Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2016-1126

CSX Transportation (CSX)
Washington, DC
May 1, 2016

SYNOPSIS

On May 1, 2016, at about 6:34 a.m., EST, an eastbound CSX Transportation (CSX) mixed freight train, Q40130, traveling on double main track (Track No. 2), at a recorded speed of 27 mph derailed 16 cars on CSX's Baltimore Division, Metropolitan Subdivision in Washington, DC, in Ward 5. Train Q40130 consisted of 3 locomotives and 175 cars, 94 loaded and 81 empty, with various commodities including hazardous materials, with a total length of 11,013 feet and 14,489 trailing tons. Of the 16 cars that derailed, 2 were loaded hazardous material cars that released a portion of their contents and 1 was a residue hazardous material car that did not release any contents. The derailment occurred at Milepost (MP) BA-2.7, which was approximately 2.5 miles north of the United States Capital building and just below the Washington Metropolitan Area Transit Authority's (WMATA) Rhode Island Metro Station. Train movement on CSX's Baltimore Division is governed by operating rules and traffic control system. The signal system consists of color light signals which are controlled by General Electric ElectroLogIXS microprocessor control units.

No evacuations or stay in place order was initiated in response to the derailment. There were road closures in the immediate area to facilitate the emergency response and WMATA's Red Line service was suspended for about 16 hours.

There were two minor injuries associated with the derailment. Both injuries were to hazardous material remediation personnel, contracted by the railroad, who received chemical burns while performing tasks related to the sodium hydroxide clean-up. The injured individuals were taken to the hospital for care, released without restrictions, and returned to work at the derailment site.

The double main track and Control Point QN Interlocking were destroyed in the derailment. Damage costs were $487,085 for Track, Signal, Way and Structure, and $391,212 for Equipment. The annual volume of rail traffic over the Metropolitan Subdivision, which spans between Weaverton, Maryland, and Washington, DC, is 43.6 million gross tons.

At the time of the derailment, there was a light rain and a temperature of approximately 50 °F.

This accident was not PTC-preventable. This is an Amtrak route (Amtrak Train No. 29/30). The "Capital Limited," operates daily, in both directions) and a Maryland Area Regional Commuter (MARC) route (18 Brunswick Line trains, operating weekdays, in both directions) over this section of track. Six Amtrak and 36 MARC trains were cancelled due to this accident.

This Federal Railroad Administration (FRA) investigation determined that the probable cause of the derailment was a broken axle journal, which is listed in FRA's Factual Railroad Accident Report as cause code E54C –Journal fractured, new cold break.

U.S. Department of Transportation Federal Railroad Administration	**FRA FACTUAL RAILROAD ACCIDENT REPORT**	FRA File #HQ-2016-1126

TRAIN SUMMARY

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

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
CSX Transportation	CSX	000159422

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	5/1/2016	6:34 AM

5. Type of Accident/Incident
Derailment

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
21	3	2	0	Metropolitan

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
WASHINGTON	BA2.7	DC	WASHINGTON, DC

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
50 ˚F	Dark	Rain	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
2	Freight Trains-40, Passenger Trains-60	43.6	East

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1126

OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	TRAIN #1 = Q40130

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross exluding power units)	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
27 MPH	R	14489		0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
D

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.)*	UTLX 630894	77	yes		0	0
(2) Causing *(if mechanical, cause reported)*	UTLX 630894	77	yes	9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	3	0	0	0	0	(1) Total in Equipment Consist	94	0	81	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	5	0	11	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
391212	487085

14. Primary Cause Code
E54C - Journal fractured, new cold break

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: 10 Mins: 35	Hrs: 10 Mins: 35

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others
Fatal	0	0	0
Nonfatal	0	0	0

25. EOT Device?	26. Was EOT Device Properly Armed?
Yes	No

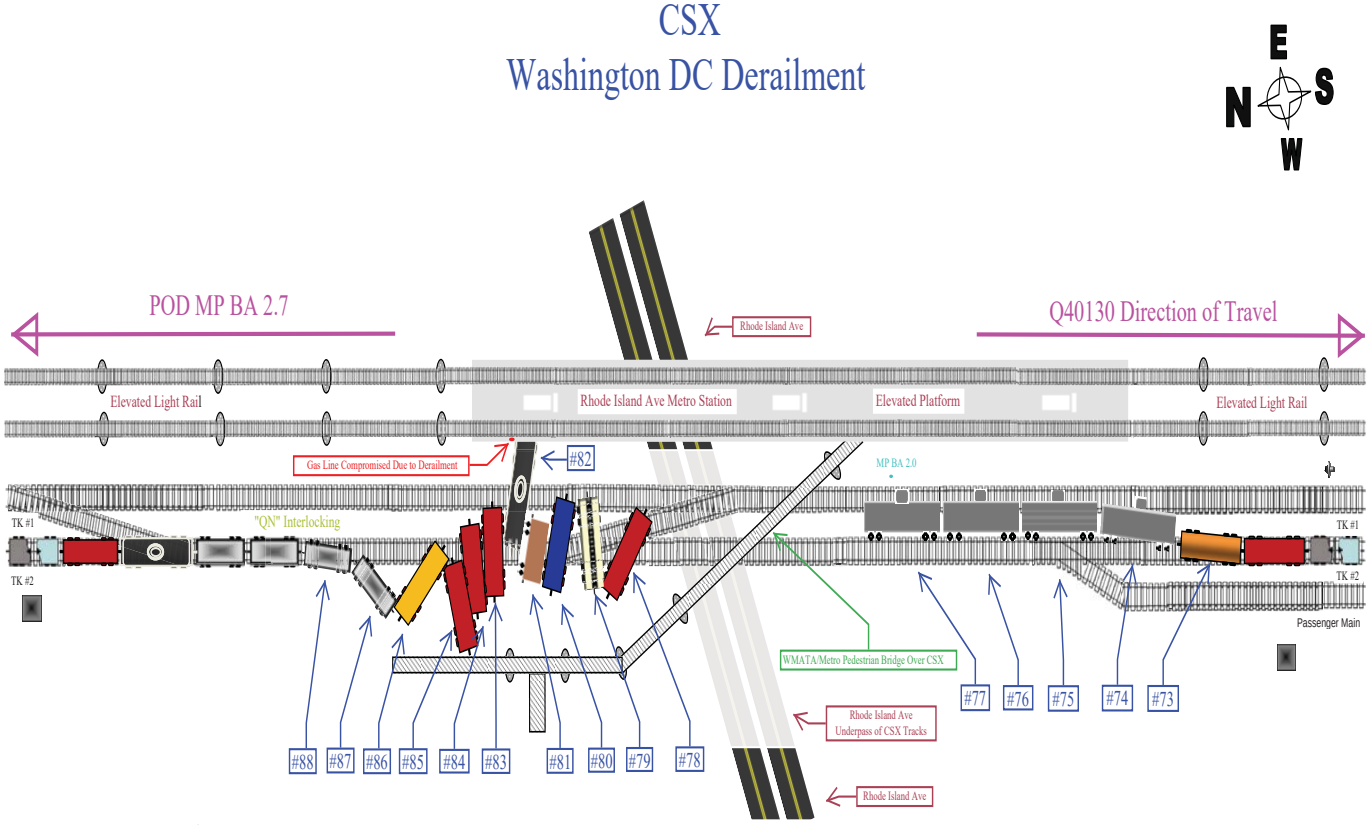
27. Caboose Occupied by Crew? N/A

28. Latitude	29. Longitude
38.929512000	-76.994123000

SKETCHES

DERAILMENT SKETCH

HQ-2016-1126
CSX
Washington DC Derailment



#73 NADX 815028 -Empty Covered Hopper
#74 NATX 364047 -Loaded Tank Car -HAZMAT (Alcohol) Releasing 628 gallons of contents -Lying on side "Post Derailment"
#75 UTLX 67096 -Loaded Tank Car -Calcium Chloride -Lying on Side "Post Derailment"
#76 DPUX 17732 -Loaded Tank Car -Calcium Chloride -Lying on Side "Post Derailment"
#77 UTLX 630894 -Loaded Tank Car -HAZMAT (Sodium Hydroxide) Releasing 729 gallons of contents -Lying on Side "Post Derailment"
#78 CSXT 142619 -Empty Box Car
#79 FURX 824097 -Empty Covered Hopper
#80 CSXT 129969 -Empty Box Car
#81 DREX 851 -Loaded Gondola Car -Scrap
#82 NATX 401104 -Residue Tank Car -HAZMAT (Propane) -Intruded into WMATA/Metro "Right of Way"
#83 NS 472306 -Empty Box Car
#84 NS 472277 -Empty Box Car
#85 BKTY 150737 -Empty Box Car -Left CSX "Right of Way" and made Incidental Contact with WMATA/Metro Pedestrian Bridge
#86 BKTY 154883 -Empty Box Car
#87 JTSX 900591 -Empty Hopper Car
#88 JTSX 900521 -Empty Hopper Car

NARRATIVE

Circumstances Prior to the Accident

CSX Transportation (CSX) Train Q40130 originated in Cumberland, Maryland. The train crew consisted of an engineer and a conductor that went on duty at 8:00 p.m., EST, in Brunswick, Maryland, on April 30, 2016. Brunswick was their away-from-home terminal. Both the Engineer and Conductor received their statutory rest period before reporting for duty. The final destination for this train was CSX's Yard in Hamlet, North Carolina. At the time of derailment, Train Q40130 consisted of 3 locomotives and 175 cars of mixed freight, 94 loaded and 81 empty, with various commodities including hazardous materials. Train Q40130 removed 3 cars, added 16 cars, and reportedly departed Brunswick, at 1:43 a.m., on May 1, 2016, traveling on the Metropolitan Subdivision.

All the equipment of Train Q40130 received the proper inspections and testing as required by railroad operating rules and regulations.

The method of operation on the Metropolitan Subdivision is by signal indication in a traffic control system. Timetable direction was east and geographical direction was south. Since timetable direction and geographical direction are not the same, timetable direction will be used throughout this report.

Approximately 9 miles prior to the accident at Milepost (MP) BA-11.7, Train Q40130 passed over the Kensington Defect Detector (the last detector passed prior to the derailment), which is equipped to detect overheating bearings, dragging equipment, and high/wide conditions. There were no defects reported and proper axle counts were recorded.

Just prior to approaching the accident scene, Train Q40130 was traveling eastward, descending the 1.8-percent grade between MP BA-7 to Control Point (CP) QN Tower MP BA-2. A review of the locomotive event recorder data indicated the throttle position transitioned from throttle to dynamic braking near MP BA-6. Approaching MP BA-5 at 27 mph, the crew of Train Q40130 made a minimum air brake reduction followed by a subsequent reduction to a total of 11 psi to allow for an accelerated release of the air brakes. Approaching MP BA-3 at 26 mph, the crew of Train Q40130 released the air brakes while continuing to maintain dynamic braking effort at 34 klbs. (34,000 pounds of force) or greater to control the slack and keep the train in a bunched state. The locomotive consist remained in dynamic braking through the location of the point of derailment (POD) at MP BA-2.7 (location of lead locomotive) at 22 mph. As Train Q40130 continued eastbound through MP BA-2.0 and QN Tower (location of lead locomotive) air brakes were released while maintaining dynamic braking effort at 54 klbs. Maximum authorized track speed is 30 mph and the train was traveling at 27 mph. As the train approached the accident location, the Engineer was sitting at the controls of the locomotive on the south side and the Conductor was sitting on the north side of the lead locomotive.

The topography approaching the POD was a 1.00-degree, right hand curve, with less than 1-inch of super elevation on a 1.89-percent descending grade.

The Accident

As CSX Train Q40130 approached MP BA-1.5 (location of lead locomotive), the locomotive event recorder indicated the Engineer had the air brakes released, the throttle in the Dynamic Braking (DB) mode maintaining an increasing dynamic braking effort above 60 klbs. and was decreasing speed,

traveling at 27 mph. The maximum authorized speed was 30 mph, as indicated in the operating rules section of the timetable. Approaching approximately MP BA-1.3 (location of lead locomotive) the train crew received a radio transmission at 6:34:14 a.m. (radio recording time) from CSX's BC Dispatcher – Baltimore (Dispatcher).

The Dispatcher indicated that he had received a derailment alarm and asked the train crew if they had communication with the rear of the train. The train crew responded that communication with the rear of the train had been intermittent due to the train's length of 2 miles; however, the train was still moving and had no other indications of a problem. The Dispatcher instructed the train crew to continue movement and indicated further investigation as to why the derailment alarm would continue. The Dispatcher and train crew then proceeded to discuss possible locations where the crew could be relieved. The total length of the radio communication was a recorded time of 54 seconds. At the completion of the conversation, Train Q40130 was approaching MP BAA-37.0 (location of lead locomotive), and the locomotive event recorder indicated the Engineer had the air brakes released, the throttle in DB, maintaining a dynamic braking effort above 80 klbs. at 27 mph.

At 6:35:19 a.m. (event recorder time), approximately 1 minute after first receiving the radio transmission from the Dispatcher concerning a derailment alarm, Train Q40130 received an undesired brake application and then traveled a total distance of 364 feet to a complete stop at MP BAA-36.9 (location of lead locomotive).

As soon as Train Q40130 came to a complete stop, the Engineer then made an emergency radio transmission. At that time, the Conductor had dismounted the locomotive and began walking back to inspect his train. At 6:49:21 a.m. (radio recording time), the Dispatcher informed the train crew that he had been advised of a reported derailed tank car at Rhode Island Avenue near MP BA-2.3. At 6:52:07 a.m. (radio recording time), the train crew informed the Dispatcher that the train had derailed. The train crew noted that some of the cars were tank cars; however, they could not confirm if any were leaking.

A total of 16 cars derailed including 11 mixed freight cars and 5 tank cars. Eleven of the cars were empty/residue. The additional five cars were loaded. Four were tank cars and one was a gondola car. The derailed cars were located in the train consist at position #73 through position #88 from the head end of the train. Three of the four loaded tank cars that derailed released some of their contents. Car NATX 364047 (position #74) released approximately 729 gallons of the hazardous material Sodium Hydroxide Solution. Car DUPX 17732 (position #76) released and undetermined amount of the non-hazardous material Calcium Chloride. UTLX 630894 (position #77) released approximately 682 gallons of the hazardous material Alcohol. A natural gas line suppling fuel to the switch heaters at the QN interlocking was also compromised.

No evacuations or stay in place order was initiated. There were road closures in the immediate area to facilitate the emergency response and the Washington Metropolitan Area Transit Authority's (WMATA) Metrorail Red Line Rhode Island Avenue Station was closed due to the hazardous material leaks. Emergency responders from the District of Columbia Fire and EMS Department were called and arrived on-scene first. They met with the train crew, exchanged information about the contents of the train, and retrieved the train consist paperwork. At the time of the derailment, it was raining and the temperature was approximately 50 °F.

As a result of the derailment, the double main track was blocked on the Metropolitan Subdivision at Washington, DC, and all train traffic in the accident area was rerouted or suspended.

At about 5:00 p.m., emergency responders authorized the re-railing to begin, and at about 11:00 p.m., WMATA was informed the Metrorail Red Line service could resume with the Rhode Island Avenue Station remaining closed until CSX train service was reestablished through the derailment site.

The three hazardous material tank cars that derailed contained three types of commodities. The first tank car was NATX 364047 (position 74), type DOT-111A100W1, described on shipping documents as containing UN1987, Alcohol, N.O.S., Class 3, Packing Group II. The car was destined for Eco-Energy Distribution Services located in Franklin, Tennessee. The second tank car was UTLX 630894 (position 77), type DOT-111A100W1, described on shipping documents as containing UN1824, Sodium Hydroxide Solution, Class 8, Packing Group II. The car was destined for Univar USA, Inc. located in Curtis, Virginia. The third tank car was NATX 401104 (position 82), type DOT-112A340W, described on shipping documents as last containing UN1075, Petroleum Gases, Liquefied, Class 2.1. The car was destined for Factor Gas Liquids, Inc. located in Calgary, Alberta, Canada.

The wreckage was cleared during the afternoon of May 3, 2016, including the completion of temporary track repairs and the removal of contaminated soil. There were 500 wooden crossties, one complete No. 15 crossover, two No. 20 head-end switch panels, and 14 track panels installed. On May 3, 2016, at about 3:00 p.m., the first CSX freight train since the derailment passed over the restored accident scene. At 5:30 p.m., CSX informed Amtrak and MARC that their normal service could resume on May 4, 2016.

Analysis and Conclusions:

Analysis - Toxicology Testing: Toxicology testing was conducted because the expected damage amount was predicted to exceed 1 million dollars. The crew on CSX Train Q40130 submitted to drug and alcohol testing under the requirements of Title 49 Code of Regulations (CFR) Part 219, Subpart C.

Conclusion: The toxicology test results were negative for the Engineer and Conductor on CSX Train Q40130. The Federal Railroad Administration (FRA) concluded that intoxication was not a contributing factor to the derailment.

Analysis – Fatigue: FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis. At or above this baseline, FRA does not consider fatigue as probable for any employee. Software sleep settings vary according to information obtained from each employee. FRA used the sleep information provided by the Engineer and Conductor of CSX Train Q40130.

FRA also obtained fatigue-related information, including a 10-day work history, for both the Engineer and Conductor.

Conclusion: FRA concluded fatigue was not probable for the Conductor or Engineer assigned to CSX Train Q40130. FRA further concluded that fatigue of the train crew was not a contributing factor to the derailment.

Analysis – Locomotive Engineer Train Operating Performance: The locomotive was equipped with a speed indicator and event recorder as required by Federal regulations. The relevant event recorder data was downloaded by CSX's Road Foreman of Engines and analyzed by FRA and CSX officials.

Conclusion: The Locomotive Engineer of CSX Train Q40130 complied with all applicable FRA, railroad operating, and train handling rules and requirements. FRA concluded train handling was not a contributing factor to the derailment.

Analysis – Timetable/Special Instructions: A review was conducted by FRA as to the Special Instructions regarding the CSX – WMATA (Metro) Corridor, contained in CSX's Baltimore Division, Timetable No. 1

(Effective Wednesday April 1, 2015) for the Metropolitan Subdivision, which states in part:
The activation of any warning alarms requires the BC Dispatcher to immediately stop all CSX trains moving within the affected corridor or approaching that corridor and hold such trains until it can be ascertained from both CSX and Metro personnel that all train operations may be safely resumed.
Conclusion: CSX's BC Dispatcher contacted the crew of CSX Train Q40130 regarding the status of their train but failed to instruct the crew to stop the train. The train continued to proceed for more than 1-minute and about 3,360 feet after the activation of the warning alarm. FRA concluded that the failure of CSX's BC Dispatcher to immediately stop CSX Train Q40130 did not comply with the railroad's Special Instructions but was not a contributing factor to the derailment.
Analysis – Signal and Train Control: On May 3, 2016, a representative from FRA and CSX signal personnel conducted a field inspection, test, and investigation of the railroad signal system in the immediate area and west of the derailment site. These sites included CP QN Tower, Intermediate Signal Terra Cotta, and Intermediate Signal Tacoma. All signal aspects for the route that was lined at the time of the derailment were tested. Additionally, ground tests and shunt tests were performed at the two intermediate locations. Ground tests and shunt tests were not performed at CP QN Tower because the control point was damaged from the derailment.
On May 3, 2016, a representative from FRA conducted a review, inspection, and analysis of the required signal test records and data recorder downloads from the three locations listed above. The analysis also included a review of the data recorder download from the Kensington Defect Detector (the last defect detector passed prior to the derailment), CSX's Dispatcher's event log, and trouble tickets from CP QN Tower. The download log from General Electric's ElectroLogIXS unit at CP QN Tower was not usable because the dates were off by more than a year and CSX management was unable to correlate data to the derailment. The download log from the Kensington Defect Detector did not show any warnings or alarms for CSX Train Q40130. The Dispatcher's event log showed that CSX Train Q40130 occupied Track No. 2 eastbound approach circuit to CP QN Tower at 6:23:44 a.m. The log then shows that the train occupied the first track circuit inside CP QN Tower at 6:32:54 a.m., and that 6 Signal indicated stop at 6:32:55 a.m. The log then shows that a derailment alarm was generated at 6:34:03 a.m.
Conclusion: FRA conducted a thorough inspection and test of the signal system post-derailment and review of the pre-derailment test records. FRA concluded the signal system was operating properly, as intended, and was not a contributing factor to the derailment.
Analysis – Track: On May 1, 2016, a representative from FRA conducted a field inspection of the condition of CSX Baltimore Division, Metropolitan Subdivision, Main Track No. 2 from just prior to the POD (MP BA2.7) through QN Interlocking and past the location of the pile-up (MP BA 1.7). The representative from FRA also conducted a records review of inspection and testing records from MP BA-1.0 to MP BA-10.0.
The track is constructed with wooden crossties, double shoulder tie plates, cut spikes, and continuous welded rail boxes anchored every other tie. The rail in the accident vicinity is 136 pounds. The track was last visually inspected by CSX on April 29, 2016, with no exceptions noted in the derailment area.
Conclusion: FRA took no exceptions during the field inspection or the records reviewed and concluded the track was not a contributing factor to the derailment.
Analysis – Tank Car Damage Assessment (Hazmat): FRA conducted a damage assessment (non-

running gear components) of the three derailed hazardous material tank cars.
Loaded Tank Car NATX 364047 (position 74 and lying on its side), a type DOT-111A100W1, was found with a sheared off bottom outlet valve nozzle at the skid protection which did not result in the release of any contents. A leak from the flange at the base of the liquid line, located at the top of the car, resulted in the release of approximately 682 gallons of Alcohol, N.O.S. The flange at the base of the liquid line appeared undamaged by the derailment. The defective condition would have been very difficult to identify prior to the derailment and only began leaking due to the post-derailment orientation of the car (lying on its side).
Loaded Tank Car UTLX 630894 (position 77 and lying on its side), a type DOT-111A100W1, was found with a sheared off bottom outlet valve nozzle at the skid protection that did not result in the release of any contents. Additional damage due to the derailment to the bottom outlet handle caused the bottom outlet valve to partially open which did result in a release of approximately 729 gallons of sodium hydroxide solution.
Residue Tank Car NATX 401104 (position 82 and upright), a type DOT-112A340W, was not structurally damaged and there was no release of its contents, Petroleum Gases, Liquefied, Class 2.1.
Conclusion: The tank car damage assessment (non-running gear components) determined there was structural damage to two of the three derailed hazardous material tank cars. FRA concluded the structural damage observed and the release of any contents was a result of the derailment and not a contributing factor to the derailment.
Analysis – Hazardous Materials (Shipper Pre-Transportation Assessment): Shipping documents and Bills-of-Lading provided by the shipper were reviewed.
Conclusion: FRA concluded that the shipper properly classified the material and selected the proper package for rail transportation. It was concluded that the shipper functions were compliant with Federal regulations and were not a contributing factor to the derailment.
Analysis – Hazardous Materials (Train Documents Review): FRA reviewed the original work order for CSX Train Q40130 and all of the applicable train documents relating to the description of the tank cars, their standing order in the train, and the emergency response information.
Conclusion: It was concluded after a detailed review of the train documents that the carrier was in compliance with hazardous materials regulations in regard to shipping documentation, hazardous materials description, and train placement. FRA determined the carrier's documentation had no causal effect on the derailment or emergency response.
Analysis – Mechanical (Locomotives): CSX Train Q40130 consisted of three head-end locomotives, and no distributed power was assigned to this train at the time of the derailment.
The lead locomotive, CSXT 908, was a six-axle; two-truck design; 4,400 horsepower; General Electric model ES44AH. It was built in 2008 and was equipped with Wabtec Fast Brake type air brake equipment. This locomotive had its last periodic inspection performed by CSX on April 10, 2016, at Cumberland, as recorded on Form FRA F 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection was also dated April 10, 2016, and listed Cumberland as the location where the inspection was performed. The last calendar day inspection recorded was dated April 30, 2016, and performed at Cumberland. No defects were noted on the report as part of the inspection. However, a defective condition on the locomotive was indicted en route by the Engineer of CSX Train

Q40130.

CSX Locomotive Work Report -5001B, which is used to record calendar day inspections and record defective conditions, had notations made by the Engineer of CSX Train Q40130 regarding an air brake issue with locomotive CSXT 908. The Engineer indicated that while at CSX's Brunswick Yard, he repeatedly had failures of the air brake system. When a failure occurred, the Engineer would get a message on the locomotive's control display screen "EAB control failure, to clear go to emergency." The Engineer then indicated that he spoke to the mechanical department troubleshooters at the mechanical desk located in Jacksonville, Florida, concerning the issue and was instructed to reset the electronic air brake system circuit breakers. According to the Engineer, the circuit breaker reset appeared to resolve the problem.

The first trailing locomotive, CSXT 4565, was a 4,000 horsepower Electro-Motive Diesel model SD70AC. It was built in 2000 and was equipped with CCB1 type air brakes, six-axle, and two truck assembly design. This locomotive had its last periodic inspection performed by CSX on April 1, 2016, at Cumberland, as recorded on Form FRA F 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection was dated April 26, 2016, and listed Cumberland as the location where the inspection was performed. The last calendar day inspection recorded was dated April 30, 2016, and was performed at Cumberland. No defects were noted on the report.

The second trailing locomotive, CSXT 6352, was a 2,200 horsepower Electro-Motive Diesel model GP382S. It was built in 1972 and was equipped with 26L type air brakes, four-axle, and two truck assembly design. This locomotive had its last periodic inspection performed by CSX on February 29, 2016, at Cumberland, as recorded on Form FRA F 6180.49A (blue card). The last calendar day inspection recorded was dated April 30, 2016, and was performed at Brunswick. No defects were noted on the report.

Conclusion: The locomotive CSXT 908's en route defect of the electronic air brake system appears to have been corrected by resetting the circuit breakers (rebooting the computer). The post-accident calendar day inspection conducted by CSX mechanical at Huntington, West Virginia, on May 2, 2016, reported the electronic air brake system operating as intended. FRA concluded the mechanical condition of the locomotives was not a contributing factor in the derailment.

Analysis – Mechanical (Pre-Accident Inspection of Cars by the Railroad): CSX Train Q40130 originated at Cumberland with 162 cars on April 30, 2016. Three cars were removed and 16 added to the head-end of the train at Brunswick, making 175 total.

Records reviewed indicated that Train Q40130 received a Class I brake test and mechanical inspection performed by qualified mechanical department inspectors at Cumberland on April 30, 2016. The first block of cars' (96) inspection was completed on Track No. H04 at 10:30 a.m., and the second block of cars' (66) inspection was completed on Track No. H02 at 11:50 a.m., with no defective cars noted. The assembled 162 cars had an end-of-train device (ETD), CSXE 44738, telemetry tested in Cumberland on April 30, 2016, at 9:22 p.m. The 16 cars added at Brunswick received a Class I brake test and mechanical inspection performed by qualified transportation department personnel (Local train crew of Train Symbol D78930) on Track No. A15 the morning of April 30, 2016, and remained on yard air. A Class III brake test and pre-departure inspection were performed by the train crew when the 16 cars were added to Train Q40130.

Train Q40130 left Brunswick at about 1:45 a.m., and proceeded east along CSX's Metropolitan Subdivision. As the train neared the derailment site, Train Q40130 passed over the Kensington Defect Detector (the last detector passed prior to the derailment) in Kensington, Maryland. There were no defects reported and proper axle counts were recorded.

Conclusion: A comprehensive review of the available documentation and records was conducted. This review found no indications of defective equipment in CSX Train Q40130 prior to the derailment. FRA concluded the pre-accident inspection and testing of the cars was not a contributing factor in the derailment.

Analysis – Mechanical (Post-Accident Inspection): The previously mentioned undesired emergency brake application occurred at 6:35:19 a.m. (event recorder time), when the lead locomotive on CSX Train Q40130 was approaching MP BAA-37.0 (location of lead locomotive). The lead locomotive then travelled 364 feet to a complete stop at MP BAA-36.9. All locomotives and cars remained in place until about 5:00 p.m., on May 1, 2016, when first responders allowed re-railing and remediation work to begin. The leading three locomotives and 72 cars (positions 1 through 72) that did not derail, received a brake test and mechanical inspection and continued to CSX's Hamlet Yard (original destination), on May 1, 2016, at about 8:00 p.m. The trailing 87 cars (positions 89 through 175) that did not derail, received a brake test and mechanical inspection and were moved to CSX Brunswick Yard, on May 1, 2016, at about 9:00 p.m. The 16 cars that derailed were all re-railed and moved to CSX Benning Yard in Washington, DC, for repairs or other disposition with the exception of DREX 851 (position 81) which was scrapped on site. The distance from the derailment site to CSX Benning Yard is 10 miles east by rail.

As a result of the derailment, the leading car (in direction of movement) that derailed was NYDX 815028 (position 73) which was found shifted off center. The next 4 tank cars, which were in positions 74 through 77 in the train consist, stopped on their side in a string-line formation, lying on the roadbed of Main Track No. 1. There was a separation of about 185 feet between the cars in positions 77 and 78. The main pile up of 11 cars was located in positions 78 through 88 of the train consist. With the exception of Hopper Car DREX 851 (position 81) lying on its side, all of these cars were found in an upright position, angled across the tracks and heavily damaged.

A detailed mechanical investigation and records review was performed to identify conditions that may have contributed to or caused the derailment. During the wreck clearing process, all equipment involved was thoroughly inspected for any identifiable noncompliant condition or evidence that may relate to the cause of the derailment. Each wheel and truck component removed from under the wreckage was inspected at the site to the extent possible to ensure that evidence could be marked for further evaluation.

Prior to FRA arriving at the accident scene, CSX personnel discovered a broken freight car axle journal with the roller bearing attached and intact on the south side of Main Track No. 1 at about MP BA-2.7. CSX personnel then discovered a wheelset missing an axle journal and roller bearing assembly at about MP BA-2.0.

A review of the rail and roadbed at the location where the axle journal with the roller bearing attached was discovered (MP BA-2.7) found indications of adverse adhesion on the rail, abrupt crosstie damage and a tie plate with impact damage. The crosstie damage observed continued on the inside of the gage and field side of Track No. 2 from (MP BA-2.7) to QN interlocking (MP BA-2.2).

FRA also conducted a review of the ETD failure as reported by the Engineer of CSX Train Q40130 during radio transmission on recordings provided to FRA as part of the accident investigation. A review of the event recorder download from MP BA-76.0 (CSX Brunswick Yard) to MP BAA-36.9 (post-derailment location of locomotive) indicated numerous failures concerning "invalid data" with the ETD including about the last 5 ½ minutes that the train was moving. CSX indicated that "invalid data" could indicate a communication loss or other reason.

Conclusion: No exceptions were noted regarding the cars that did not derail or the repair records reviewed for the cars that did derail. The response to the ETD failure was found to be in compliance with the Federal regulations in Title 49 CFR Section 232.407 regarding en route failures and was not a contributing factor in the derailment.

The investigation determined that the axle journal with a roller bearing attached found at about MP BA-2.7 and defective wheelset found at about MP BA-2.0 were from the same axle/wheelset assembly and that the axle journal had experienced what appeared to be a cold break. The investigation also determined that this axle/wheelset assembly had originally been located on Car UTLX 630894 (position 77) at axle/wheelset location number 1, with the broken axle journal location on the left side of the number 1 axle (L1). This could also be described as the leading axle on the south side, in the direction of train movement, on Car UTLX 630894 (position 77).

A review of the rail and roadbed at the location where the axle journal with the roller bearing attached was discovered (MP BA-2.7) determined that this location was the POD due to indications on the rail, crossties, and tie plates. The investigation also determined that the leading axle of Car UTLX 630894 remained derailed from the POD for about 3,385 feet east, to the east switch of the west crossover (MP BA-2.0) at QN interlocking. At this point, the derailed wheel, inside the gage, struck the frog of the switch resulting in the complete derailment of Car UTLX 630894 (position 77) and the subsequent derailment of 15 additional cars (positions 73 through 76, and positions 78 through 88).

Analysis – Mechanical (Broken Axle Journal): FRA's Motive Power and Equipment (MP&E) inspectors made a close examination of the failed axle journal discovered from Car UTLX 630894 at the derailment site and later, where it was secured, at CSX's Benning Yard. These examinations revealed an apparent new cold break, of approximately 50 percent of the circumference, and a preexisting fatigue crack, of approximately 50 percent of the circumference, of the axle journal under the backing ring.

FRA conducted a records review of all the wheel, axle, and bearing components applied to Car UTLX 630894. The records reviewed indicate that the number 1 axle/wheelset was assembled by Progress Rail in Waskom, Texas, in March 2007, with 36-inch wheels and 6 ½-inch by 12-inch (AP Class F) roller bearings applied. The axle was second hand, manufactured by British Steel in July 1980, and the journals had been plated, to restore the diameter, at Progress Vanguard in Lincoln, Nebraska, in February 2007. The wheels were manufactured by Griffin in Keokuk, Iowa, in February 2007, and the roller bearings were manufactured by Timken and new when applied in March 2007.

CSX initiated a failure analysis of the number 1 axle from Car UTLX 630894 which was conducted by Engineering Systems, Inc. (ESI) in Omaha, Nebraska.

ESI concluded:

1. "The failed axle met the chemical composition, tensile and microstructural requirements for Association of American Railroads (AAR) specified Grade F Axle."

2. “The failure of the axle was the result of a fatigue crack which progressed approximately half way through the axle, before sudden rupture occurred.”
3. “The fatigue crack was initiated from an area of corrosion pits in the journal fillet, beneath the backing ring.”
4. “The backing ring will have prevented visual inspections to identify the presence of a crack during routine inspections.”

Conclusion: FRA took no exceptions to the original assembly of the wheelset by Progress Rail in March of 2007. The records reviewed indicated that all applicable Federal regulations and AAR standards, in place at the time of assembly, were followed.

The failure analysis from the axle, conducted by ESI, was reviewed by FRA and its findings appear consistent with observations made in the field by FRA’s MP&E investigators.

After completing all inspections and reviewing the available documentation, FRA concludes the broken axle journal (new cold break) is the probable cause of the derailment of CSX Train Q40130 in Washington, DC.

Overall Conclusions:

Based on a close examination, the investigation found no human factor, track, signal, or hazardous material issues that were contributing factors to the cause of the derailment. The failure of the Dispatcher to stop the train immediately upon receiving the activation of the warning alarm did not comply with the railroad’s Special Instructions but was not a contributing factor in the derailment. FRA’s investigation concluded the only contributing factor and probable cause of the derailment of CSX Train Q40130 at 6:35 a.m., on May 1, 2016, in Washington, DC, was the broken number 1 axle journal from Car UTLX 630894.

Probable Cause:

FRA’s investigation determined that the probable cause of the derailment was a broken axle journal, which will be listed in FRA’s Factual Railroad Accident Report as cause code E54C –Journal fractured, new cold break.