcohol and controlled substance policies. The acknowledgment form documents that the driver has read, understood, and agreed to follow the policies.

[35] For more information, see 49 *CFR* Part 395 -- Hours of Service of Drivers.

[36] For more information, see ELD Compliance Solutions | Samsara.

1.7.3 Controlled Substance and Alcohol Testing

CJJ had an established controlled substance and alcohol testing program and policy. The carrier provided copies to the NTSB of its annual drug and alcohol testing for the past four quarters. The controlled substance testing program met the regulatory requirements in 49 *CFR* Part 382.305. The truck driver was subjected to three random urinalysis tests for controlled substances on January 28, 2020, August 4, 2022, and February 7, 2023. He was also subjected to two postcrash controlled-substance tests on November 10, 2023, and again on July 22, 2024.[37] The results of all the random and postcrash tests were negative. Although the NTSB arranged toxicological testing of the truck driver's postcrash hospital specimens following the August 15, 2024, crash, CJJ did not have him undergo USDOT postcrash testing, although required by 49 *CFR* 382.303, due to his postcrash medical treatment.[38]

1.8 Postcrash Actions

1.8.1 Ohio Turnpike and Infrastructure Commission

On June 11, 2025, OTIC installed two additional portable message signs near mile posts 47 and 44.8 in the eastbound direction leading to the Swanton Toll Plaza. OTIC also updated overhead signage, reading "Toll Plaza Tickets" with a pictogram showing a toll booth. The updates were also made in the westbound direction.

OTIC has begun planning for construction for an access point to enable emergency responders improved access to crashes on the Ohio Turnpike. OTIC has identified a suitable location on property between Holloway Road and the turnpike, located at mile post 57.3. The Springfield Township Fire Department Station 53 is located at the intersection of Holloway Road and Garden Road about 0.2 miles north of the planned access point. Two large gas transmission lines ran through the area near the access point and at least one of them would need to be relocated as it was located at too shallow a depth to support traffic overtop. As of the date of this report, OTIC was working on the necessary agreements and budget for the relocation, with construction of the access point slated to begin shortly thereafter. However, OTIC did not provide a specific time when the work would be completed and noted that

[37] The truck driver was involved in a crash while stopped at a highway offramp. A second vehicle attempted to pass and collided with the truck and a wall. The truck driver was not cited in the incident but did undergo required drug and alcohol screenings and his driving credentials were checked.

[38] CJJ included a letter in the truck driver's employment file explaining that because of his postcrash medical treatment, the carrier did not test him for alcohol and other drugs.

Springfield Township had requested additional easement agreements, which has delayed the project.

In addition, interviews with supporting first-responder agencies revealed past problems navigating toll plazas when traveling the turnpike due to lack of transponders for their vehicles and having to pay tolls in cash or use personal transponders. The NTSB notified OTIC of these issues, and OTIC then provided local first responders with non-revenue toll transponders. Five agencies requested and received a total of 48 non-revenue turnpike transponders.[39]

1.8.2 Springfield Township Fire Department

Following this crash, given the hazmat exposure to on-scene personnel when extricating the truck driver, the STFD proactively conducted Scene Size Up Review training August 19–22, 2024. The training topic of Hands-On Spill Response Hazmat Review was completed on or before May 15, 2025, and was intended to help improve hazardous material spill recognition when arriving on scene and avoid exposure to hazardous materials.

[39] Agencies that requested transponders included the Sylvania Township Fire Department, the Whitehouse Fire Department, the Waterville Fire Department, the Richfield Township Fire Department, and the Toledo Fire and Rescue Department.

2 Analysis

2.1 Introduction

On Thursday, August 15, 2024, an SUV was traveling east in the left high-speed toll lane of I-80 toward the Swanton Toll Plaza, where it decelerated and changed lanes in front of a combination vehicle to reach the low-speed toll lanes at the plaza. The SUV's lane change maneuver occurred where the high-speed and low-speed toll lanes were separated by a gore area. The combination vehicle, traveling in the right high-speed toll lane, struck the rear of the SUV, then hit a concrete barrier separating the high- and low-speed toll lanes and overturned. Two of the four SUV occupants died, and two were seriously injured; all three rear seat passengers were ejected from the vehicle during the crash. The truck driver was seriously injured. Hazardous materials were spilled when the combination vehicle overturned.

The analysis first examines factors that can be excluded as causal or contributory to the crash, including hazardous materials (2.1.1), emergency response (2.1.2), and traffic incident management (2.1.3). The analysis then reviews factors related to the crash sequence, including the SUV driver actions and the truck driver actions (2.2). The analysis also discusses the following safety issues:

- Lack of seat belt use (2.3),
- Risk of rear-end crashes at hybrid toll plazas due to unsafe merging/lane changing and large speed differentials (these behaviors can stem from infrastructure factors such as lane configuration and signage; drivers' factors such as operators' hesitation, confusion, inattention, and fatigue; and their interactions). (2.4)

The NTSB established that the following factors were not causal or contributory to the crash:

- *Weather and lighting:* At the time of the crash, the weather was clear, the roadway was dry, and the area was dark but roadway lighting was present.
- *The mechanical condition of the involved vehicles:* The postcrash examination did not identify any pre-existing conditions with the SUV or the truck-tractor that would have contributed to the crash. The combination vehicle's semitrailer did have precrash defects but these did not contribute to the crash.
- *The SUV driver's licensing, reported and observed general health, use of alcohol or other tested-for drugs, or cell phone use:* The SUV driver reported to the NTSB that she had no significant medical conditions, and

none were identified in postcrash medical records; further, toxicological testing did not find evidence of precrash medication use. Also, she was actively maneuvering the SUV and was alert on scene and at the hospital after the crash occurred. In addition, she had adequate licensing and experience, and was not using her cell phone leading up to the crash.

- *The safety policies of the motor carrier:* The safety policies of the motor carrier did not result in unsafe driving practices or otherwise create causal conditions for the crash.

- *The truck driver's licensing, experience, medical conditions, fatigue, use of alcohol or other tested-for drugs, familiarity with the vehicle and route, or cell phone use:* The truck driver was properly licensed, had experience and familiarity with the vehicle, and was familiar with the route. He had a valid FMCSA medical certificate, and his most recent medical examination before the crash did not document any significant medical issues. Further, no significant medical issues were identified in reviewed postcrash medical records, and toxicological testing did not find evidence of precrash medication use. In addition, the truck driver had normal visual acuity with use of corrective lenses, normal hearing, was not fatigued, was not impaired by alcohol or other tested-for drugs, and was not using his cell phone.

As such, the NTSB concludes that none of the following were factors in this crash: (1) weather and lighting; (2) the mechanical condition of the involved vehicles; (3) the SUV driver's licensing, reported and observed general health, use of alcohol or other tested-for drugs, or cell phone use; (4) the safety policies of the motor carrier; and (5) the truck driver's licensing, experience, medical conditions, fatigue, use of alcohol or other tested-for drugs, familiarity with the vehicle and route, or cell phone use.

2.1.1 Hazardous Materials

With regard to the hazardous material spill, the hazardous materials were packaged and labeled appropriately. However, the load was not secured in accordance with the company SOP; no straps or adjustable bars were in place forward or behind the pallets loaded as dunnage in the front of the trailer, and only one ratchet strap was used at the rear of the load instead of the two straps specified by the SOP. Furthermore, single drums should have been secured to the side of the trailer as covered in the SOP best practices. Nevertheless, the precrash loading of the hazardous materials did not contribute to their spillage because the crash forces exceeded securement standards outlined in the applicable federal regulations. Finally, the spill did not contribute to the injuries or their severity; the injuries were crash/impact-related. The NTSB concludes that the non-compliant load securement of the appropriately packaged hazardous materials was not causal to the crash and did not contribute to the injuries.

2.1.2 Emergency Response

The initial 911 notification was received at 5:31 a.m., and the first OSHP units were on scene at 5:37 a.m. OSHP units arrived at the crash scene from the west, before the establishment of the hazardous material containment zone, as did a motor carrier enforcement unit. Although not exposed directly to the hazardous materials, they were downwind of the spill and inside what would become the containment zone. As a precaution, six individuals underwent decontamination procedures.

The first fire rescue and EMS units from the STFD arrived at 5:51 a.m., 20 minutes after they were notified and 16 minutes after they were dispatched. STFD responders experienced an unnecessary delay as they did not have a direct access point to the toll road in the same fashion as OSHP did west of the crash site; the STFD responders had to travel 7 miles to the nearest entrance to the turnpike. The STFD is the primary response agency for the turnpike in the vicinity of the crash. Although the access delay did not change the injury outcome in this crash because most of the collision-related injuries were so serious or fatal that quicker medical attention would not have mattered, any unnecessary delays in response time in future crashes could certainly lead to poorer outcomes. Discussions with OTIC and the STFD revealed their plans to implement an access point less than a mile away, but delays have occurred in constructing this access point due to re-routing of natural gas transmission lines in the area and associated easement restrictions applied by Springfield Township. The NTSB concludes that although the STFD was delayed due to inadequate turnpike access, the overall emergency response was adequate. According to research (Byrne and others 2019), response times are directly related to fatal injury outcomes when adjusting for other factors, and statistical analysis of freeway crashes (Huang and others 2024) showed that fatality odds increased by 2.6% for every 1-minute increase in emergency medical response time. Because the STFD is the primary response agency for this section of the turnpike and because of the critical importance of emergency response times, the NTSB recommends that OTIC and Springfield Township work together to expedite completing the planned turnpike access point to improve emergency response times on the turnpike in the vicinity of the Swanton Township Toll Plaza.

This investigation illustrated the access difficulties that the STFD experienced in response to the crash at the Swanton Toll Plaza; however, the turnpike spans 241 miles and traverses the entire state of Ohio. The NTSB therefore concludes that the extent to which emergency response delays occur in other areas of the turnpike is not known, but it is OTIC's responsibility to ensure efficient emergency response access in all turnpike locations. The NTSB therefore recommends that OTIC conduct a systemwide evaluation of the Ohio Turnpike to determine whether additional access points are needed to improve emergency response times, with emphasis on locations requiring actions similar to those currently in progress to improve turnpike access in the vicinity of the Swanton Township Toll Plaza, and make the results available to the public. The NTSB further recommends to OTIC that if the systemwide evaluation of the Ohio Turnpike determines that additional access points are needed, build those access points to improve emergency response times.

2.1.3 Traffic Incident Management

After the initial crash, the two subsequent crashes occurred in queues formed due to road closures in both directions because of the ongoing response to the initial crash, including helicopter transport of crash victims and the presence of hazardous materials. Active traffic incident management (TIM) was underway as the queues formed, although subsequent crashes still occurred. The NTSB recently investigated a crash in Etna, Ohio, that occurred at the end of a traffic queue that had formed due to a postcrash lane closure (NTSB 2025). As the Etna queue developed, active TIM procedures were not undertaken to minimize queue formation or to protect the rear of the queue. The NTSB concluded in its report of the Etna crash that, at the time, Ohio's policies, training, and procedures for TIM did not require or advise communication between responders and the Ohio Department of Transportation (ODOT) after minor incidents when vehicles are quickly removed from the travel lane, even if a queue forms. In the Etna crash, that lack of communication led to a missed opportunity for ODOT to warn drivers approaching the traffic queue after the initial incident.

After the initial Swanton collision, however, authorities did take active measures to divert traffic from the turnpike and protect the ends of the traffic queue while the response to the initial crash was still underway. Once the traffic was rerouted, no further crashes occurred. Investigators examined the TIM procedures that on-scene authorities put in place after the initial Swanton crash and found that they were consistent with the state TIM plan. Further, investigators did not identify deficiencies in multiagency communication or in the strategies for end-of-queue protections that could have contributed to the secondary Swanton crashes. The NTSB therefore concludes that the TIM procedures put into action after the initial Swanton crash complied with Ohio's state TIM plan, and no deficiencies were identified that would have led to the secondary crashes.

2.2 Crash Analysis

2.2.1 Crash Sequence

The crash occurred as the two vehicles were approaching a hybrid toll plaza in which the left two travel lanes were electronically tolled high-speed lanes, with the right lanes designated as low-speed lanes in which drivers slowed to make a manual cash/credit transaction at a toll booth. The high-speed toll lanes allowed traffic to continue through the toll plaza at 70 mph while the low-speed toll lanes required drivers to slow to 10 mph before stopping at the toll booth to pay the fee. Approaching the toll booths, the lanes were first divided by a 950-foot-long gore area and then divided by a concrete barrier due to the speed difference between them near the toll plaza. The SUV driver told NTSB investigators that she realized she needed to exit to the low-speed lanes.

The SUV was in the left high-speed lane of travel when the driver began braking and steering rightward toward the low-speed toll lanes, after the high- and low-speed lanes were separated by the gore area and before the path was blocked by the concrete barrier.[40] This maneuver put the SUV in the path of the combination vehicle that was in the right high-speed lane, traveling at a recorded speed of 69.6 mph with the cruise control on. The SUV was decelerating as it crossed in front of the path of the combination vehicle and was traveling between 35 and 43.5 mph when it entered the right travel lane and at a speed of 14.9 mph at impact. Compared to the constant speed of the combination vehicle, 69.6 mph, the speed differential started at 26.1 mph and increased to 54.7 mph at the time of impact as the SUV continued decelerating. Using the combined EDR sources, the NTSB concludes that the SUV driver's attempt to enter the low-speed toll lanes in front of the combination vehicle created a rapidly increasing speed differential between the two vehicles.

With clear visibility conditions at the time of the crash, the truck driver would likely have seen the SUV entering the right lane, including its brake lights indicating that the SUV was decelerating, but would not have clear indication of the rate of deceleration from the brake lights alone.[41] The perceptual cue to detect a large speed differential would be the expansion of the SUV in the truck driver's visual field, referred to as perceptual looming. Looming creates a physiological response to perceive an object as approaching rather than stationary or receding (DeLucia and

[40] It is not known if the SUV driver used her turn indicator while performing the maneuver, because video of the crash sequence was not available and the status of the turn indicator was not recorded in the vehicle's EDR.

[41] The weather was clear and dark at the time of the crash with adequate roadway lighting. The SUV driver told investigators that it was "foggy but just teeny, tiny foggy," but fog was not reported at the nearest weather station, located about 4 miles to the southeast.

Tharanathan 2009; Kennedy, Jentsch, and Smither 2001). The perception of looming depends on the object size, distances between the observer and the object, viewing angles, and relative speeds between the observer and the object; looming rates can be estimated if these parameters are known and compared to detection thresholds.[42]

Given the estimated speed and distances between the vehicles, the earliest point at which the truck driver would have been able to detect that he was rapidly approaching the SUV was about 1 second after the SUV entered the right high-speed lane, when the vehicles were about 135 feet apart. At this point, the SUV was traveling at about 30 mph and decelerating, and the combination vehicle was traveling at a constant 69.6 mph. Studies assessing the detection of expansion rates typically assume the observer is sitting directly behind the looming target; however, the truck driver was offset from the SUV due to the seating position height difference between the combination vehicle and the SUV. The offset viewing angle likely reduced the visual looming cue, and therefore the vehicles would have needed to be closer than 135 feet for the truck driver to detect that the SUV was slowing rapidly (Perez and Walsh 2021). Given the lack of clear visual indication of the speed differential, the NTSB concludes that the SUV was likely visible to the truck driver; however, the magnitude of the speed difference between the two vehicles would have been difficult for the truck driver to determine when the SUV entered his lane.

Although not installed on the truck-tractor, automatic emergency braking (AEB) systems were part of the optional Bendix Wingman systems and designed to avoid rear-end crashes. However, even if they had been installed, the adaptive cruise control and AEB system limitations described by the manufacturer note that the system might not detect and respond to offset or rotated vehicles in the host vehicle's lane of travel. This fact suggests that the system would likely not have responded to the crash scenario or would have responded too late to avoid the crash, because the SUV was in the left travel lane and moving across the right lane to enter the low-speed toll lanes.

2.2.1.1 SUV Driver Actions

Although the investigation did not find that the SUV driver was experiencing chronic sleep loss, she was likely experiencing acute sleep loss from low-quality and short-duration sleep while in the passenger seat of the car.[43] The SUV driver reported that in the days before the start of her trip, she typically slept for at least 8 hours each night and had a nighttime sleeping schedule. On the night before the trip, she went to bed, woke up at her typical time, and worked a full day. After work, she prepared

[42] Detectable changes in expansion rate are reported at .006 radians per second in the literature (Muttart and others 2005).

[43] *Chronic sleep loss* involves long-term nightly sleep restrictions; *acute sleep loss* is a recent and temporary loss of quality sleep.

for her trip and then drove for 2 hours before switching drivers at about 9 p.m. Although she reported feeling rested when she took over driving between 2:30 and 3:00 a.m. on the crash trip, at most she would have slept for 6 hours in the passenger seat, during which time the SUV also made stops for fuel, which would have further disrupted sleep.

Impairment due to fatigue has been shown to lead to involuntary microsleeps, increased errors of omission and commission in attention-intensive performance, cognitive slowing and cognitive errors for time-sensitive tasks, and loss of situation awareness (Durmer and Dinges 2005). Situation awareness is the ability to perceive and understand the environment to make informed decisions about future outcomes and is foundational for decision-making and for driving in general (Smith and Hancock 1995).

As noted in section 1.3.1.3, informational signage was located in advance of the toll plaza, and the SUV driver had the opportunity to maneuver to a far-right lane located about 1 mile west of (before) the gore area; however, she tried to enter the low-speed toll booth access lanes at the last possible moment through the gore area. Given that the SUV driver failed to follow six signs (three overhead guide signs, one overhead warning sign, and two portable changeable message signs located in the median) advising drivers of the upcoming toll plaza as well as the presence of the combination vehicle in the right lane behind her, the NTSB concludes that the SUV driver was experiencing loss of situation awareness approaching the Swanton Township Toll Plaza, likely as the result of fatigue caused by acute sleep debt and poor sleep quality before the crash.

2.2.1.2 Truck Driver Actions

After the SUV entered the right travel lane, it took at least 1 second for the looming cue to be detectable by the truck driver. The service brake in the combination vehicle was recorded as "on" in the ELD data at 0.75 seconds before time 0, but the combination vehicle had already started decelerating before the brake switch activation. Because cruise control was still recorded as active, this indicates that contact with the SUV had already taken place, and the impact at time 0 most likely corresponds to the time at which the combination vehicle struck the crash attenuator and/or the concrete barrier wall.

The recorded time for the combination vehicle brake application was about 2 seconds after the earliest opportunity for the driver to visually detect the closing rate. Brake response time (BRT) is the total time it takes for a driver to perceive a hazard and move their foot to the brake, and the time for the brakes to begin activating. BRT values vary based on many factors and can be difficult to standardize, although the National Highway Traffic Safety Administration (NHTSA) reports that an average driver takes about 1.5 seconds to perceive, react, and initiate brake pedal application.[44] Many studies report a range of perception/reaction times of 2 seconds or more (for example, Taoka 1989, Green 2000, and Dozza 2013). The time it took for the truck driver to activate the brake falls within a reasonable response time, particularly when considering the difficulty in perceiving the closing speed. Due to the large speed differential between the vehicles, the difficulty for the truck driver to perceive the SUV as a hazard, and the truck driver's reaction time, the truck driver initiated braking after his vehicle had already struck the SUV. Figure 10 shows the sequence of events starting with the time when the SUV entered the right lane of travel.

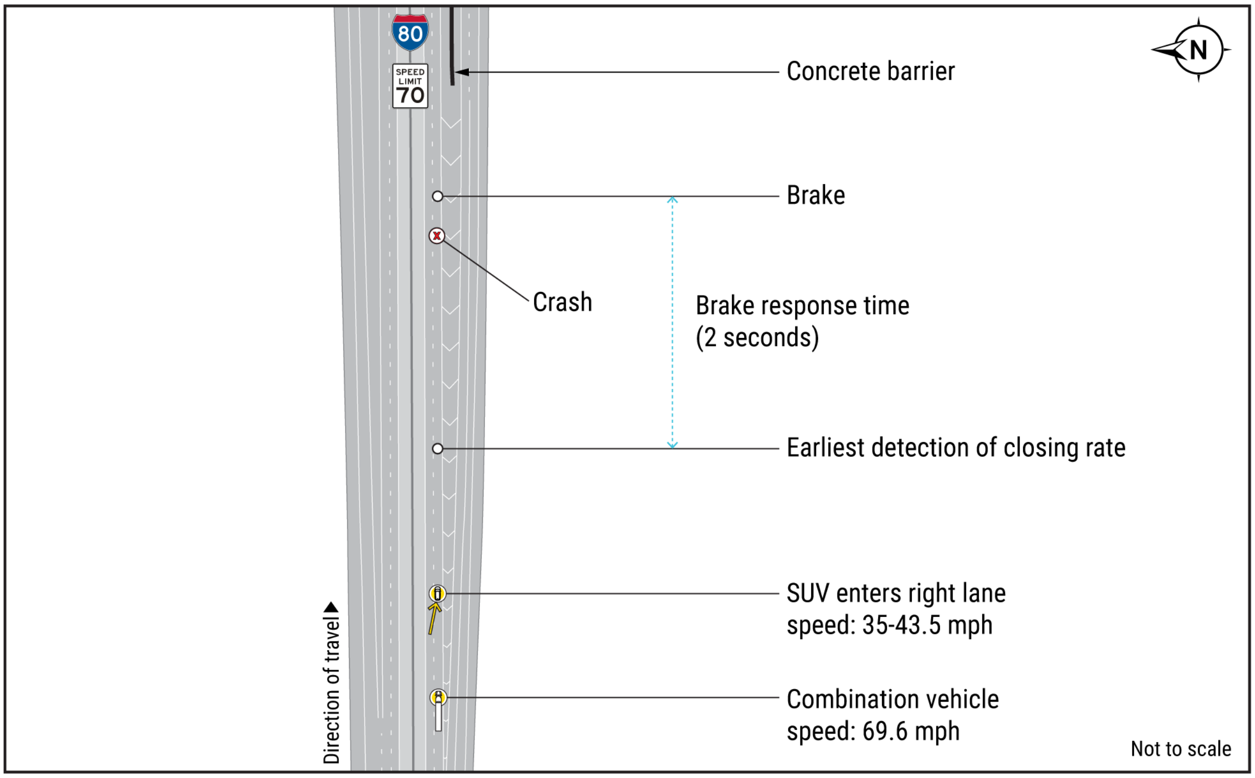

Figure 10. Locations of critical points in the crash sequence, from the SUV entering the lane, when the closing rate would first be perceptible to the truck driver, the brake reaction time, and when braking was recorded in the combination vehicle EDR.

Considering the closing rate, detection times, and actions of both drivers, the NTSB concludes that although the truck driver was traveling at the posted speed limit, he did not have enough time to react to the imminent hazard created by the SUV's sudden lane incursion and deceleration to avoid or mitigate the crash.

[44] As noted in NHTSA training for Speed-Measuring Device Operator training, available at https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/core_participant_manual-smd-2018.pdf.

2.3 Lack of Seat Belt Use

In the crash sequence, the three rear-seated SUV occupants were not wearing their lap/shoulder belts. They were ejected and sustained serious and fatal injuries as a result of the crash. The truck driver also did not wear his lap/shoulder belt during the crash and sustained serious injuries; he was not ejected due to being pinned in the cab of the truck-tractor due to the collision damage. The effectiveness of seat belt use in reducing injuries and injury severity is well known; according to NHTSA, buckling up is the single most effective thing you can do to protect yourself in a crash.[45] The structural integrity of the vehicle must also be maintained to reduce intrusion and maintain survival space for an occupant's seating location. Although the SUV passenger in the rear seat behind the driver was unbelted and ejected, the collision between the combination vehicle and the SUV left no survivable space for this passenger even if the passenger had remained in the vehicle. The damage to the center-rear seating space and the right-rear passenger seat was not as severe, and the proper use of the available lap/shoulder belts would have kept the passengers in the vehicle and reduced their likelihood of injury. The NTSB concludes that proper use of the SUV's lap/shoulder belts by the rear-seated occupants would have prevented their ejection and likely reduced the injury severity to the center- and right-rear-seated occupants, who were outside the main intrusion area, and would have likely prevented the death of the right-rear-seated occupant.

The unbelted truck driver also experienced a loss in survival space during the crash sequence, which may have contributed to his severity of injury. The NTSB concludes that the unbelted truck driver sustained serious injuries, likely as a result of intrusion into his seating space and a lack of proper lap/shoulder belt use.

All of the states through which the SUV traveled leading up to the crash—Minnesota, Wisconsin, Illinois, and Indiana—have enacted primary enforcement of seat belt use in all occupant positions, which allows law enforcement to intervene and issue citations if an occupant is unbelted. Ohio, however, where the crash occurred, has not. Although *Ohio Revised Code* Section 4513.263 mandates that all front and rear-seated occupants wear seat belts, law enforcement can only intervene and issue citations for seat belt non-compliance if the driver is already stopped for a primary offense (lack of seat belt use would be a secondary offense).[46] Research has shown that primary enforcement of seat belt use for all seating positions reduces rear-seated

[45] For more information, see Seat Belt Safety: Buckle Up America | NHTSA; see also https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812369.pdf and https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/808945.

[46] For more information, see Ohio Laws & Administrative Rules - 4513.263.

passenger fatalities because the enforcement factor makes it more likely that those occupants are belted (Findley and others 2018).

As a result of a September 26, 2014, crash in Davis, Oklahoma (NTSB 2015), the NTSB issued Safety Recommendation H-15-42 to the 50 states, the District of Columbia, and the Commonwealth of Puerto Rico:

> Enact legislation that provides for primary enforcement of a mandatory seat belt use law for all vehicle seating positions equipped with a passenger restraint system.

Safety Recommendation H-15-42 was classified Open—Acceptable Alternate Response to Ohio in 2021 because the Ohio Legislature considered, but failed to pass, a bill to expand the requirement for seat belt use to rear seating positions. During Ohio's legislative session of 2023–2024, a bill was introduced to make seat belt violations a primary offense (House Bill 536 | 135th General Assembly | Ohio Legislature). Again, the bill failed to pass. In March 2026, Ohio Governor Mike DeWine urged primary enforcement of seat belt use (DeWine pushes for primary seat belt law during State of the State address); however, as of the date of this report, the Ohio legislature has not addressed the matter.

In January 2025, NHTSA issued a final rule, amending Federal Motor Vehicle Safety Standard 208 to require new passenger vehicles to be equipped with a seat belt use warning system for rear seats. The system is required to detect occupancy and belt status of each rear-seat position and provide visual and audible warnings when non-compliance occurs.[47] NHTSA's final regulatory impact analysis estimated that seat belt warning systems would prevent about 26–39 fatalities and 148–222 non-fatal injuries each year.[48] The compliance date for the final rule applicable for the rear seat belt warning systems requirements was originally September 2027, with optional early compliance permitted. In response to petitions for reconsideration, NHTSA issued an interim final rule on April 6, 2026, making technical clarifications to the regulatory text and delaying the compliance dates to September 1, 2028, with optional early compliance permitted.[49]

Although the requirement for seat belt use warning systems, also known as seat belt reminder systems, in all seating positions is a positive step to encourage seat belt use in new passenger vehicles, it does not address the millions of vehicles already on the road without these systems, such as the 2015 SUV in the Swanton

[47] For more information, see 90 *Federal Register* 390.

[48] See NHTSA's Final Regulatory Impact Analysis Report for more details, at Regulations.gov.

[49] For more information, see Federal Motor Vehicle Safety Standards: Occupant Crash Protection, Seat Belt Reminder Systems, at Regulations.gov.

crash. In response to Safety Recommendation H-15-42, Ohio has not yet enacted a statewide primary enforcement law for seat belt use in all seating positions. At present, primary enforcement is only in place for front-seat passengers, despite Ohio's legal requirement that occupants wear seat belts in all seating positions in passenger vehicles. The NTSB has long concluded, and continues to maintain, that primary enforcement of seat belt use can help increase the likelihood that occupants are properly belted. Ohio has not passed a law to permit primary enforcement of mandatory seat belt use for all vehicle seating positions equipped with a passenger restraint system. The NTSB concludes that primary enforcement of seat belt use for all vehicle seating positions by the state of Ohio would increase the likelihood that all vehicle occupants are properly belted. Therefore, the NTSB reiterates Safety Recommendation H-15-42 to the state of Ohio. The NTSB also classifies Safety Recommendation H-15-42 Open—Unacceptable Response to the state of Ohio.

2.4 Risk of Rear-End Crashes at Hybrid Toll Plazas due to Unsafe Merging/Lane Changing and Large Speed Differentials

This crash occurred as the SUV driver was navigating a hybrid toll plaza, where drivers who thought they had to make manual toll transactions diverged from the primary lanes of travel, and drivers who paid their tolls electronically stayed in the primary, high-speed lanes of travel. Hybrid designs may not require all drivers to slow or change lanes as a conventional design, but for some drivers it is still a requirement to pay the toll manually. This necessity creates a decision point for drivers whether to change lanes to conduct a manual toll transaction and then re-enter the travel lanes. Furthermore, the relative speed differences between exiting and entering vehicles and vehicles that can remain at highway speed are greater than what is typical at a conventional toll plaza. At the Swanton Toll Plaza, the speed limit in the low-speed lanes was 10 mph while the high-speed lanes had a speed limit of 70 mph. For drivers who might still be confused or otherwise unsure of the appropriate actions to navigate the toll plaza, the risk of a severe crash is greater due to these higher speeds. Exit and re-entry for tolling purposes is not fundamentally different from exiting or entering the highway itself, one of the more dangerous maneuvers that is part of highway driving. The Fatality Analysis Reporting System database shows 23,284 total fatal crashes on interstates from 2019–2023, with 2,187 or about 9% of those occurring on entrance or exit ramps.[50]

Limited research has been conducted on the overall safety of toll plaza configurations. An analysis of toll plaza configurations on Florida roads (Abuzwidah and Abdel-Aty 2018) found that conventional toll plazas had the highest crash rate. Comparing fully electronic and hybrid designs showed that although hybrid plaza

[50] Only fatal crashes are coded with the specific road type and location; the database does not include a categorization for toll plaza crashes.

designs had fewer crashes compared to conventional designs, fully electronic tolling plazas had the fewest number of crashes overall. The study found that the majority of crashes in hybrid designs occurred in the merging and diverging areas when entering and exiting the plaza.

Similar results were observed in an analysis of toll plazas in Austin, Texas. When comparing crash data before 2013, before high-speed tolling was implemented, to crash data from after implementation, a reduction in fatal, injury, and property damage crashes was observed in the vicinity of fully electronic toll plazas (Chakraborty and others 2020). Crash data provided by OTIC for 12 months after the Swanton crash showed about the same number of crashes as when the plaza was a conventional configuration (54 crashes in 2023), as in the updated hybrid configuration (51 crashes between April 2024 and April 2025).

The NTSB concludes that although hybrid toll plaza designs show some safety improvements over conventional toll plaza configurations, they still have inherent safety risk due to large speed differentials at entrance and exit points used for manual toll transactions, as shown in the Swanton crash.

2.4.1 Unsafe Driver Behavior at Toll Plazas

Driver behavior at hybrid toll plazas, including sudden lane changes and significant speed variation, can lead to crashes and near misses as shown in this crash. As noted in section 1.3.1.3, informational signage was located in advance of the toll plaza, and the SUV driver had the opportunity to maneuver to a far-right lane located about 1 mile west of (before) the gore area; however, she tried to enter the low-speed toll booth access lanes at the last possible moment through the gore area.[51] Although the SUV driver was likely fatigued, the behavior that led to this crash is not limited to her alone. When reviewing video footage of the Swanton Toll Plaza, NTSB investigators observed more than 1,000 instances in 21 days where numerous drivers were making last-minute lane changes from the high-speed lanes to the low-speed lanes through the gore area near the concrete barrier. The number of gore area excursions that occurred in such a short period of time is alarming, particularly because the observed estimate is conservative given visibility issues at night and passing traffic blocking the camera view. Overall, the video review showed that unsafe merging and weaving of vehicles approaching the plaza is occurring consistently, more than twice per hour on average, and is clearly a problem beyond the SUV driver in this crash.

Unsafe driver behavior approaching the Swanton Toll Plaza may be exacerbated by the lack of fixed or variable message signage regarding the option

[51] The length of the gore area was about 950 feet.

for drivers to use the high-speed lanes and pay their toll online if their vehicles were not equipped with a toll transponder. The overhead signage for the high-speed lanes stated that they were "E-ZPass Only" lanes and did not indicate the option to pay online; instead, they emphasized the need to use the low-speed lanes. Figure 11 shows a sign 1.3 miles *after* the toll plaza stating that drivers who missed the toll could pay online.

Figure 11. Signage 1.3 miles east (after) the Swanton Toll Plaza.

This lack of information about how to pay a missing toll may further encourage drivers to make last-minute lane changes to enter the low-speed lanes. OTIC could encourage use of the high-speed lanes by adding signage before the toll plaza, including modifying overhead signage to state that the tolls can be paid online and/or by mail. Informing drivers that they are not explicitly required to use the low-speed lanes might help reduce the number of last-minute lane changes (along with significant speed reduction in the high-speed lanes) and potentially reduce the overall number of conflicts and crashes near toll plazas. Other locations that use hybrid designs have adopted this type of signage, informing motorists of the payment options before reaching the toll plaza and using license plate readers to facilitate payment collection. Figure 12 shows overhead signage on the Central Florida Expressway that includes a "pay-by-plate" option in addition to the logo for the electronic tolling option. Based on documentation provided by OTIC and in discussions with the NTSB, no additional equipment is required to be installed at the Swanton Toll Plaza to accomplish this; open-road or high-speed tolling technology and equipment was installed at the turnpike plazas along the Ohio Turnpike in all lanes, including Swanton, during the recent upgrade completed in 2024.[52]

[52] The reported total cost for upgraded plazas along the Ohio Turnpike is $250 million, with a $10 million figure reported for the Swanton Toll Plaza; see Swanton Toll Plaza Testing New Components Of Collection System - The Village Reporter.

Figure 12. Overhead signage on the Central Florida Expressway that includes pay-by-plate designation for the high-speed lanes. (Source: Google Maps)

This more informative signage would also be consistent with other signage along the turnpike corridor. Figure 13 shows an overhead sign that was present when the SUV approached the Hampshire-Marengo Toll Plaza in Hampshire, Illinois, with the "pay online" option clearly indicated in addition to the transponder-based toll option (for more information about the Hampshire–Marengo Toll Plaza, see section 2.4.2.2). Figure 14 shows a similar image from the Pennsylvania Turnpike, displaying a "toll-by-plate" payment option.

Figure 13. Signage approaching the Hampshire-Marengo toll plaza in Illinois, traversed by the SUV driver. (Source: Google Maps)

Figure 14. Signage on the Pennsylvania Turnpike, displaying a pay-by-plate option. (Source: Google Maps)

The NTSB concludes that better presentation of toll payment options at the Swanton Township Toll Plaza to drivers in the high-speed toll lanes would have made it less likely that the SUV driver would have changed lanes across the path of the combination vehicle to enter the low-speed lanes, and therefore the crash could have been avoided.

Each state is responsible for management of the section of the I-80 turnpike that traverses their state. In addition to including payment options in their signage, other states on the turnpike have taken the approach of closing low-speed lanes and implementing fully electronic high-speed tolling, at least in part to avoid confusion at hybrid plazas. Illinois and Pennsylvania, which connect to the same east-west turnpike through the mid-west and northeast portions of the United States, have implemented fully electronic tolling on their portions of the turnpike. Illinois has painted striping across the entrances to low-speed toll lanes. Pennsylvania has closed the low-speed lanes completely, using raised tubular barriers and updated pavement markings.

The NTSB concludes that had the Swanton Township Toll Plaza been configured as fully electronic tolling like other states' toll plazas along turnpikes—reducing the need for lane changes and the associated speed variability—the crash would have been avoided.

2.4.2 Available Design Guidance

2.4.2.1 *Manual on Uniform Traffic Control Devices for Streets and Highways*

The FHWA provides guidance and standards for toll plaza signage in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD). The MUTCD defines standards used by road managers to install and maintain traffic control devices on all roadways open to public travel. The MUTCD has been published as a requirement of 23 *CFR* Part 655 Subpart F since 1971 (FHWA 2023). The most recent update to the MUTCD was the 11th edition, published in December 2023 and effective as of January 18, 2024. The 11th edition was further revised in December 2025. The previous version was published in 2009. States are required to adopt this version of the MUTCD as their standard within 2 years of the effective date. In addition to standards generally applicable to highways with toll plazas, the MUTCD contains several relevant chapters regarding toll plaza traffic control devices: Chapter 2F provides standards for toll road signs, Chapter 3F provides standards for pavement markings at toll roads, and Chapter 4R provides standards for traffic signals at toll plazas.

OTIC told NTSB investigators that, at the time the Swanton Toll Plaza was constructed, the applicable design standards were those set forth in the 2009 edition of the MUTCD. The NTSB confirmed that the lane markings, as well as the overhead signs and spacing, conformed with the guidance in the 2009 MUTCD. The guidance states that signs over the travel lanes should display "*Stop Ahead - Pay Toll*" located immediately preceding the diverging alignment, "*Pay Toll 1/2 Mile*" located about half a mile from the plaza, and "*Pay Toll 1 Mile*" located about 1 mile from the plaza.[53] The overhead signs and spacing as shown in the 2009 MUTCD are for a mainline toll plaza on a diverging alignment from open-road electronic toll collection lanes, or hybrid toll plaza. This guidance is still in effect in the current MUTCD edition without change.

The 2023 MUTCD does include updated guidance on signage for freeways and expressways that could also be applicable to toll plaza signage.[54] This addition is contained in Chapter 2E, Guide Signs – Freeways and Expressways, and can also be applied to toll plazas located on the interstate system. The guidance states, "Where there is 800 feet or more between the beginning of the lane diverge and the theoretical gore, signs indicating the destinations allowed by each lane may be

[53] MUTCD, 2009 Edition, Part 2 Signs Chapter 2F – Toll Road Signs, page 251.

[54] The NTSB met with FHWA staff on September 24, 2025, to discuss the Swanton crash. One item that the FHWA brought to the NTSB's attention was an addition to the 2023 MUTCD about the design of overhead arrow-per-lane guide signs for option lanes.

added in the vicinity of the theoretical gore to reinforce positive guidance."[55] When the Swanton Toll Plaza was designed, this additional guidance was not available in the 2009 MUTCD, and at the Swanton Toll Plaza the distance between the beginning of the lane diverge and the theoretical gore was 1,335 feet, greater than the 800 feet advised in the guidance.

The OTIC updates to the overhead sign messaging after the crash are also consistent with current MUTCD guidance; however, other additions are also possible. Although not standards, guidance for roadway markings at toll plazas in the 2023 version of the MUTCD has been updated from the 2009 edition. Examples of purple-colored pavement applications when approaching toll plazas are included in Section 3H.08, Figure 3H-6. Purple-colored pavement markings at toll plazas are used to indicate lane use for vehicles registered with electronic toll collection systems, and could provide road users with an additional visual cue, aside from signage, about the correct lane to navigate the toll plaza. Flashing beacons that can draw attention to overhead signage are another option that could alert drivers approaching toll plazas. Beacons are included in both the 2009 and 2023 versions of the MUTCD as guidance.

Given that the MUTCD standards related to toll plazas have remained unchanged since 2009 and that only guidance, not standards, has been updated in recent versions, individual toll road operators are left to determine what additional signage, pavement markings, and beacons should be employed to inform drivers about all toll payment options. The MUTCD does include signage guidance for multiple toll payment options in section 2F.13, but the figure that shows the signage examples is labeled as the entrance to a tollway, not a hybrid plaza design. For toll road operators that use license plate-reading technology to supplement transponder technology, as was the case at the Swanton Toll Plaza, operators can essentially decide which guidance to follow. Lack of clear standards to display all payment options available in all design configurations meant that, when roadway users approached the Swanton Toll Plaza, only the E-ZPass transponder option was clear to them, yet the signage was consistent with the MUTCD standards. The NTSB concludes that the current standards in the MUTCD do not address current tolling capabilities, including fully electronic tolling, because the FHWA has not updated them since 2009. The NTSB therefore recommends that the FHWA update the standards and guidance in the MUTCD pertaining to traffic control devices regulating and guiding motorists through toll facilities, including signage that informs drivers about fully electronic tolling options, not just transponder-based tolling.

[55] MUTCD, 11th Edition, Part 2E.40 – Design of Overhead Arrow-per-Lane Guide Signs for Option Lanes, page 351.

The decision by a toll plaza operator to continue using a hybrid design is largely financial, rather than one based on safety alone.[56] Maintaining a method for cash and credit manual transactions provides more chances to collect tolls for drivers that do not have a toll transponder. However, as noted, the systems in place at toll plazas on the Ohio Turnpike are already equipped with high-speed license plate readers in all lanes of travel. OTIC can then send a bill to drivers that they can pay by mail or online. As such, other than additional signage, changes required to encourage drivers to use the high-speed lanes rather than exiting and merging would be administrative, as opposed to additional construction or capability investments. For example, OTIC can take additional measures in the near term, consistent with guidance in the 2023 MUTCD, to reduce unsafe driver behaviors—such as last-minute lane changes and large speed differentials—by improving the informative signage before toll plazas about all payment options and updating the pavement markings. In the long term, OTIC can also close the low-speed lanes, as other states along the turnpike corridor have done. The NTSB therefore recommends that OTIC implement safety improvements, consistent with the 2023 MUTCD, at the following four toll plazas: Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza to reduce unsafe driver behaviors, such as last-minute lane changes and large speed differentials.

The NTSB further recommends that OTIC implement fully electronic high-speed tolling and permanently close the low-speed lanes at the Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza, and provide the NTSB with a timeframe for doing so.

2.4.2.2 Additional Federal Guidance

The Swanton investigation is not the first the NTSB has conducted involving a crash at a toll plaza. In the investigation of an October 1, 2003, crash at the Hampshire–Marengo Toll Plaza in Hampshire, Illinois, the NTSB found that traditional toll plazas, such as the Hampshire–Marengo Toll Plaza (as configured on the day of the crash), create traffic backups that present a safety hazard; the conversion of traditional plazas to electronic toll collection systems should greatly reduce such hazards and improve safety on toll roads (NTSB 2005). The NTSB issued Safety Recommendation H-06-18 to the FHWA:

> Cooperate with the American Association of State Highway and Transportation Officials and the International Bridge, Tunnel and Turnpike Association to develop written guidelines on toll plaza design that provide information on current tolling practices, electronic toll

[56] Investigators spoke with OTIC and the International Bridge, Tunnel and Turnpike Association (IBTTA, a global association for owners and operators of toll facilities. Also see section 2.3.2.3, Industry Organizations).

collection strategies, and other equipment designed to eliminate queuing at toll plazas and to improve toll road safety.

Companion recommendations were also issued to the American Association of State Highway and Transportation Officials (H-06-19) and to the International Bridge, Tunnel and Turnpike Association (H-06-21).

In 2006, as a response to H-06-18, the FHWA published guidance titled "State of the Practice and Recommendations on Traffic Control Strategies at Toll Plazas" (in turn, the NTSB classified Safety Recommendation H-06-18 and companion recommendations H-06-19 and -21 Closed—Acceptable Action in January 2007). The FHWA guidance included best practices and existing examples for plaza operations and lane configuration; signage, markings, and channelization; geometric and safety design; and toll collection equipment technology.[57] As stated in the document, when drivers unfamiliar with the toll plaza realize that their vehicle is in the wrong payment lane and they suddenly stop, a following vehicle—equipped with a high-speed electronic toll-collection device—can easily collide with the stopped vehicle. Although the Hampshire-Marengo toll plaza was a conventional design at the time of the 2003 crash, requiring all passenger and commercial vehicles to stop, the 2006 FHWA guidance is still relevant to this hybrid design, as evident in the Swanton crash.

Section 2.1.5 of the 2006 FHWA guidance document states, "The precedent set by the operation of non-stop toll facilities around the country is expected to result in toll customers increasingly not wanting to stop in a toll plaza environment, thereby limiting the life of conventional plazas, certainly less than the expected life of the underlying tolled highways, bridges or tunnels," and that, "Proposed plaza construction and modifications should be designed with anticipation of increasing [electronic toll collection] utilization." Both statements are consistent with recommendations in this report; however, the FHWA has not updated its guidance on meeting these goals since the document was issued.

Overall, although the research is not definitive as to whether hybrid designs provide a safety benefit over conventional toll plaza designs, published research does point to a clear safety benefit of high-speed fully electronic tolling over both hybrid and conventional designs. Non-transponder-based, fully electronic tolling technology is readily accessible and, in most cases, already installed at toll plazas, but is often implemented as a backup. Yet, a best-practices document has not been issued or updated since 2006, leaving toll road operators on their own when making decisions about electronic tolling.

[57] The publication, although available online, is currently archived, and FHWA notes that it may contain dated technical, contact, and link information: Traffic Control Strategies at Toll Plazas Home Page - FHWA.

The NTSB concludes that updates to FHWA guidance could provide toll road operators such as OTIC with better information to safely upgrade their tolling configurations. The NTSB therefore recommends that the FHWA create and distribute updated guidance on current best practices for toll road operators that addresses the safety benefits of fully electronic tolling.

2.4.2.3 Industry Organizations

The International Bridge, Tunnel and Turnpike Association (IBTTA) is a global association for owners and operators of toll facilities. IBTTA conducts advocacy on behalf of tolling agencies, holds events for and shares information with members, and has working groups to investigate and analyze topic areas, such as emerging technologies, and publish findings for their membership.

NTSB investigators held a meeting with IBTTA members on December 16, 2025, to discuss safety issues found as part of the Swanton crash investigation. IBTTA confirmed that hybrid tolling designs are in use at other tolling facilities in the United States, including:

- Central Florida Expressway
- Maine Turnpike
- New Hampshire Department of Transportation/Bureau of Turnpikes
- New Jersey Turnpike Authority
- Globalvia Inversiones Holding LLC (Virginia Pocohontas Parkway)
- Richmond Metropolitan Transportation Authority
- Washington State Department of Transportation (Tacoma Narrows Bridge)

IBTTA also confirmed that although safety is a concern for its members when deciding whether to implement fully electronic tolling, the decision is primarily a financial one. Manual toll options remain in place if members believe that those options facilitate higher toll revenue. Given that hybrid toll plazas similar to the Swanton Toll Plaza are still in place nationwide, other operators may need to monitor activity in the vicinity of their toll plazas for unsafe lane-change behaviors like those that NTSB investigators observed in reviewing video from the Swanton Toll Plaza.[58] Furthermore, given that the technology to implement fully electronic tolling via license plate reading and/or toll transponders is likely already present at these facilities, the NTSB recommends that IBTTA inform its members of the circumstances of the Swanton Township Toll Plaza crash, the need to ensure efficient access points

[58] In addition to video analysis, other forms of monitoring devices like pneumatic road tubes could be used to count vehicles crossing gore areas.

to toll roads for emergency responders, the unsafe driver behaviors—such as last-minute lane changes and large speed differentials—at hybrid toll plazas, the need to monitor hybrid toll plazas for these unsafe behaviors, methods to inform drivers about all payment options in advance of toll plazas, and the safety benefits that are gained when closing low-speed lanes and converting to fully electronic toll collection systems.

3 Conclusions

3.1 Findings

1. None of the following were factors in this crash: (1) weather and lighting; (2) the mechanical condition of the involved vehicles; (3) the sport utility vehicle driver's licensing, reported and observed general health, use of alcohol or other tested-for drugs, or cell phone use; (4) the safety policies of the motor carrier; and (5) the truck driver's licensing, experience, medical conditions, fatigue, use of alcohol or other tested-for drugs, familiarity with the vehicle and route, or cell phone use.

2. The non-compliant load securement of the appropriately packaged hazardous materials was not causal to the crash and did not contribute to the injuries.

3. Although the Springfield Township Fire Department was delayed due to inadequate turnpike access, the overall emergency response was adequate.

4. The extent to which emergency response delays occur in other areas of the turnpike is not known, but it is the Ohio Turnpike and Infrastructure Commission's responsibility to ensure efficient emergency response access in all turnpike locations.

5. The traffic incident management procedures put into action after the initial Swanton crash complied with Ohio's state traffic incident management plan, and no deficiencies were identified that would have led to the secondary crashes.

6. The sport utility vehicle driver's attempt to enter the low-speed toll lanes in front of the combination vehicle created a rapidly increasing speed differential between the two vehicles.

7. The sport utility vehicle was likely visible to the truck driver; however, the magnitude of the speed difference between the two vehicles would have been difficult for the truck driver to determine when the sport utility vehicle entered his lane.

8. The sport utility vehicle driver was experiencing loss of situation awareness approaching the Swanton Township Toll Plaza, likely as the result of fatigue caused by acute sleep debt and poor sleep quality before the crash.

9. Although the truck driver was traveling at the posted speed limit, he did not have enough time to react to the imminent hazard created by the sport

utility vehicle's sudden lane incursion and rapid deceleration to avoid or mitigate the crash.

10. Proper use of the sport utility vehicle's lap/shoulder belts by the rear-seated occupants would have prevented their ejection and likely reduced the injury severity to the center- and right-rear-seated occupants, who were outside the main intrusion area, and would have likely prevented the death of the right-rear-seated occupant.

11. The unbelted truck driver sustained serious injuries, likely as a result of intrusion into his seating space and a lack of proper lap/shoulder belt use.

12. Primary enforcement of seat belt use for all vehicle seating positions by the state of Ohio would increase the likelihood that all vehicle occupants are properly belted.

13. Although hybrid toll plaza designs show some safety improvements over conventional toll plaza configurations, they still have inherent safety risk due to large speed differentials at entrance and exit points used for manual toll transactions, as shown in the Swanton crash.

14. Better presentation of toll payment options at the Swanton Township Toll Plaza to drivers in the high-speed toll lanes would have made it less likely that the sport utility vehicle driver would have changed lanes across the path of the combination vehicle to enter the low-speed lanes, and therefore the crash could have been avoided.

15. Had the Swanton Township Toll Plaza been configured as fully electronic tolling like other states' toll plazas along turnpikes—reducing the need for lane changes and the associated speed variability—the crash would have been avoided.

16. The current standards in the *Manual on Uniform Traffic Control Devices for Streets and Highways* do not address current tolling capabilities, including fully electronic tolling, because the Federal Highway Administration has not updated them since 2009.

17. Updates to Federal Highway Administration guidance could provide toll road operators such as the Ohio Turnpike and Infrastructure Commission with better information to safely upgrade their tolling configurations.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the Swanton crash was the sport utility vehicle (SUV) driver's deceleration and lane change into the eastbound right lane of the turnpike high-speed lanes and across the path of the combination vehicle. Contributing to the SUV driver's performance was reduced situation awareness, likely due to fatigue. Contributing to the SUV driver's decision to change lanes was the lack of signage stating that missed tolls could be paid online. Contributing to the severity of the crash was the large speed differential between the two vehicles, which did not give the truck driver sufficient opportunity to slow down or avoid the collision. Contributing to the severity of injuries, including death, was the lack of seat belt use by several occupants.

4 Recommendations

4.1 New Recommendations

As a result of this investigation, the National Transportation Safety Board makes the following new safety recommendations:

To the Federal Highway Administration:

Update the standards and guidance in the *Manual on Uniform Traffic Control Devices for Streets and Highways* pertaining to traffic control devices regulating and guiding motorists through toll facilities, including signage that informs drivers about fully electronic tolling options, not just transponder-based tolling. (H-26-10)

Create and distribute updated guidance on current best practices for toll road operators that addresses the safety benefits of fully electronic tolling. (H-26-11)

To the Ohio Turnpike and Infrastructure Commission:

Work together with Springfield Township to expedite completing the planned turnpike access point to improve emergency response times on the turnpike in the vicinity of the Swanton Township Toll Plaza. (H-26-12)

Conduct a systemwide evaluation of the Ohio Turnpike to determine whether additional access points are needed to improve emergency response times, with emphasis on locations requiring actions similar to those currently in progress to improve turnpike access in the vicinity of the Swanton Township Toll Plaza, and make the results available to the public. (H-26-13)

If the systemwide evaluation of the Ohio Turnpike (recommended in Safety Recommendation H-26-13) determines that additional access points are needed, build those access points to improve emergency response times. (H-26-14)

Implement safety improvements, consistent with the 2023 *Manual on Uniform Traffic Control Devices for Streets and Highways*, at the following four toll plazas: Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza to reduce unsafe driver behaviors, such as last-minute lane changes and large speed differentials. (H-26-15)

Implement fully electronic high-speed tolling and permanently close the low-speed lanes at the Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza, and provide the National Transportation Safety Board with a timeframe for doing so. (H-26-16)

To Springfield Township:

Work together with the Ohio Turnpike and Infrastructure Commission to expedite completing the planned turnpike access point to improve emergency response times on the turnpike in the vicinity of the Swanton Township Toll Plaza. (H-26-17)

To the International Bridge, Tunnel and Turnpike Association:

Inform your members of the circumstances of the Swanton Township Toll Plaza crash, the need to ensure efficient access points to toll roads for emergency responders, the unsafe driver behaviors—such as last-minute lane changes and large speed differentials—at hybrid toll plazas, the need to monitor hybrid toll plazas for these unsafe behaviors, methods to inform drivers about all payment options in advance of toll plazas, and the safety benefits that are gained when closing low-speed lanes and converting to fully electronic toll collection systems. (H-26-18)

4.2 Previously Issued Recommendations Reiterated and Classified in This Report

The National Transportation Safety Board reiterates and classifies the following safety recommendation:

To the State of Ohio:

Enact legislation that provides for primary enforcement of a mandatory seat belt use law for all vehicle seating positions equipped with a passenger restraint system. (H-15-42)

Safety Recommendation H-15-42 is reiterated in section 2.3 of this report. Its previous status Open—Acceptable Alternate Response is changed to Open—Unacceptable Response.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

JENNIFER L. HOMENDY
Chairwoman

THOMAS CHAPMAN
Member

MICHAEL E. GRAHAM
Vice Chairman

JOHN DELEEUW
Member

Report Date: August 31, 2026

Appendixes

Appendix A: Investigation

The National Transportation Safety Board (NTSB) received notification of the Swanton, Ohio, crash on August 15, 2024, and launched investigators on the same day from the Office of Highway Safety to address highway and vehicle factors, motor carrier operations, human performance, survival factors, and technical reconstruction. The team included staff from the NTSB's Office of Railroad, Pipeline, and Hazardous Materials, the Transportation Disaster Assistance Division, Office of General Counsel, and Office of Safety Recommendations and Communications. Chairwoman Jennifer Homendy was the board member on scene.

The Federal Motor Carrier Safety Administration, the Ohio State Highway Patrol, the Ohio Turnpike and Infrastructure Commission, and the Public Utilities Commission of Ohio were parties to the investigation.

Appendix B: Consolidated Recommendation Information

Title 49 *United States Code* 1117(b) requires the following information on the recommendations in this report.

For each recommendation–

(1) a brief summary of the Board's collection and analysis of the specific accident investigation information most relevant to the recommendation;

(2) a description of the Board's use of external information, including studies, reports, and experts, other than the findings of a specific accident investigation, if any were used to inform or support the recommendation, including a brief summary of the specific safety benefits and other effects identified by each study, report, or expert; and

(3) a brief summary of any examples of actions taken by regulated entities before the publication of the safety recommendation, to the extent such actions are known to the Board, that were consistent with the recommendation.

To the Federal Highway Administration:

H-26-10

Update the standards and guidance in the *Manual on Uniform Traffic Control Devices for Streets and Highways* pertaining to traffic control devices regulating and guiding motorists through toll facilities, including signage that informs drivers about fully electronic tolling options, not just transponder-based tolling.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.4.2, Available Design Guidance. Information supporting (b)(1) can be found on pages 44–46; (b)(2) can be found on pages 44–46; and (b)(3) is not applicable.

H-26-11

Create and distribute updated guidance on current best practices for toll road operators that addresses the safety benefits of fully electronic tolling.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.4.2, Available Design Guidance. Information supporting (b)(1) can be found on pages 44–48; (b)(2) can be found on pages 44–48; and (b)(3) is not applicable.

To the Ohio Turnpike and Infrastructure Commission:

H-26-12

Work together with Springfield Township to expedite completing the planned turnpike access point to improve emergency response times on the turnpike in the vicinity of the Swanton Township Toll Plaza.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.1.2, Emergency Response. Information supporting (b)(1) can be found on pages 31–32; (b)(2) can be found on pages 31–32; and (b)(3) is not applicable.

H-26-13

Conduct a systemwide evaluation of the Ohio Turnpike to determine whether additional access points are needed to improve emergency response times, with emphasis on locations requiring actions similar to those currently in progress to improve turnpike access in the vicinity of the Swanton Township Toll Plaza, and make the results available to the public.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.1.2, Emergency Response. Information supporting (b)(1) can be found on pages 31–32; (b)(2) can be found on pages 31–32; and (b)(3) is not applicable.

H-26-14

If the systemwide evaluation of the Ohio Turnpike (recommended in Safety Recommendation H-26-13) determines that additional access points are needed, build those access points to improve emergency response times.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.1.2, Emergency Response. Information supporting (b)(1) can be found on pages 31–32; (b)(2) can be found on pages 31–32; and (b)(3) is not applicable.

H-26-15

Implement safety improvements, consistent with the 2023 *Manual on Uniform Traffic Devices for Streets and Highways*, at the following four toll plazas: Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza to reduce unsafe driver behaviors, such as last-minute lane changes and large speed differentials.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.4.2, Available Design Guidance. Information supporting (b)(1) can be found on pages 44–46; (b)(2) can be found on pages 44–46; and (b)(3) is not applicable.

H-26-16

Implement fully electronic high-speed tolling and permanently close the low-speed lanes at the Westgate Toll Plaza, Swanton Township Toll Plaza, Newton Falls Toll Plaza, and Eastgate Toll Plaza, and provide the National Transportation Safety Board with a timeframe for doing so.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.4.2, Available Design Guidance. Information supporting (b)(1) can be found on pages 44–46; (b)(2) can be found on pages 44–46; and (b)(3) is not applicable.

To Springfield Township:

H-26-17

Work together with the Ohio Turnpike and Infrastructure Commission to expedite completing the planned turnpike access point to improve emergency response times on the turnpike in the vicinity of the Swanton Township Toll Plaza.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.1.2, Emergency Response. Information supporting (b)(1) can be found on pages 31–32; (b)(2) can be found on pages 31–32; and (b)(3) is not applicable.

To the International Bridge, Tunnel and Turnpike Association:

H-26-18

Inform your members of the circumstances of the Swanton Township Toll Plaza crash, the need to ensure efficient access points to toll roads for emergency responders, the unsafe driver behaviors—such as last-minute lane changes and large speed differentials—at hybrid toll plazas, the need to monitor hybrid toll plazas for these unsafe behaviors, methods to inform drivers about all payment options in advance of toll plazas, and the safety benefits that are gained when closing low-speed lanes and converting to fully electronic toll collection systems.

Information that addresses the requirements of 49 *USC* 1117(b), as applicable, can be found in section 2.4.2, Available Design Guidance. Information supporting (b)(1) can be found on pages 48–49; (b)(2) can be found on pages 48–49; and (b)(3) is not applicable.

Appendix C: Brief History of Roadway Tolling Systems

The Manual Era (Mid-20th Century)

- **Configuration:** Wide, sprawling plazas with physical toll booths. The highway widened into a large queue zone, forcing all vehicles to slow down and stop.
- **Design Emphasis:** Included underground tunnels for toll attendants to access booths safely, large administrative buildings, and heavy concrete barriers.
- **Issues:** Created traffic bottlenecks and high collision rates due to drivers weaving across lanes, as well as poor air quality from vehicle idling.

The Transitional Era (1980s – 1990s)

- **Configuration:** The introduction of dedicated exact-change lanes alongside attended booths.
- **Technology Integration:** Early versions of electronic toll collection systems—such as early transponders—allowed vehicles to pass through specialized, nonstop lanes at reduced speeds.
- **Design Emphasis:** Introduction of massive overhead steel canopies and signage to direct drivers to specific electronic or cash lanes safely.

Fully Electronic- / High-Speed- Open-Road Tolling (2000s – 2010s)

- **Configuration:** Physical toll plazas began to be demolished or bypassed. Instead, wide-span overhead trusses or gantries were built directly over the open highway.
- **Technology Integration:** Heavy reliance on radio frequency identification tags and video tolling (license plate optical character recognition).
- **Design Emphasis:** Shifted away from heavy civil architecture to roadside technological infrastructure, eliminating the need for vehicles to slow down.

Modern Era (Present)

- **Configuration:** True high-speed or open-road tolling where vehicles maintain highway speeds under overhead gantries.
- **Technology Integration:** Ubiquitous digital systems including license plate-reading cameras, connected vehicle systems, and mobile app pay-by-plate integration.

- **Design Emphasis:** Focus on seamless integration into intelligent transportation systems. Modern design guidelines prioritize approach taper rates, sight distances, and queue reduction where remnants of old plazas still exist.

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