



***Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch***

***Accident Investigation Report
HQ-2018-1275***

***CSX Transportation (CSX)
Princeton, IN
June 17, 2018***

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.

SYNOPSIS

On June 17, 2018, at approximately 8:12 p.m., EDT, CSX Transportation (CSX) freight Train Q513-17, operating southbound on the CSX CE&D Subdivision, derailed 22 loaded and 1 empty mixed-freight and tank cars at Milepost (MP) 0ZA261.2. This derailment collided into 3 standing auto rack cars that were on the Toyota siding, derailing those as well. 26 total cars were derailed. The accident occurred in Princeton, Indiana, on Main Track No.1 in a Two Main Track territory. The derailment damaged approximately 1,000 feet of Main Track No. 1; 270 feet of Main Track No. 2; 230 feet of the Princeton Siding Track (sometimes referred to as the Toyota Siding Track); 270 feet of the Princeton Yard Track (sometimes referred to the Toyota Storage Track); and one switch on Main Track No. 1. The method of train operation in this territory is Traffic Control System (TCS). Positive Train Control (PTC) is in effect on this territory.

The train consisted of 2 locomotives, 89 loaded cars, and 9 unloaded cars. The train was 6,821 feet in length and weighed 11,491 trailing tons. Twenty-six cars were involved in the derailment; 23 on Train Q513-17; and 3 were auto-rack cars on the Toyota Siding, which was two tracks east of Main Track No.1. Six of the derailed cars were placarded hazardous material, Liquefied Petroleum Gas (LPG), tank cars. All six of the tank cars were loaded. Two of the six tank cars were ruptured and caught fire.

First responders ordered an evacuation of approximately 32 people, for homes and businesses within a half-mile radius of the derailment site. U.S. Highway 41 was closed between Princeton and Fort Branch, Indiana. The Princeton police, Indiana State Police, Princeton Fire Department, Gibson County Emergency Management Services, emergency response contractors, and environmental contractors responded to this accident and were on site. On June 18, 2018 at 4:00 p.m., EDT, the evacuation order was lifted.

An estimated \$1,520,252 total in equipment damage and \$283,656 total in track and structures damage was reported.

It was nighttime, dark, the weather was clear, and the temperature was 89 ° F with 65 percent humidity at the time the accident occurred.

No injuries were reported. This is a crude oil route, but is not an Amtrak route. This derailment was not PTC preventable.

The probable cause of the derailment was a thermal misalignment, Cause Code T109, on Main Track No. 1 in the curve at MP 0ZA261.2. The thermal misalignment was being reported to the train dispatcher when the derailment occurred.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 CSX Transportation	1a. Alphabetic Code CSX	1b. Railroad Accident/Incident No. HQ-2018-1275
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GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance CSX Transportation	1a. Alphabetic Code CSX	1b. Railroad Accident/Incident No. HQ-2018-1275
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 6/17/2018	4. Time of Accident/Incident 8:12 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 14	7. HAZMAT Cars Damaged/Derailed 6	8. Cars Releasing HAZMAT 2
	9. People Evacuated 32	10. Subdivision CE&D
11. Nearest City/Town Princeton, Indiana	12. Milepost (to nearest tenth) 0ZA261.2	13. State Abbr. IN
		14. County GIBSON
15. Temperature (F) 89 °F	16. Visibility Day	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number Main Track No. 1	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 33
		22. Time Table Direction South
23. PTC Preventable No		

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol Q513-17				
4. Speed (recorded speed, if available) R - Recorded 38.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 11491		6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter					Code 0	
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q, J</u>											
7. Principal Car/Unit		a. Initial and Number		b. Position in Train		c. Loaded (yes/no)		8. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box		Alcohol	Drugs
(1) First Involved (derailed, struck, etc.)		TBOX 638508		30		yes				0	0
(2) Causing (if mechanical, cause reported)		0		0		no		9. Was this consist transporting passengers?		No	
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		e. Caboose
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	
(1) Total in Train	2	0	0	0	0	(1) Total in Equipment Consist	89	0	9	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	22	0	1	0	0
12. Equipment Damage This Consist 1520252			13. Track, Signal, Way & Structure Damage 283656								
14. Primary Cause Code T109 - Track alignment irregular (buckled/sunkink)											
15. Contributing Cause Code											
Number of Crew Members						Length of Time on Duty					
16. Engineers/Operators		17. Firemen		18. Conductors		19. Brakemen		20. Engineer/Operator		21. Conductor	
1		0		1		0		Hrs: 7 Mins: 22		Hrs: 7 Mins: 22	
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?		26. Was EOT Device Properly Armed?	
Fatal		0		0		0		Yes		Yes	
Nonfatal		0		0		0		27. Caboose Occupied by Crew?		N/A	
28. Latitude 38.320793000				29. Longitude -87.575316000							

SKETCHES

Sketch - Princeton Site Map Sketch HQ-2018-1275

DERAILMENT SITE MAP

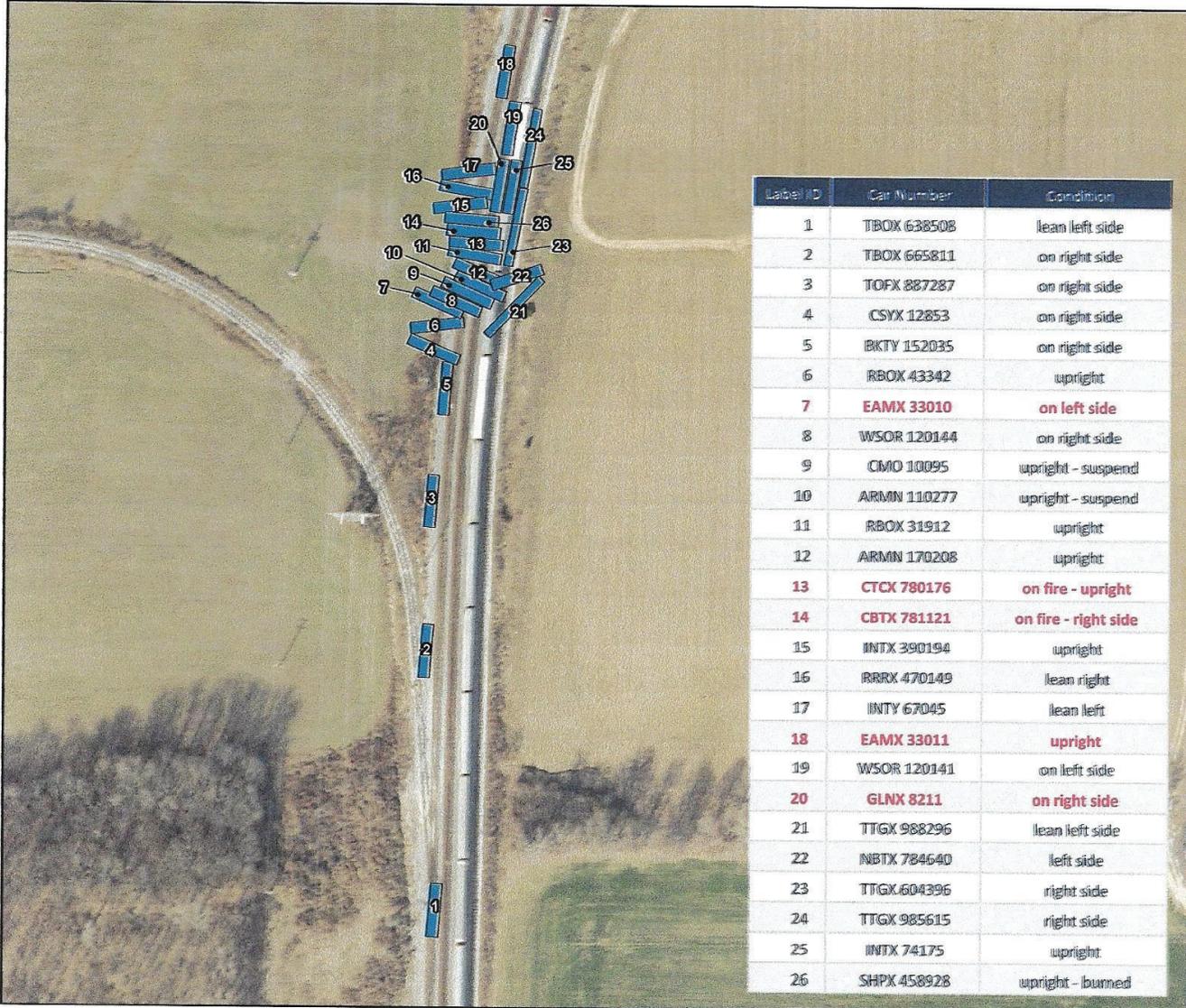
Princeton, IN

Incident: June 17, 2018



Map Date/Time: 6/17/2018 19:00 (IAP 1)

BaseMap Sources: Google Earth, Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, METI



Label ID	Car Number	Condition
1	TBOX 638508	lean left side
2	TBOX 665811	on right side
3	TOFX 887287	on right side
4	CSYX 12853	on right side
5	BKTY 152035	on right side
6	RBOX 43342	upright
7	EAMX 33010	on left side
8	WSOR 120144	on right side
9	CMO 10095	upright - suspend
10	ARMN 110277	upright - suspend
11	RBOX 31912	upright
12	ARMN 170208	upright
13	CTCX 780176	on fire - upright
14	CBTX 781121	on fire - right side
15	INTX 390194	upright
16	RRRX 470149	lean right
17	INTY 67045	lean left
18	EAMX 33011	upright
19	WSOR 120141	on left side
20	GLNX 8211	on right side
21	TTGX 988296	lean left side
22	NBTX 784640	left side
23	TTGX 604396	right side
24	TTGX 985615	right side
25	INTX 74175	upright
26	SHPX 458928	upright - burned



NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

On June 17, 2018, at 12:45 p.m., EDT, a CSX Transportation (CSX) locomotive engineer and conductor reported for duty at the Avon Terminal in Avon, Indiana, their away-from-home terminal, to operate CSX Train Q513-17 to Evansville, Indiana. The engineer and conductor had received more than the statutory off-duty period prior to reporting for duty. The engineer had 19 hours and 9 minutes of off-duty time and the conductor had 17 hours and 50 minutes of off-duty time. The train crew was issued its paperwork at the Avon terminal, had a job briefing, and departed to pick up its train in Avon yard.

The crew was taxied to its train in the yard. The freight train consisted of 2 locomotives (lead unit CSXT 578), both of which were on-line, 89 loaded mixed freight cars, and 9 empty freight cars. Fourteen of the cars in the consist were loaded hazardous material cars. The train was 6,821 feet in length and had 11,491 trailing tons excluding the locomotives. The train was scheduled to operate to Evansville, where it would be re-crewed and continue south. Upon arrival to the train, the engineer inspected the locomotives taking no exceptions. A mechanical inspection and a Class 1 air brake test was performed by the mechanical department and the air slip was placed in the cab of the lead locomotive.

Train Q513-17 departed Avon yard on the St. Louis Subdivision. It entered onto the Main Track at the west end of the yard. The train was headed west to Terre Haute, Indiana, where it transferred to the CE&D Subdivision and began heading south to Evansville. The method of operation is Traffic Control System. Positive Train Control (PTC) is in effect on this territory but was not in use by the train. The train traveled approximately 82 miles south on the CE&D Subdivision on the Main Track No.1 to Milepost (MP) 0ZA261.2 where Train Q513-17 experienced an undesired train emergency brake application. The head end of the train came to a stop at approximately MP 0ZA262.0.

As the train approached the accident area, the locomotive engineer was seated at the controls on the west (right) side of the leading locomotive. The conductor was seated on the east (left) side of the leading locomotive. The engineer was on the radio with the dispatcher asking about the plans for getting into Evansville, which the dispatcher said they would take the siding at the Ingle control point at MP 0ZA274.5, and that it would be up to the Evansville Terminal from there. During this conversation, the train reported they had just gone over a sunkink (thermal misalignment). As the dispatcher was confirming the sunkink and asking if they were over it, the engineer replied, "about 20 cars." The engineer then replied that their train had just gone into emergency and said, "I think it is bad," and added that an explosion and fire was behind them.

In the area of the accident, the CSX CE&D Subdivision is comprised of two main tracks and two siding tracks, from the west to east, the tracks are Main Track 1, Main track 2, Princeton Siding, and Princeton Yard Track. The track is on a 0.47 percent ascending grade, going south, from MP 0ZA260.9 to MP 0ZA261.6. A 2 degree, 1 minute left-hand curve goes south from MP 0ZA 261.0 to MP 0ZA261.3. The

point of derailment (POD) was at MP 0ZA261.2.

It was nighttime, dark, the weather was clear, and the temperature was 89 ° F with 65 percent humidity at the time the accident occurred.

The railroad timetable direction of the train was south. The geographic direction was also south. Timetable directions are used throughout this report.

The Accident

CSX Train Q513-17 was being operated at a recorded speed of 39 mph approaching the accident area. It was southbound on Main Track No. 1. The bell and whistle were being actuated for the road crossings in Princeton, Indiana, with the last crossing being approximately one mile north of the POD. At the time the accident occurred, the train speed was 38 mph. Both speeds were recorded by the event recorder of the leading locomotive CSXT 578. The maximum authorized speed for freight trains is 60 mph as designated in the current CE&D Subdivision Timetable No. 1 dated, December 1, 2017. A temporary 40 mph speed restriction had been in effect at the POD due to the heat.

As CSX Train Q513-17 approached the derailment area the engineer had the locomotive in throttle position No. 8 with a brake pipe pressure of 89 to 90 psi. At 8:12:20 p.m., EDT, the brake pipe pressure went from 89 psi to 87 psi. Two seconds later the brake pipe pressure went to 0 psi. One second after this the End of Train (EOT) pressure went from 88 psi to 7 psi. At this time, the throttle was still in position No. 8 and the speed had slowed to 34 mph. At 8:12:32 p.m., EDT, the throttle was moved to position No. 6 and the speed had been reduced to 30 mph. Six seconds later, the throttle was moved to position No. 4 and the speed was now 27 mph. Three seconds after this, the throttle was in the idle position and the train speed was now 24 mph. The train finally came to a stop at 8:13:11 p.m., approximately 1,500 feet from where the derailment event started. The engineer was on the radio just prior to this event with the dispatcher discussing their arrival to Evansville and reporting a thermal misalignment. During this radio transmission, the train experienced the undesired emergency brake application. The engineer announced on the radio, "Emergency," three times and told the dispatcher their status. He said the derailment had blocked both main tracks as well as the Toyota tracks, and that there had been an explosion and the propane tank cars were on fire. The dispatcher asked if they were okay, to which the crew responded they were not injured, and the dispatcher told the train crew he had responders enroute.

The derailed equipment consisted of 22 loaded cars and one empty car. Of the 23 derailed cars, 6 of these were loaded hazardous material cars. All six hazardous material cars were liquefied petroleum gas (LPG) propane tank cars. Two of the six LPG tank cars were ruptured and caught fire, car CTCX 780176 and car CBTX 781121. Car CTCX 780176 was crossways across both main tracks in an upright position and on fire. Car CBTX 781121 was also crossways across both main tracks, on its right side, and on fire. The first derailed car was a TBOX 638508 that was dragged approximately two-tenths of a mile and

leaning to the left side. It was the 30th car in the consist behind two locomotives. The second derailed car – the 31st car -- was a TBOX 665811; it was dragged approximately one-tenth of a mile and turned over on its right side. The third derailed car – the 32nd car -- was a TOFX 887297; it was dragged approximately 300 feet and turned over on the right side. The rest of the derailed cars were strung out in a general pile-up from the POD at MP 0ZA261.2, for approximately 300 feet. Three auto-rack cars were on the Toyota Siding, which is the second track east of Main Track No. 1, that were derailed from the general pile-up of the Train Q513-17 derailment. Total car and equipment damage was estimated to be \$1,520,252.

The derailment damaged one hand throw switch, the Sunbeam Switch, which is an industrial track switch on Main Track No. 1 approximately one- to two-tenths of a mile south of the POD. The derailment damaged approximately 1,000 feet of Main Track No. 1 (26 track panels installed); 270 feet of Main Track No. 2 (seven track panels installed); 230 feet of the Princeton Siding (six track panels installed); and 270 feet of the Princeton Yard Track (seven track panels installed). Total track and structures damage was estimated to be \$283,656.14.

At 8:21 p.m., EDT, on June 17, 2018, the Indiana State Police received a call informing them of a derailment with explosions and fire on CSX in the town of Princeton. It was reported that a train had been travelling on the tracks located adjacent to County Road 150 South just south of West Alabama Street on the south side of Princeton, in Gibson County when it derailed and the flammable contents exploded. Several emergency responder units were also notified. The Princeton Fire Department and police were on the scene almost immediately. The Indiana State Police, Gibson County Sherriff's Department, Gibson County Emergency Management Services, and other emergency responders arrived at the site a short time later. After being informed that hazardous material cars containing LPG were involved and there had been explosions and fire, an evacuation was ordered for a one-half mile radius of the derailment site by the Princeton, Indiana Fire Department Chief. The exact number of evacuees who heeded the order is not known. Approximately 75 houses were in the evacuation zone and CSX reports providing shelter for 32. The Fire Chief did not have an exact number of evacuees, but estimated 150 to 200 people. U.S. Highway 41 from Princeton to Fort Branch, Indiana, west of the derailment site, was also shut down and traffic re-routed. The evacuation order and U.S. Highway 41 shutdown were lifted on June 18, 2018, approximately 18.5 hours after it was ordered.

Post-Accident Investigation

An incident command post was set up at the Princeton Fire Department Station Number Three located on South Main Street in Princeton. On June 18, 2018, CSX informed the emergency responders at the morning briefing that four rail cars were on fire -- the two ruptured LPG cars and two box cars with food products. CSX hazardous material employees said they had a plan to remove the rail cars, begin a burn-off of the propane, extinguish additional fires, and begin debris removal. Later, at the afternoon briefing CSX stated they would begin a burn-off of the propane that evening. Small fires from the two ruptured LPG cars were still burning on June 19, 2018 at 12:30 p.m., EDT.

Derailment contractors Hulcher Services, Inc. and RJ Corman Railroad Group, LLC, were on site in the early morning hours of June 18, 2018. After being briefed and allowed into the derailment site, both contractors started removing the wreckage and damaged track from the railroad right of way. They started at the farthest point from the general pile-up and fire. All the cars were cleared off the track by 1:30 p.m., EDT, on June 19, 2018. The two LPG cars that were ruptured and on fire were then removed from the railroad right of way after the fire had burned out. Main Track No. 2 was put back in service at approximately 9:30 p.m., EDT, on June 19, 2018, at a speed of 10 mph. The first two trains, both south-bound, ran on Main Track No. 2 at approximately 10:00 p.m., EDT, and 10:30 p.m., EDT, respectively. Main Track No. 1 and the Toyota Siding were put in service shortly thereafter. The Toyota Lead, the farthest east track from Main Track No. 1, was put back in service at approximately 2:30 a.m., EDT, on June 20, 2018. The first train cleared the Toyota Lead at approximately 6:45 a.m., EDT, on June 20, 2018.

Analysis and Conclusions

Analysis-Post Accident Toxicological Testing: The train crew was not tested as required in Title 49 Code of Federal Regulations (CFR) part 219 subpart C, post-accident toxicological testing. No physical signs of impairment existed per the investigating CSX Trainmaster.

Conclusion: The Federal Railroad Administration (FRA) determined that impairment of the engineer and conductor was not a causal factor in this accident.

Analysis-Fatigue: FRA performed a fatigue analysis using the Fatigue Avoidance Scheduling Tool (FAST). FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis. At or above this baseline, the FRA does not consider fatigue as probable for any employee. Inputs into the FAST software vary based on information obtained from each employee. FRA obtained fatigue-related information, including a 10-day work history, for two employees involved in this incident, the conductor and the locomotive engineer assigned to this train. Based on the results of the analysis, fatigue was not likely for any of the employees involved in the accident.

Conclusion: FRA determined fatigue did not contribute to the cause or severity of the accident.

Analysis-Operating Practices/Train Handling: An FRA Operating Inspector analyzed the event recorder data provided by CSX for the lead locomotive CSXT 578. The event recorder data prior to the derailment suggested that train handling was in accordance with proper train-handling procedures. This data also suggested that the emergency application of the air brakes was induced by the train line, probably caused by a train separation.

Conclusion: FRA determined that train handling did not contribute to the cause or severity of the accident.

Analysis-Operating Practices/Training and Certification: The engineer and conductor on Train Q513-17

were trained and currently certified to operate on the day of the incident. The engineer's certificate (dual certified) was active and issued on December 31, 2016, and expires on December 31, 2019. The conductor's certificate was active and issued December 31, 2016, and expires on December 31, 2019. Operational testing was performed on both crew members during the period of June 2017-June 2018. The engineer had two tests in 2018 and 19 tests in 2017. The conductor had 19 tests performed in 2018 and three tests in 2017.

Conclusion: FRA determined training and certification did not contribute to the cause or severity of the accident.

Analysis-Hazard Materials: A total of six LPG tanks cars derailed.

1. EAMX 33010:

- DOT 112J340W.
- Position in train: 36.
- Resting on left side.
- A-end: Safety appliances damaged, L- bolster bent toward A-end.
- B-end: Safety appliances damaged, draft gear missing, draft pocket damaged, coupler missing, R- bolster damaged.
- Left Side: Jacket crinkled.
- Right Side: Jacket crinkled and torn.

2. CTCX 780176:

- DOT112J340W.
- Position in train: 42.
- Upright and On-Fire
- A-end: Crinkled jacket, safety appliances damaged/missing.
- B-end: Circular tank head dent 2"deep x 38" diameter, the B-end coupler was hooked to another (coupler, draft gear and draft pocket) from another tank car, damaged safety appliances and brake hardware, L- bolster bent toward B-end.
- Left side: Side impact damage, product release and fire from two breaches in the tank.
- Right side: Not visible for inspection as tank was laying on its right side.
- Top: Jacket crinkled and torn, safety appliances damaged.
- Bottom: Jacket crinkled and torn.

3. CBTX 781121:

- DOT 112J340W.
- Position in train: 43.

- Resting on right side and on fire.
- A-end: Safety appliances damaged, draft gear missing, draft pocket damaged, coupler missing, L-bolster bent toward B-end.
- B-end: L-bolster bent toward B-end, damaged safety appliances and brake hardware.
- Left Side: Jacket was torn and crinkled.
- Right Side: Not visible for inspection as tank was laying on its right side.
- Top: Fire at the top of the tank as product was releasing from the service equipment on the tank car. Response contractor MEI reported product was leaking from the packing on all three valves, possible vapor leak from PRD, the pipe plug on the vapor valve had vapor leaking from around it, and valve handles were burnt off. The jacket was torn and dented.
- Bottom: Jacket crinkled, small tear in jacket.

4. NBTX 784640:

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- DOT112J340W.
 - Position in train: 44.
 - Resting on left side.
 - A-end: L-bolster torn at top, R-bolster bent toward B-end, safety appliances torn off, draft gear missing, draft pocket damaged, coupler missing, jacket crinkled and torn.
 - B-end: Safety appliances damaged, R-bolster bent toward B-end.
 - Left side: Jacket crushed and torn.
 - Right side: Jacket crinkled.
 - Top: Lid for manway bonnet missing, manway bonnet 1/2 filled with dirt.
 - Bottom: Jacket crinkled.

5. GLNX 8211:

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- DOT 105J400W.
 - Train position: 50.
 - Resting on right side.
 - A-end: Safety appliances damaged, L-bolster bent toward A-end, R-bolster bent toward A-end.
 - B-end: L- bolster damaged, right bolster bent toward A-end, safety appliances and brake hardware damaged.
 - Left Side: Jacket crinkled.
 - Right Side: jacket crinkled.
 - Top: Jacket crinkled at A-end.
 - Bottom: No access and/or view of bottom of tank.

6. EAMX 33011:

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- DOT 112J340W.

- Train position: 52.
- Upright, the B-end derailed.
- B-end: Safety appliances and brake hardware damaged.
- Damages to this tank car were at the B-end and right side.
- Left Side: No damage.
- Right Side No damage.
- Top: No damage.
- Bottom: No damage.

FRA reviewed all emergency response, hazardous material documents and equipment noting no defects.

Conclusion: FRA determined that hazardous materials did not contribute to the cause or severity of the accident.

Analysis-Track: The last inspection prior to the accident was performed by a qualified CSX Track Inspector on June 17, 2018, the same day this accident occurred. This inspection was a special inspection due to the heat and the track inspector stated that he went through the accident area around 1:15 p.m., EDT, southbound on Main Track No. 2 with no exceptions taken. A heat inspection was also performed on June 16, 2018, with no exceptions. The previous CSX inspection was performed on June 15, 2018, by the track inspector and roadmaster transiting the accident area around mid-day with no exceptions taken. The track was also inspected on June 12, 2018, with the roadmaster and an FRA inspector with no exceptions taken. According to the roadmaster, no recent production work had taken place in the area and the last basic force work was performed on March 9, 2018, at MP 0ZA260.8, where three mud spots were tamped in tangent track. The roadmaster stated two geometry car surveys had been performed since February of 2018, with the last one at the end of May or beginning of June and no defects were found in the derailment area. The CE&D Subdivision is a continuous rail test territory where Sperry Rail Services conducts ultrasonic rail tests every 30 days. No rail defects have been found in the derailment area. The Sunbeam switch at MP 0ZA261.4 off of Main Track No. 1, a trailing point movement for southbound traffic had some mud but no noted defects on the last track inspection trip. The track inspector stated the curve north of the Sunbeam switch had no issues, which is where the derailment occurred.

The track where the derailment occurred consists of two main tracks from MP 0ZA260.1 to MP 0ZA265.9, with Main Track No.1 being the west track. A siding and lead track is east of Main Track No. 2. The track, in the direction of movement (south), is on a .47 percent ascending (uphill) grade from MP 0ZA260.9 to MP 0ZA261.6. A 2 degree, one minute left-hand curve goes south from MP 0ZA261.0 to MP 0ZA261.3. The POD was in the curve at MP 0ZA261.2.

FRA's inspection of the track in the derailment area noted the track north and south of the POD was in compliance with the FRA Track Safety Standards for Class 4 track. The ties had rail anchors installed on every other tie, which is compliant with CSX instructions and rules governing CWR. The one switch

involved in the derailment area at Sunbeam Plastics was destroyed and removed prior to FRA's arrival and its rail anchor pattern could not be observed. The track at the actual POD and general pile-up location was also destroyed and removed prior to FRA's arrival and was not inspected. Some evidence pointed to the rail moving in the tie plates, but not lifting out of the tie plates north of the POD. The rail anchors on the north side of the ties were tight against the ties and the rail anchors on the south side of the ties were away from the ties approximately one to one and one-half inches. Some evidence pointed to the ties moving longitudinally, but not laterally or vertically. Some of the ties north of the POD were skewed slightly to the south. No evidence existed of the ballast section being disturbed, having voids, or being heaved upwards. The ballast section was compliant to the FRA Track Safety Standards. The recent CSX geometry car survey was supportive of these findings as no geometry deviations were found in the derailment area. The rail throughout the derailment area is 136-pound RE CWR.

The temperature at the time of the derailment was 89° F. The temperature had reached 92° F two and one-half hours prior to the derailment. This was the hottest day of June for both high temperature and average temperature. This means the night before had less cooling and more heat retained in the rail. No record of precipitation was recorded for the month of June, which also reduces the cooling effect on the rail. The weather records were obtained from Weather Underground Historical Data and are included in the list of attachments.

The prior train, southbound loaded coal Train N040-17, came through the derailment area approximately one-and-one-half to two hours prior to the Train Q513-17 derailment. This was during the hottest part of the day. The forward-facing video of the lead locomotive on this train was viewed by the FRA on July 23, 2018. No thermal misalignment was observed. The forward-facing video on the lead locomotive of the Q513-17 was defective and no video was available. The second locomotive of the Q513-17, turned backwards, had an operable video and was facing to the rear. This video was viewed and it showed the car behind the locomotive moving laterally back and forth as it passed over the area of the suspected thermal misalignment.

FRA suspects the loaded coal Train N040-17, which had passed over the derailment area prior to the derailment, created a train-induced thermal misalignment. It was this thermal misalignment that the engineer of the Q513-17 was reporting to the dispatcher when the derailment occurred. It was also this thermal misalignment that is suspected of causing the lateral movement of the car behind the second locomotive of the Q513-17.

A thermal misalignment, sunkink, was observed by the engineer of Train Q513-17 in the curve at MP 0ZA261.2 and being reported to the dispatcher when the derailment occurred. June 17, 2018 was the hottest day of the month for both high and average temperature and with no rain recorded for the month.

Conclusion: FRA determined a thermal misalignment, Cause Code T109, on Main Track No. 1 in the curve at MP 0ZA261.2 to be the probable cause of the derailment.

Overall Conclusion

FRA determined that CSX was in full compliance with its own standards and all applicable Federal regulations. The investigation found that the all locomotive safety devices functioned as intended. There were no exceptions taken to the train's operation. A thermal misalignment, sunkink, was observed by the engineer of Train Q513-17 in the curve at MP 0ZA261.2 and being reported to the dispatcher when the derailment occurred. Based on the track inspection, FRA concluded that the probable cause of the derailment was a thermal misalignment, Cause Code T109, on Main Track No. 1 in the curve at MP 0ZA261.2.

This accident was not PTC-preventable.

Probable Cause and Contributing Factors

The probable cause of the derailment was a thermal misalignment, Cause Code T109, on Main Track No. 1, in the curve at MP 0ZA261.2. The thermal misalignment was being reported to the train dispatcher when the derailment occurred.