



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

***Accident Investigation Report
HQ-2018-1263***

***Union Pacific Railroad (UP)
Monahans, Texas
Wednesday, April 18, 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 April 18, 2018, at approximately 1:23 a.m., CST, a local Union Pacific Railroad Company (UP) freight train, symbol MFWMH-15, with 5 lead locomotives and 17 of the original 114 rail cars remaining in the train, derailed a single rail car in yard track 108 at Milepost (MP) 609.43 on UP's Toyah Subdivision, in Monahans, Texas. The derailed car (PMRX 131788) derailed at the 500 switch within Monahans Yard and was pulled to Eva Avenue (MP 609.7) where, after contacting the paneled crossing, the car fouled the main track.

Train ILXDIB-16, an eastbound UP intermodal freight train handling 115 loads, and zero empties, struck the derailed car of MFWMH-15 at approximately 1:30 a.m. resulting in train ILXDIB-16's derailment of 3 locomotives and 10 articulated cars, totaling 33 wells.

Train ILXDIB-16 was operating in centralized traffic control territory at an estimated speed of 65 mph while the manifest train was stopped on yard track 108 at the time of the collision which resulted in an additional three cars derailing from MFWMH-15.

The eastbound ILXDIB-16 crew members both sustained non-life-threatening injuries.

The MFWMH-15 crew members were uninjured.

Resulting from the accident, there was an estimated \$3,990,942 in equipment damage, and \$233,290 in track and signal damage.

The weather at the time of the accident was reported as clear, dark at 68°F with a slight breeze out of the south at 6 mph.

The Federal Railroad Administration (FRA) has determined the probable cause of the initial derailment was T201 - Broken Rail - Bolt hole crack or break.

FRA has determined that the secondary collision was the result of the contributing cause of M404 - Object or equipment on or fouling track. FRA has also determined H212 - Radio communication, failure to give/receive, and H199 - Employee physical condition, other were additional contributing causes to the secondary collision and derailment.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Union Pacific Railroad Company	1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. 0418FW026
2. Name of Railroad Operating Train #2 Union Pacific Railroad Company	2a. Alphabetic Code UP	2b. Railroad Accident/Incident No. 0418FW027

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Union Pacific Railroad Company		1a. Alphabetic Code UP	1b. Railroad Accident/Incident No. HQ-2018-1263	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 4/18/2018	4. Time of Accident/Incident 1:23 AM	
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 Toyah
11. Nearest City/Town Monahans		12. Milepost (to nearest tenth) 609.43	13. State Abbr. TX	14. County WARD
15. Temperature (F) 68 °F	16. Visibility Dark		17. Weather Clear	18. Type of Track Yard
19. Track Name/Number 108		20. FRA Track Class Freight Trains-10, Passenger Trains-15		21. Annual Track Density (gross tons in millions) 40.1
22. Time Table Direction West		23. PTC Preventable No		

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes			3. Train Number/Symbol MFWMH-15			
4. Speed (recorded speed, if available) R - Recorded 0.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 15055		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>Not Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: _____											
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 <i>(derailed, struck, etc.)</i>		PRMX 131788	14	yes				0	0		
(2) Causing <i>(if mechanical, cause reported)</i>					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	4	0	0	0	1	(1) Total in Equipment Consist	108	0	6	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	4	0	0	0	0
12. Equipment Damage This Consist 86926		13. Track, Signal, Way & Structure Damage 0									
14. Primary Cause Code T201 - Broken Rail - Bolt hole crack or break											
15. Contributing Cause Code H212 - Radio communication, failure to give/receive											
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: 11 Mins: 8		Hrs: 11 Mins: 8			
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 31.596818000			29. Longitude -102.886606000								

OPERATING TRAIN #2

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol ILXDIB-16				
4. Speed (recorded speed, if available) R - Recorded 65.0 MPH E - Estimated		Code E	5. Trailing Tons (gross excluding power units) 5540		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</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 <i>(derailed, struck, etc.)</i>		UP 6073		1		yes				0	0
(2) Causing <i>(if mechanical, cause reported)</i>		N/A		0		no		9. Was this consist transporting passengers?		No	
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)											
11. Cars (Include EMU, DMU, and Cab Car Locomotives.)											
12. Equipment Damage This Consist											
13. Track, Signal, Way & Structure Damage											
14. Primary Cause Code											
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: 1 Mins: 38		Hrs: 1 Mins: 38	
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		2		0		0		27. Caboose Occupied by Crew?		N/A	
28. Latitude 31.596818000				29. Longitude -102.886606000							

SKETCHES

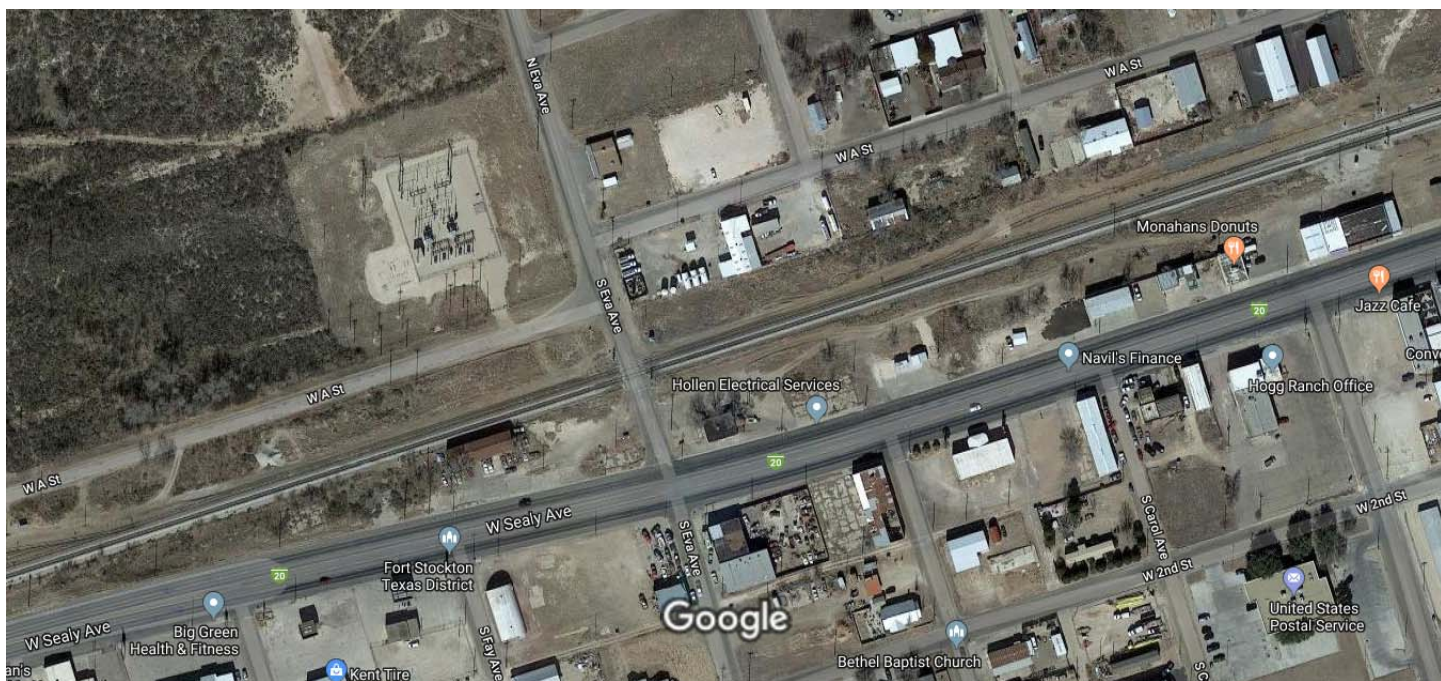
Sketch - Aerial View

HQ-2018-1263
Drone still shot provided by Union Pacific Railroad

Aerial View of Union Pacific Railroad Monahans Texas Derailment

4/18/2018





Imagery ©2018 DigitalGlobe, NMRGIS, Texas Orthoimagery Program, Map data ©2018 Google 100 ft

NARRATIVE

Circumstances Prior to the Accident**Train 1 – MFWMH-15**

Union Pacific Railroad Company (UP) westbound mixed manifest freight train MFWMH-15 (train 1) consisted of four locomotives in the lead position: UP2677, UP 4105, UP 2255, and UP9778, with Distributed Power Unit (DPU) UP 8417 on the rear. Train 1 consisted of 108 loads and 6 empties, measuring 6,023 feet, with 15,055 trailing tons.

Train 1 received an initial Class 1 Air Brake Test at Fort Worth, Texas, on April 15, 2018, at 7:50 p.m., CST, and it was performed on 114 cars per UP Mechanical Records. The locomotives were up-to-date on their daily inspections. The rear DPU unit served as the end of train device (EOTD).

The maximum authorized speed for the train would have been 60 mph – but car restrictions limited its speed to 50 mph. The 103rd car in the train (TTPX 81298) was restricted to 50 mph. The restriction was not due to any mechanical issue – but by design.

The crew of train 1 included a locomotive engineer and a conductor. The crew went on duty at 2:15 p.m., CST, on April 17, 2018, in Sweetwater, Texas. Both employees received more than the statutory off-duty period prior to reporting for duty.

The accident occurred on the UP Sunset Division, Toyah Subdivision, Ward County, Monahans, Texas.

Timetable direction of Monahans Yard is west. Timetable direction will be used throughout this report.

Train 1 departed Sweetwater at approximately 4 p.m., CST. The train was initially delayed due to car placement errors and an applied (sticking) handbrake on the distributed power unit at the rear of the train. The train did no work before Monahans Yard. Estimated arrival at Monahans Yard was approximately 11:15 p.m., CST.

Train 2 – ILXDIB-16

The UP eastbound intermodal freight train ILXDIB-16 (train 2) consisted of three locomotives in lead position, UP 6073, UP 7129 and UP 483 handling 115 loads, and no empty cars measuring 6,577 feet in length, with 5,540 trailing tons.

Train 2 had an initial Extended Haul Class 1 Air Brake Test entered at 8:15 a.m., CST, on April 16, 2018, in Long Beach, California, and was performed on 115 cars per UP Mechanical Records. The locomotives were up-to-date on their daily inspections. Train 2 was equipped with a functioning EOTD.

The crew of train 2 included a locomotive engineer and a conductor. The crew went on duty at 11:45 p.m., CST, on April 17, 2018, in Pecos, Texas. Both employees received more than the statutory off-duty

period prior to reporting for duty.

Train 2 was an expedited intermodal train with no scheduled work between station of origin and Fort Worth, Texas. Maximum authorized speed for train 2 was 70 mph – with no restrictions. The train departed Pecos, Texas at 12:31 a.m. on the morning of April 18 with no issues reported.

As train 2 approached the accident area, the Locomotive Engineer was seated at the controls on the south side of the lead locomotive. The Conductor was seated on the north side of the lead locomotive.

The Accident

Train 1 was advised they would set-out their Texas & New Mexico Railroad (TXN) block (97 cars) into the “New Yard” side – Track 611. The remaining 17 cars would go to the “Old Yard” side. The crew set-out the 97 TXN’s where instructed without incident. Their next move was to drag the 17 cars down (westward) Track 108 to clear 105 – then shove (eastward) to clear and tie-down. The train 1 Engineer was situated in the cab seat operating the locomotives while the Conductor was in a limo going to line switches at the west-end of the yard.

The crew of train 1 was completing the yarding of their train when the train experienced an emergency application of the air brakes in Track 108 at approximately 1:23 a.m. – situated north of the Toyah Sub main track. The air recovered on the train and the Engineer continued pulling west. The 14th car (PRMX 131788) had derailed at the 500 switch, located at Milepost (MP) 609.43. After the air was restored, the Engineer continued to pull the train westward to the Eva Avenue crossing, located at MP 609.7, where the derailed car (PMRX 131788) impacted the Eva Avenue crossing and fouled the main track. The Engineer stopped at that point and notified the Conductor, who was on the ground to the west of the train, that he felt something wrong.

During this time, train 2 consisting of 115 cars was traveling an estimated 65 mph on the main track, adjacent to track 108, and to the south side – operating under Centralized Traffic Control (CTC). Train 2 struck the derailed car that was fouling the main track at the Eva Avenue crossing MP 609.7 resulting in the derailment of three locomotives and 10 articulated cars totaling 33 wells from train 2, and an additional 3 cars from train 1.

Train 2’s lead locomotive stopped on its side to the south side of the main track. Train 2’s conductor and engineer both received non-life-threatening injuries and first responders had to rescue them from the conductor’s window that was now facing upward.

There were no injuries to the train 1 crew.

Resulting from the accident, there was an estimated \$3,990,942 in equipment damage, and \$233,290 in track and signal damage.

There was no hazardous material involved and no evacuation. Approximately 5,000 gallons of diesel

spilled from the derailed locomotives and contained without injury or evacuation by local responders.

The weather at the time of the accident was reported as clear, dark at 68°F with a slight breeze out of the south at 6 mph.

Post-Accident Investigation

The Federal Railroad Administration (FRA) Region 5 sent inspectors from the Operating Practices (OP), Motive Power & Equipment (MP&E), Track, and Signal & Train Control (S&TC) disciplines to investigate the accident.

Analysis and Conclusions

Analysis - Mechanical: A compliant Class 1 Air Brake Test and pre-departure inspection was performed on train 1 on April 15, 2018, at 7:50 p.m., CST, in Fort Worth, Texas. Train 2 had an initial Extended Haul Class 1 Air Brake Test entered at 8:15 a.m., CST, on April 16, 2018, in Long Beach, California. The test was performed on 115 cars according to UP Mechanical Records.

FRA reviewed inspection records for all cars and locomotives with no exceptions taken.

Conclusion: FRA determined that mechanical conditions were not a primary or contributing factor in this derailment.

Analysis Toxicological Testing: FRA Post-Accident Forensic Toxicology Result Reports indicate the four employees tested had negative test results.

Conclusions: FRA determined drugs and alcohol were not a primary or contributing factor in this derailment.

Analysis – Fatigue: FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to a Blood Alcohol Content (BAC) of 0.05. At or above this baseline, we do not consider fatigue as probable for any employee. Software sleep settings vary according to information obtained from each employee. If an employee does not provide sleep information, FRA uses the default software settings.

FRA obtained fatigue-related information, including a 10-day work history for the Locomotive Engineers and Conductors assigned to train 1 and train 2.

Fatigue Avoidance Scheduling Tool (FAST) results indicated fatigue was probable for the Engineer and Conductor of train 1.

FAST test results fatigue was not probable for the Engineer and Conductor of train 2.

Conclusion: FRA concluded that fatigue was probable for one or more of the employees of train 1, and

the employee or employees may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue, which may have contributed to the cause of the accident/incident.

Analysis – Train 1 Operating Practices: The Engineer was a certified engineer with a certification date of May 5, 2011, and an expiration date of November 10, 2018. He was also a qualified conductor with the same expiration date. UP hired him on February 9, 2007. The event recorder was reviewed and train handling was determined to be a factor in this accident.

The Conductor was certified with a certification date of November 29, 2017, and an expiration date of September 20, 2020. UP hired him on July 17, 2017. The conductor was on the ground when the Engineer operated the locomotive. The Conductor stated he had no knowledge of the emergency application until the second time and he did not have time to check the cars before the eastbound train struck the derailed cars.

Train 1 arrived at Monahans with 108 loads, 6 empty cars with 4 locomotives in the lead position and one DP locomotive on the rear. The crew removed the DP unit and moved it to the head end of the locomotives then removed 17 cars from the train to move to the yard on track 108. As the crew approached the 500 switch the Engineer was operating the Locomotive and the Conductor was on the ground to the west of the lead locomotive when an emergency application of the brakes occurred at 1:23:10 (UTC). The Conductor noticed the train stopped so he walked to the last locomotive to check the air hoses. The Engineer was able to recover the air at 1:25:01. The Conductor walked back to the west, direction of movement, as the Engineer tried to move the cars. The timeline of events is listed below as indicated by the event recorder from the lead locomotive UP 2677.

1:20:20 - Moving

1:23:10 - Emergency

1:23:13 - Stopped

1:25:01 - Engineer placed engine in throttle 1 position (train brake pipe pressure recovered to 79 psi) train is not moving.

1:25:31 - Engineer increased to throttle 3 position and train still not moving and then placed throttle in idle position. Brake pipe air pressure was 84 psi.

1:27:16 - Engineer placed throttle in 1 position with 84 psi (train did not move).

1:27:42 - Engineer increased to throttle position 4 (train did not move).

1:27:44 - Engineer then placed in idle position.

1:29:24 - Train remained in stopped position with no throttle movement and 84 psi.

1:29:24 - Engineer placed throttle 1 position and no movement.

1:29:38 - Engineer increased throttle to 5 position and still no movement.

1:29:48 - Engineer still in throttle position 5 and train began to move at 1 mph.

1:29:48 – 1:30:27 - Train moving between speeds of 1–7 mph and engineer operating in throttle to No 5.

1:30:28 - Train went into emergency and throttle went to idle position with train moving at 6 mph.

1:30:33 - Train stopped

Train 1 moved after the Engineer recovered air and began moving the cars until the second emergency application occurred at 1:30:28. One car derailed at the time of the first emergency application and the Engineer continued pulling until the derailed car impacted the crossing at Eva Avenue where the derailed car fouled the main track - at approximately 1:30:33.

Train 2 traveled at an estimated speed of 65 mph and had no warning of train 1 on track 108 derailing and fouling the main track. At 1:30:39, train 2 collided with the beforementioned derailed car.

The train 1 Engineer made no effort to notify train 2 of the emergency as required by Title 49 Code of Federal Regulations (CFR) §220.13, Reporting Emergencies and General Code of Operating Rules (GCOR) 2.10, Emergency calls which requires an employee to make the call over the radio "Emergency, Emergency, Emergency".

Approximately 22 seconds after the initial derailment, but prior to the collision, the Engineer pulled his phone from beneath him and made a phone call. The phone call was approximately 1 minute and 17 seconds.

Conclusion: The Engineer failed to stop the movement and notify the Conductor of the initial emergency application of the brakes and failed to announce the emergency application over his radio while continuing to pull the cars after they were derailed. The derailed equipment fouled the main track. The Engineer also failed to notify the oncoming train which would have prevented the second train from striking the fouled equipment.

Analysis – Train 2 Operating Practices: The Engineer was a certified engineer with a certification date of February 25, 2004, and an expiration date of November 10, 2018. He was also a qualified conductor with the same expiration date. UP hired him on February 9, 1999. The event recorder was reviewed and no anomalies were found in the train handling.

The Conductor was a certified conductor with a certification date of May 12, 2014, and an expiration date of March 30, 2020. UP hired him on February 3, 2014.

Conclusion: FRA determined the Engineer and Conductor were properly trained in compliance with Federal regulations and complied with carrier operating rules.

Analysis- Wayside Signal System: Train movements are governed by operating rules, timetable instructions, and the signal indications of a traffic control signal system. The signal system also includes the overlay of a Positive Train Control (PTC) system that was operational for equipped trains at the time of the accident.

The Union Pacific Harriman Dispatch Center located in Omaha, Nebraska, controls train movements on

this portion of the Toyah Subdivision. The wayside signal system control points are operated by US&S Microlok processor units. The Microlok unit utilizes the GETS Electro Code 5 system to interface with the wayside signals on the main track. The control points and intermediate signals consist of color-light signal heads with LED lamps. Each lamp and aspect lens housed within a single three position head can display a green, flashing yellow, yellow, and red aspect from top to bottom.

Two FRA Signal and Train Control inspectors arrived on scene the following afternoon. FRA inspectors met with the UP Signal Manager to begin the investigation. The FRA inspectors along with UP's Signal department personnel downloaded the signal system data recorders, as well as the highway-rail grade crossing event recorders.

The signal system event recorders' data indicated that train 2 was proceeding eastbound on green aspects as it approached the point of impact at MP 609.715. The Hot Box Detector at MP 613.54 recorded train 2 entering the detector at 1:27 a.m., CST, with a recorded speed of 57 mph at 1:28 a.m., CST. The data showed a leaving speed of 67 mph. The event recorder at the highway-rail grade crossing was located at Loop 464, MP 610.87, logged a speed of 66 mph. The Eva Avenue crossing located at MP 609.71 was at or near the initial point of impact. The data collected appeared distorted possibly by the erratic shunting of derauling cars. This data was not consistent with normal train movement.

Train 1 was operating on track 108. Track 108 is a dark non-controlled other-than-main track with no wayside signal data to review.

FRA Signal and Train Control inspectors accompanied by UP's Signal Manager, Signal Inspector, and Signal Maintainer performed operational testing of the signal system. Testing procedures included the verification of signal aspects and track circuits. Locking tests were performed at the control point as well as shunt tests and ground tests at each location to ensure signal system integrity.

Conclusion: FRA determined the way side signal system was neither a primary or contributing cause in this accident.

Analysis - Track and Track Structures: The main track at MP 609.7 was single main track with a yard track parallel to it on the north side. The track through this area was tangent and flat. The rail on the main track was 136 lbs. Continuous Welded Rail (CWR) with a manufacture date of 2002 RE VT (Vacuum Treated) RMSM, and the rail on the yard track was 90 lbs. jointed rail, with a manufacture date of 1926, OH (Open Hearth), Tennessee. The yard track was Lead 108 Track. Switch number 500 is located on Lead 108 Track at this location. This switch faces the west and turns out to the north, away from the main track.

The main track at the accident location has a maximum speed of 70 mph, FRA Class 5. The Lead 108 Track has a maximum speed of 10 mph, FRA Class 1.

FRA's investigation discovered that the broken rail on Lead 108 Track was caused by a torch cut bolt hole created by UP employees. There were 10 separate pieces of rail found at this location after the derailment. Photographs taken on April 18, 2018, at the time of the investigation, demonstrate these conditions.

Note: A "bolt hole crack" is a progressive fracture originating at a bolt hole and extending away from the hole, usually initiating as a result of both dynamic and thermal responses of the joint bolt and points along the edge of the hole, under load. A major cause of this high stress is improper field drilling of the hole.

According to FRA Track Safety Standards (TSS), torch cutting rail on Class 2 through 5 is prohibited, but on Class 1 Track it is allowed. UP's Field Handbook and Chief Engineer's Bulletins do not allow torch cutting of rail or bolt holes on any track. Inspection records for Track 108 were reviewed and no exceptions were noted.

Conclusion: The derailment of a single car from train 1 on the Lead 108 Track was caused by a broken rail. The derailment of train 2 was the result of the initial derailment on Lead 108 Track and failure of the train 1 Engineer to conform to required operational rules governing emergency application of brakes near adjacent track(s). UP's track workers failed to follow their own rules and procedures regarding torch cutting rail.

Overall Conclusion

The initial derailment of train 1 on track 108 was caused by the broken rail. The Engineer continued to pull the car after being derailed until it fouled the main track. The car was on the ground for 7 minutes and 23 seconds and during that time the Engineer was using excessive power to move the cars and should have known there was a problem. At no time did he warn the oncoming train. Inward facing cameras showed the Engineer was holding his personal phone and looking at it during the time he was operating the locomotive with the cars derailed. The probable fatigue of the crew of train 1 based on FAST analysis is also a possible contributing factor.

The rail broke at a rail joint and the rail holes had been torch cut instead of drilled. FRA does not restrict torch cut rail holes in Class 1 Track but UP rules do restrict it.

Train 2 was operating in compliance with FRA and UP Operating Rules and Regulations.

Probable Cause and Contributing Factors

FRA has determined the probable cause of the initial derailment was T201 - Broken Rail - Bolt hole crack or break.

FRA has determined that the secondary collision was the result of the contributing cause of M404 - Object or equipment on or fouling track. FRA has also determined H212 - Radio communication, failure to give/receive, and H199 - Employee physical condition, other were additional contributing causes to the secondary collision and derailment.