



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

***Accident Investigation Report
HQ-2018-1265***

***CSX Transportation (CSX) Derailment
Lebanon Junction, Kentucky
May 1, 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 May 1, 2018, at 3:21 p.m., EST, CSX Transportation (CSX) southbound freight train Q24129 (Train 1) derailed 2 locomotives and 19 loaded auto carriers at CSX Milepost (MP) 00026.7, on the Louisville Division in Lebanon Junction, Kentucky.

Train 1 was operating in throttle notch 6 as the train speed increased to 57 mph when the crew noticed a severe track misalignment ahead. As Train 1's locomotives traversed the track misalignment, they derailed and rolled onto their left side, with the head 19 cars derailling in a general pileup. CSX reported \$1,282,600 in damage to equipment and \$193,090 in damage to track and signal.

Weather at the time of the accident was clear, with a temperature of 82 °F.

FRA determined the probable cause of the accident was T109 – Track alignment irregular (buckled/sunkink).

FRA determined two contributing factors of this accident:

- H993 – Human factor – track
- M599 – Other miscellaneous causes

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 CSX Transportation	1a. Alphabetic Code CSX	1b. Railroad Accident/Incident No. 000176125
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GENERAL INFORMATION

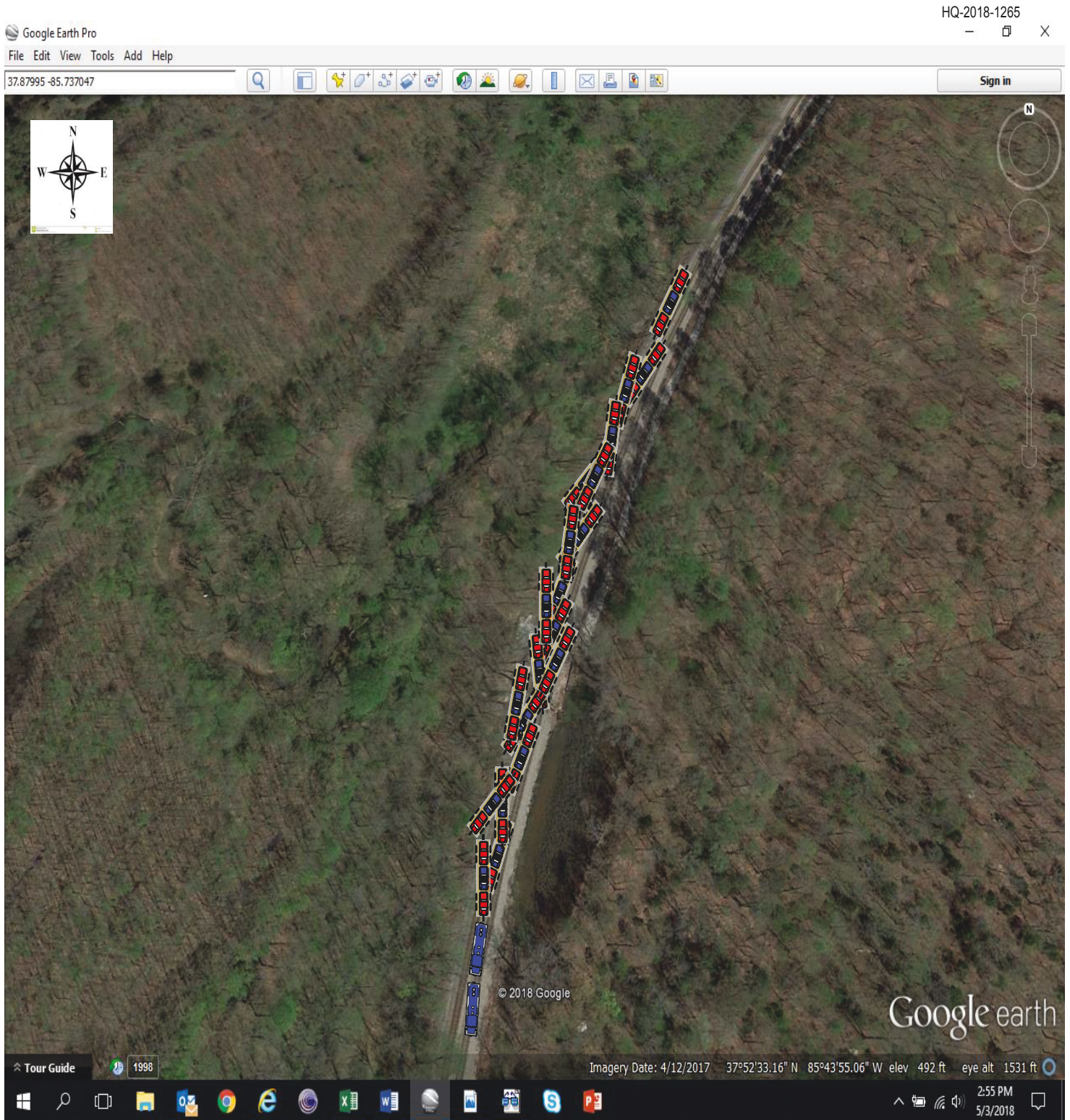
1. Name of Railroad or Other Entity Responsible for Track Maintenance CSX Transportation	1a. Alphabetic Code CSX	1b. Railroad Accident/Incident No. 000176125
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 5/1/2018	4. Time of Accident/Incident 3:21 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
	9. People Evacuated 0	10. Subdivision CSX TRANSPORTATION - MA
11. Nearest City/Town Lebanon Junction	12. Milepost (to nearest tenth) 26.7	13. State Abbr. KY
		14. County BUTLER
15. Temperature (F) 82 °F	16. Visibility Day	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number Main Track 1	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 70
		22. Time Table Direction South
23. PTC Preventable No	24. Primary Cause Code [T109] Track alignment irregular (buc	25. Contributing Cause Code(s) M599, H993

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes			3. Train Number/Symbol Q24129			
4. Speed (recorded speed, if available) R - Recorded 59.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 4318		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.)		CSXT 7815	1	yes				0	0		
(2) Causing (if mechanical, cause reported)		N/A	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	59	0	0	0	0
(2) Total Derailed	2	0	0	0	0	(2) Total Derailed	19	0	0	0	0
12. Equipment Damage This Consist 1282600			13. Track, Signal, Way & Structure Damage 193090								
Number of Crew Members						Length of Time on Duty					
14. Engineers/Operators 1	15. Firemen 0		16. Conductors 1		17. Brakemen 0	18. Engineer/Operator Hrs: 2 Mins: 51		19. Conductor Hrs: 2 Mins: 51			
Casualties to:		20. Railroad Employees	21. Train Passengers	22. Others		23. EOT Device? N/A		24. Was EOT Device Properly Armed? N/A			
Fatal	0		0	0		25. Caboose Occupied by Crew?		N/A			
Nonfatal	1		0		0						
26. Latitude 37.877124000			27. Longitude -85.732885000								

SKETCHES

Sketch - Sketch



NARRATIVE

Circumstances Prior to the Accident

Southbound CSX Transportation (CSX) Train Symbol Q24129 (Train 1) originated in Detroit, Michigan, on April 29, 2018, with a destination of Nashville, Tennessee. Prior to departure, Train 1 received all required pre-departure tests and inspection by qualified mechanical personnel with no exceptions.

At 12:30 p.m., EDT, on May 1, 2018, a crew consisting of an engineer and conductor was called for duty at Osborn Yard, in Louisville, Kentucky, to take Train 1 to Nashville. Both crew members received their statutory off-duty period prior to reporting for duty at their home terminal of Louisville. The Engineer was seated at the controls on the forward (F-end) right side of the leading locomotive and the Conductor was seated on the left side (F-end) of the lead locomotive. Train 1 departed Louisville with 2 lead locomotives and 59 loaded auto racks, was 5,834 feet long, and had 4,318 trailing tons.

The accident occurred on the CSX Louisville Division, Mainline Subdivision, at Milepost (MP) 00026.7, on main track Number 1, near the town of Lebanon Junction, Kentucky. The Mainline Subdivision runs geographic northeast and southwest, and timetable direction is south. Timetable direction will be used throughout this report. The method of operation for this subdivision is Centralized Traffic Control, with a Positive Train Control (PTC) overlay. Beginning at MP 00026.0, there are two main tracks identified, from west to east, as Main Track 1 and Main Track 2. The maximum authorized speed for the Mainline Subdivision is 60 mph, and there were no active speed restrictions in effect. Both Main Tracks have a descending 0.03-percent grade, and are tangent from MP 00026.0 until a 2-degree, left hand curve at about MP 00026.6, and then become tangent again at MP 00027.0. A culvert runs beneath the track at about MP 00026.7.

At about 3:20 p.m., EDT, Train 1 was traveling south on Main Track 1 at a recorded speed of 50 mph, with no air brakes applied and the throttle in the T6 position.

Weather at the time of the accident was clear, with a temperature of 82 °F.

The Accident

At approximately 3:21 p.m., EDT, Train 1 approached MP 00026.7 operating in throttle notch 6 as the train speed increased to 57 mph when the crew noticed a severe track misalignment ahead. The Engineer did not have enough time to make any changes to the controls due to the limited sight distance. As Train 1's locomotives traversed the track misalignment, they derailed and rolled onto their left side, with the head 19 cars derailed in a general pileup. The event recorder on the lead locomotive indicates Train 1 came to a complete stop at 3:21:55 p.m., EDT.

Approximately 2,400 gallons of diesel fuel was released from the lead locomotive, with two of the auto carriers catching fire. The derailment did not result in an evacuation.

Train 1's crew exited the locomotive, walked to safety, and called the Trainmaster at Osborn Yard. The train dispatcher called emergency services and railroad management. When the crew of Train 1 returned to Osborn Yard, the Engineer was taken to the hospital and treated for non-life-threatening injuries.

The accident area is a remote area which slowed the emergency response. Emergency responders from six surrounding communities responded including the Louisville Fire Department and Air One, Bullitt County EMS, Lebanon Junction Fire Department, Mount Washington Fire Protection District, Nichols Fire District, Shepardsville Division of Fire, Southeast Bullitt Fire District, and Zoneton Fire District. The Bullitt County Sheriff and Hazmat Department and the CSX Hazmat team also responded.

CSX reported \$1,282,600 in damage to equipment and \$193,090 in damage to track and signal.

Post-accident/Incident Investigation

A Federal Railroad Administration (FRA) Track Inspector and a Hazmat Inspector responded to the accident site immediately. FRA also assigned an Operating Practices Inspector and a Mechanical Inspector to the investigation. The FRA team inspected the accident site, conducted interviews with two CSX engineering department employees for their roles in previous rail repairs at the derailment site. On May 15, 2018, FRA reconstructed the rail to determine CSX's compliance with its Continuous Welded Rail Policy.

FRA's investigators requested and received all records, forms, and other documentation necessary to conduct their investigation into the probable cause of the derailment. The following analysis and conclusions represent the findings of FRA's investigation.

Analysis and Conclusions

Analysis – Toxicology: This accident did not meet the criteria for Title 49 Code of Federal Regulations (CFR) Part 219, Subpart C, *Post-Accident Toxicological Testing*.

Neither crew member of Train 1 was tested due to the derailment not meeting the testing threshold; however, FRA determined the presence of drugs and alcohol would not have contributed to the track misalignment.

Conclusion: FRA determined drug and alcohol did not contribute to the cause or severity of the derailment.

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. The results indicated fatigue was not probable for the crew of Train 1.

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

Analysis – Operating Practices: FRA reviewed the rules compliance and historical operational testing conducted on the Main Line Subdivision by CSX Supervisors. FRA found that frequent and adequate operational testing was performed on the Main Line Subdivision by multiple supervisors over the five-month period reviewed. FRA reviewed the event recorder of the lead locomotive and took no exception to the train handling of Train 1.

The head end video from engine CSX 7815 clearly showed the irregular track alignment (buckled/sunkink). The track was drastically misaligned at the culvert location causing the derailment.

Conclusion: FRA determined rules compliance, operational testing, and train handling did not contribute to the cause or severity of the derailment.

Analysis – PTC System: PTC was functioning as intended at the time of the derailment. This accident was not PTC preventable.

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

Analysis –Track: The track at MP 00026.7 is constructed of 136-pound continuous welded rail (CWR). The branding manufacture label on the rail at the Point of Derailment (POD) was 136-RE Bethlehem Steel, dated May 1985 on timber cross ties with 16-inch standard plates with typical cut spikes. The ballast section consisted of granite stone and a culvert was located near the POD. The ballast section was compliant with the Track Safety Standards (TSS). The track at this location consists of a 2.00-degree left-hand curve along with a -0.03 percent ascending grade with culvert. The head end video from engine CSX 7815 clearly shows a major irregular track alignment (buckled/sunkink). The track clearly misaligns to the left around the culvert.

On February 9, 2018, a CSX section crew made four rail cuts (two cuts on each rail) effectively creating a track panel in preparation of culvert work that was to be performed on main track No. 1, at MP 00026.7, and installed joint bars. On February 22, 2018, while replacing the culvert, the bridge crew members removed and replaced the panel under the supervision of the CSX Bridge Manager and Foreman. The bridge department disturbed a large portion of the subgrade while replacing the culvert. After replacing the culvert, CSX reinstalled the pre-cut panel and resumed service. The track was surfaced by a tamper following the completion of culvert work. None of the work at this location (up to this point) was recorded in the CSX track disturbance system.

On March 7, 2018, a CSX welder completed a disturbance report for the left rail at MP 00026.7. CSX reports show they should have removed 1 7/8" of rail to re-establish the proper Rail Neutral Temperature (RNT). However, the CSX welder stated he did not remove the required amount of rail.

On March 19, 2018, the CSX welder returned and made two welds. The disturbance reporting entered in the system for this work was recorded as welding out the two joints on the left rail, using the original report created on March 7, 2018. CSX recorded an adjusted RNT of 72 °F and needed to remove an additional 1 3/8" of rail to re-establish the desired RNT of 95 °F, on both rails at MP 00026.5, and an adjusted RNT of 57 °F and needed to remove an additional 2 1/8" of rail to re-establish the desired RNT of 95 °F at MP 00027.1.

FRA reviewed the CSX CWR required records for the area of the derailment. FRA identified CSX was not in compliance with the Track Safety Standards (TSS), sections 213.7(c) training, 213.119(d) maintaining desired rail installation temperature range, 213.119(f) train speed, and 213.119(j) record keeping.

At MP 00026.60 (No. 1 track), on January 5, 2018, CSX records a Broken Rail change out at a rail temperature of 12°F, that produced a 2" gap, but the reference mark distance reportedly remained the same. At the time of the derailment it was still a plug and not welded out. The calculated RNT was 61°F, and needed to close any gap produced and an additional 1 7/8" of rail removed to return the location back to within the rail installation safe range. Until the location is returned to the designated safe range, protections would have been required by the table outlined in Section 3.1 of the CSX CWR plan, using the rail temperature at the time of separation (12°F). Had this requirement been followed, the train would have been slow ordered to 25 mph or 40 mph with an inspection during the heat of the day. This location is just 1/10th of a mile from the derailment site.

While reviewing the disturbance reports for the POD, the FRA investigative team identified there were no records for the rail cuts at MP 00026.7 created on February 9, 2018. The disturbance report at MP 00026.7 records an adjusted RNT of 60 °F with an additional 1 7/8" of rail to be removed in order to re-establish the desired RNT of 95 °F. This disturbance report recorded two joints added on the left side, on March 7, 2018. This report also documents the two joints on the left side were removed on March 19, 2018. No record existed for the joints or welds made to remove the joints on the right rail of the panel at MP 00026.7. Based on the reporting, the side that was reported shows a location not returned within the designated rail installation RNT safe range.

CSX records did not show that the locations were returned to the prescribed RNT safe range. To calculate the current RNT, three items must be established: the rail temperature at which the separation occurred, the amount of gap (pull back) produced (if any) when the separation occurred (which allows for calculating the pre-break RNT), and the amount the reference marks changed (rail added/removed). This information would allow the calculation of the adjusted RNT when the work is completed. Clearly the work performed in the field around the POD was not correctly reported, therefore CSX did not have an accurate RNT. However, the reporting they did have lowered the calculated RNT in the derailment area to an amount that would have required further remedial action.

FRA was provided Track Disturbance Records (November 1, 2017 to April 30, 2018), and Rail Defect

Records (May 3, 2017 to April 13, 2018) for the Main Line Subdivision. There were multiple disturbance reports pertaining to work performed on track No.1, around the derailment area (MP 00026.5 – MP 00027.10). The disturbance reports of the surrounding area illustrated poor information regarding calculating a proper RNT. For example, the reports show no changes in reference mark distances with a rail gap present. This does not allow for the proper calculations used in the rail adjustment methodology per the CSX CWR plan. Per CSX's CWR reports (even though it was determined that they had errors), the rail neutral temperature (RNT) was lowered at the point of derailment, along with other locations in close proximity.

A review of the required CSX CWR records pertinent to the derailment led FRA to conclude that CSX was not in compliance with the TSS, sections 213.119(d) maintaining desired rail installation temperature range, 213.119(f) train speed, and 213.119(j) record keeping.

The high ambient temperature for May 1, 2018, was 84°F. Knowing the rail temperature runs approximately 30°F higher than the ambient temperature due to radiant heating, the estimated rail temperature should have been expected to register near 114°F. Poor reporting and lack of proper rail adjustment by CSX created several buckle-prone conditions in this area. Recent culvert work had disturbed the roadbed, which reduced the ballast section's ability to control lateral resistance with track exposed to high thermal forces.

Conclusion: FRA determined the irregular track alignment was the probable cause of the derailment. (Cause code T109)

Additionally, FRA determined CSX failed to maintain proper CWR records and failed to ensure the proper adjustment for the required RNT, both contributing to the cause or severity of the derailment. (Cause code H993)

Analysis - CWR Training/Qualification Record: During the welding process, welders adjust the RNT as they complete what is known in the industry as closures welds. RNT is predetermined by calculations from the CWR plan and once welds are complete, the RNT is established. Title 49 CFR Part 213.7(c) states the railroads must train their employees to supervise the installation, adjustment, and maintenance of CWR track.

On March 19, 2018, a CSX welding crew, consisting of a welder and welder helper (two employees), completed welds at MP 00026.7. FRA requested a copy of the welding crew training records. Records show neither were trained to supervise CSX CWR maintenance and installation procedures. During interviews with the welder helper, he stated that during the welds placed at MP 00026.7 on March 19, 2018, he was a helper only and not a qualified welder. The welder helper stated the supervision was done by the welder. The welder in turn stated that he had not received CWR training from CSX.

Therefore, CSX was not in compliance with the TSS regarding CWR training.

Conclusion: FRA determined CWR Training/Qualification did contribute to the cause or severity of the derailment. (Cause code M599)

Overall Conclusion

The FRA investigation concluded there existed a severe misalignment in the track as visible from the forward-facing camera on the lead locomotive. Analysis of CSX records indicate work was performed on the track and subgrade at the derailment site prior to the derailment; however, the track was not properly restored to service following the work. FRA determined the cause of the misalignment was due to a lowered RNT around the derailment area. Additionally, CSX did not have properly trained employees performing the critical functions of making adjustments to the RNT for CWR.

Probable Cause and Contributing Factors

FRA determined the probable cause of the accident was T109 – Track alignment irregular (buckled/sunkink).

FRA determined two contributing factors of this accident:

- H993 – Human factor – track.
- M599 – Other miscellaneous causes.