



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

***Accident Investigation Report
HQ-2013-1050***

***Alabama & Gulf Coast Railway LLC (AGR)
Aliceville, AL
November 7, 2013***

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.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Alabama & Gulf Coast Railway LLC	1a. Alphabetic Code AGR	1b. Railroad Accident/Incident No. AGR444413
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GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Alabama & Gulf Coast Railway LLC		1a. Alphabetic Code AGR	1b. Railroad Accident/Incident No. AGR444413	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 11/7/2013	4. Time of Accident/Incident 11:40 PM	
5. Type of Accident/Incident Derailment				
6. Cars Carrying HAZMAT 88	7. HAZMAT Cars Damaged/Derailed 29	8. Cars Releasing HAZMAT 26	9. People Evacuated 0	10. Subdivision Magnolia
11. Nearest City/Town Aliceville		12. Milepost (to nearest tenth) 683	13. State Abbr. AL	14. County PICKENS
15. Temperature (F) 32 °F	16. Visibility Dark	17. Weather Clear		18. Type of Track Main
19. Track Name/Number Main Track		20. FRA Track Class Freight Trains-40, Passenger Trains-60		21. Annual Track Density (gross tons in millions) 8.7
				22. Time Table Direction South

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train				2. Was Equipment Attended? Yes		3. Train Number/Symbol 501-07							
4. Speed (recorded speed, if available) R - Recorded E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 11713		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>Direct Train Control</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 (derailed, struck, etc.)		BN808091	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		
			b. Manual	c. Remote	d. Manual	e. Remote			a. Freight	b. Pass.	c. Freight	d. Pass.	e. Caboose
(1) Total in Train		2	0	0	0	1	(1) Total in Equipment Consist		90	0	0	0	0
(2) Total Derailed		1	0	0	0	0	(2) Total Derailed		26	0	0	0	0
12. Equipment Damage This Consist 2076254			13. Track, Signal, Way & Structure Damage 622793										
14. Primary Cause Code T299 - Other rail and joint bar defects (Provide detailed description in narrative)													
15. Contributing Cause Code T499 - Other way and structure defect (Provide detailed description in narrative)													
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: 6 Mins: 10				Hrs: 6 Mins: 10	
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 33.088357000				29. Longitude -88.141843000									

CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved	
1. Type		5. Equipment	
2. Vehicle Speed (<i>est. mph at impact</i>)	3. Direction (<i>geographical</i>)	6. Position of Car Unit in Train	
4. Position of Involved Highway User		7. Circumstance	
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials?		8b. Was there a hazardous materials release by	
8c. State here the name and quantity of the hazardous material released, if any.			
9. Type of Crossing Warning 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (<i>spec. in narr.</i>) 3. Standard FLS 6. Audible 9. Watchman 12. None		10. Signaled Crossing Warning	11. Roadway Conditions
12. Location of Warning		13. Crossing Warning Interconnected with Highway Signals	14. Crossing Illuminated by Street Lights or Special Lights
15. Highway User's Age	16. Highway User's Gender	17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train	18. Highway User
19. Driver Passed Standing Highway Vehicle		20. View of Track Obscured by (<i>primary obstruction</i>)	
Casualties to:	Killed	Injured	21. Driver was
23. Highway-Rail Crossing Users		24. Highway Vehicle Property Damage (<i>est. dollar damage</i>)	22. Was Driver in the Vehicle?
26. Locomotive Auxiliary Lights?		25. Total Number of Vehicle Occupants (<i>including driver</i>)	
28. Locomotive Headlight Illuminated?		27. Locomotive Auxiliary Lights Operational?	
		29. Locomotive Audible Warning Sounded?	

10. Signaled Crossing Warning

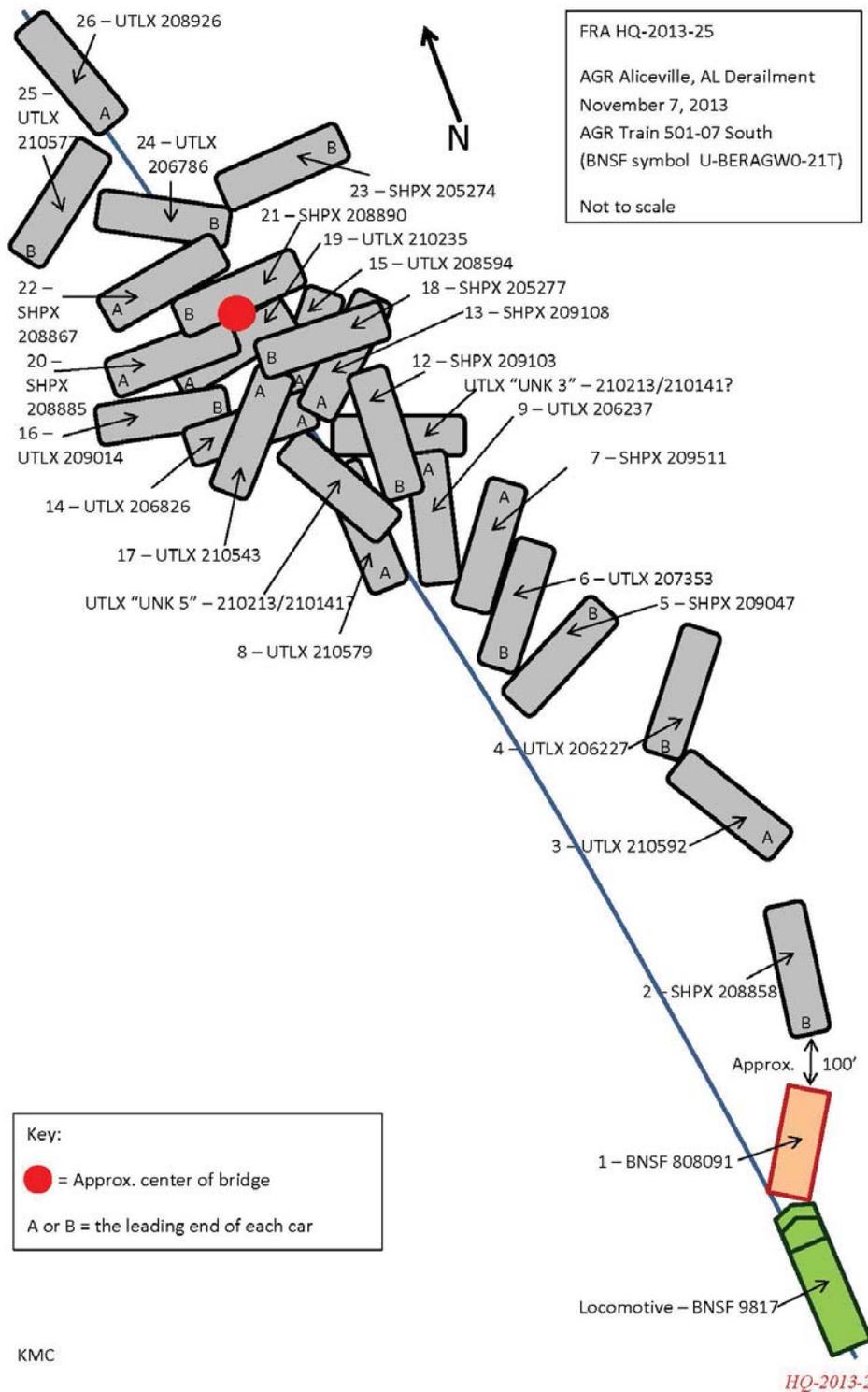
- 1 - Provided minimum 20-second warning
- 2 - Alleged warning time greater than 60 seconds
- 3 - Alleged warning time less than 20 seconds
- 4 - Alleged no warning
- 5 - Confirmed warning time greater than 60 seconds
- 6 - Confirmed warning time less than 20 seconds
- 7 - Confirmed no warning
- N/A - N/A

Explanation Code

- A - Insulated rail vehicle
- B - Storm/lightning damage
- C - Vandalism
- D - No power/batteries dead
- E - Devices down for repair
- F - Devices out of service
- G - Warning time greater than 60 seconds attributed to accident-involved train stopping short of the crossing, but within track circuit limits, while warning devices remain continuously active with no other in-motion train present
- H - Warning time greater than 60 seconds attributed to track circuit failure (e.g., insulated rail joint or rail bonding failure, track or ballast fouled)
- J - Warning time greater than 60 seconds attributed to other train/equipment within track circuit limits
- K - Warning time less than 20 seconds attributed to signals timing out before train's arrival at the crossing/island circuit
- L - Warning time less than 20 seconds attributed to train operating counter to track circuit design direction
- M - Warning time less than 20 seconds attributed to train speed in excess of track circuit's design speed
- N - Warning time less than 20 seconds attributed to signal system's failure to detect train approach
- O - Warning time less than 20 seconds attributed to violation of special train operating instructions
- P - No warning attributed to signal systems failure to detect the train
- R - Other cause(s). Explain in Narrative Description

SKETCHES

Sketch



SYNOPSIS

On November 7, 2013, at approximately 11:40 p.m., CST, southbound Alabama & Gulf Coast Railway (AGR) train, 501-07 (501), derailed 26 cars and one (1) locomotive near Milepost (MP) 683.0 on the AGR Magnolia Subdivision. The accident occurred near Aliceville, Alabama, in Pickens County, about 80 miles west-southwest of Birmingham, Alabama. Train 501-07 consisted of three (3) BNSF Railway (BNSF) locomotives, and 90 freight cars. This included two (2) buffer car loads of sand and 88 DOT-111 tank cars loaded with UN1267, PETROLEUM CRUDE OIL, 3, PG I. The two (2) buffer cars of sand were in positions one (1) and 90 of the train. Lead Locomotive BNSF 5056 was facing south with BNSF 9817 trailing and facing north. Locomotive BNSF 5768 (DPU) was on the rear of the train.

The train was traveling southward from Amory, Mississippi, towards Florida at a recorded speed of 39 mph as it approached MP 683. The maximum authorized speed at this location is 40 mph. The crew reported feeling a "thud" on the east side of the lead locomotive as they traveled over a trestle near MP 683.0 with the train immediately experiencing an emergency brake application. The crew members looked northward, heard an explosion, and observed a fire ball behind them. They reported the incident to the Genesee and Wyoming (G&W) Control Center, and exited the lead locomotive after the train came to a stop. The train derailed with the trailing wheel set of BNSF 9817 (trailing locomotive) derailed to the east side of the rail, and remaining upright. A total of 26 freight cars derailed. The buffer car in position one (1) derailed to the east side of the main track. The following 25 tank cars in positions 2 through 26 derailed, with the majority of them in a general pile at the trestle. The tank cars in positions 27 through 30 did not derail but did receive fire damage. The remainder of the train did not derail and was not damaged. The trestle at MP 683.0 was completely destroyed by the derailment and resultant fire.

Damages included \$2,076,254 to equipment, and \$622,793 to track, wayside, and structures. At the time of the derailment, weather was dark and clear. The temperature was 32 degrees Fahrenheit.

There were no injuries reported and no evacuations; this was not an Amtrak route. The probable cause of the derailment is a broken rail containing a split web defect.

NARRATIVE

Circumstances Prior to the Accident

Alabama & Gulf Coast Railway (AGR) Train 501-07 consisted of 2 BNSF Railway (BNSF) locomotives, 90 loaded cars, and a BNSF DPU locomotive on rear of the train. This included 2 buffer car loads of sand and 88 tank cars loaded with UN1267, PETROLEUM CRUDE OIL, 3, PG I. Train 501 was 5,558 feet in length and weighed 11,713 tons. The train originated in Berthold, North Dakota, and was destined for Walnut Hill, Florida. BNSF operated the train from Berthold to Amory, Mississippi, as BNSF Train U-BERAGW0-21T. AGR received the train in interchange at Amory for final movement to Walnut Hill and operated it as Train 501-07.

The crew of Train 501-07 consisted of a Locomotive Engineer and a Conductor. They went on duty on November 7, 2013, at 5:30 p.m., CST, in Columbus, Mississippi. Aliceville, Alabama, was the home terminal for both crew members. The crew received their statutory rest period before reporting for duty. The Engineer received 15 hours and 30 minutes of rest. The Conductor received 20 hours and 45 minutes of rest. They were transported (deadhead by company vehicle) to BNSF's Yard in Amory by the AGR trainmaster to board Train 501. Prior to operating the train, the crew received a Track Warrant Authority (TWA), Track Bulletin Orders (TBO), and a copy of BNSF's work order/hazardous materials documentation for the train. They released three applied handbrakes on the train; two locomotive and one car. No brake test was required, as this was a run-through train with a current brake slip on the lead locomotive.

The crew departed Amory at 8:00 p.m., CST, under track warrant authority (TWA), time table direction south and geographic direction southeast. Their authority extended to MP 667 where they met northward AGR Train 111 at Pickensville, Alabama (MP 669.3). Train 501 received a TWA from Milepost (MP) 667 to MP 731.2, Demopolis, Alabama, about 51 miles south of Aliceville.

As Train 501 approached the accident location, both crew members were in Lead Locomotive BNSF 5056. The Engineer was seated on the west side in the engineer's seat and the Conductor was standing in the middle of the cab.

Approaching the accident location from the north, the track has a 0.5-percent descending grade from Aliceville to about 1/10th of a mile north of the CR2 highway-rail grade crossing. From the crossing continuing south, there is a 0.4-percent ascending grade that continues 1/5 of a mile through the bridge and past Cotton Field Road, a private road crossing. The bridge is situated in a 1-degree right-hand curve.

The Accident

After clearing a 25 mph permanent slow order near MP 682, the Engineer began throttling up to get the train up to time table speed of 40 mph. Operating in the number three throttle position at 36 mph, the Engineer throttled down to the number two throttle position as the train increased speed to 39 mph. As they approached the CR2 road crossing, the Engineer sounded the horn until the train entered the crossing. At approximately 11:40 p.m., CST, as they approached the south end of the bridge at MP 683.0, the Engineer thought they hit something and told the Conductor he thought they hit a broken rail. The Engineer felt the locomotive go down and back up, while the Conductor heard a loud noise "thud" on the east side of the locomotive. The Engineer positioned the throttle in idle, 15 seconds later the train experienced an emergency brake application at a recorded speed of 39 mph. Train 501 came to a complete stop, after traveling 400 feet 10 seconds later.

The Engineer called for help on the radio, calling out "911 we are on fire." He was unsuccessful in reaching the AGR dispatcher, but reached AGR Train 111 who immediately called the dispatcher. The Conductor exited the lead locomotive through the front door and ran south toward the Cotton Field Road crossing. After seeing the fire and explosions, the Engineer followed the Conductor south to the crossing. The crew members were not injured. They were then picked up by two hunters passing by, who took them to the CR3 road crossing to meet up with their Supervisor.

The trailing two wheels on the trailing truck of the second locomotive, BNSF 9817, derailed to the east. The first car, BNSF 808091 (buffer car) derailed its trailing truck (north end); the following 25 tank cars derailed with the majority in a general pile-up near the center of the trestle. The next four tank cars did not derail but did receive fire damage. The derailed cars contained Bakken crude oil. Several thousand gallons of crude oil spilled in the adjacent waterway, a feeder creek for the Tombigbee River. The trestle at MP 683.0 was completely destroyed. An estimated 720,000 gallons of crude oil was lost from the 25 derailed tank cars and one additional non-derailed tank car. Cleanup actions removed more than 228,000 gallons along with 8,000 tons of soil. More than 100 emergency responders from various local, State, and Federal agencies responded to the accident scene.

ANALYSIS AND CONCLUSION

Operating Performance

Analysis – Toxicological Testing:

The accident met the criteria for Title 49 Code of Federal Regulations Part 219 Subpart C, Post-Accident Toxicological Testing. The train crew members were tested under this authority.

Conclusion: The test results for the two crew members were negative. Impairment of the crew was not a causal factor in this accident.

Analysis – Fatigue:

The Federal Railroad Administration (FRA) used a fatigue analysis software program to create an analysis model for each crew member's overall effectiveness rate at the time of the accident. This model was produced through calculations made using collected work/rest data from each of the crew members. FRA uses an overall effectiveness rating of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content of 0.05. 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. 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 both employees involved in this accident, including the Locomotive Engineer and Conductor of AGR Train 501. Both the Engineer and Conductor had an overall effectiveness rating exceeding the baseline for fatigue analysis.

Conclusion: FRA concluded fatigue was not probable for the employees assigned to the involved train.

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 BNSF and analyzed by railroad officials. The event recorder data prior to the derailment suggested train handling was in accordance with proper train handling procedures.

The train was traveling southward from Amory towards Walnut Hill at a recorded speed of 39 mph; the maximum authorized speed at the derailment location is 40 mph. The crew reported feeling a "thud" on the east side of the locomotive as they passed over the trestle at MP 683.0. The noise was followed by an undesired emergency application of the air brakes.

Conclusion: The Locomotive Engineer was in compliance with all applicable FRA regulations, railroad operating, and train handling rules and requirements. Improper train handling was not a causal factor in this derailment.

Mechanical Performance

Analysis – Locomotive Consist

The lead locomotive, BNSF 5056, was inspected after the locomotive was placed on an inspection pit in Fountain, Alabama. Fresh marks were noted on the underside of the locomotive number 2 traction motor gear box, the number 3 traction motor lower support bearing housing, the number 3 traction motor gear box, and underside of the fuel tank. All marks noted were on or near the left (east) side of the locomotive. Locomotive BNSF 9817, the trailing locomotive in consist, had derailed the R-1 wheel of the trailing (front) truck. It showed strike marks on the undercarriage right (east) side, similar in location to the marks on Locomotive BNSF 5056. The marks indicate the

trailing (front) truck. It showed strike marks on the undercarriage right (east) side, similar in location to the marks on Locomotive BNSF 5056. The marks indicate the locomotives had traversed over or were struck by an object from underneath the locomotives.

The locomotives were equipped with outward facing video recorders. The video recorder on the lead locomotive was inoperative. The video recorder on the second locomotive was facing north. The recorder on the second locomotive recorded a loud noise as the train passed the south end of trestle at MP 683.0. After the train went into emergency, the video showed a large fire ball and explosion looking north behind the locomotives.

Conclusion: After inspecting Locomotive BNSF 5056, there was no indication that it was causal in the derailment. It was determined that the R-1 wheel on Locomotive BNSF 9817 derailed as a result of the accident, being pulled off the track by the derauling car immediately behind the locomotive. There were no indications that conditions noted on the subject locomotives caused or contributed to this accident

Hazardous Materials Tank Car Performance

Train 501 contained 88 DOT-111 tank cars. Each tank car was loaded with UN 1267, PETROLEUM CRUDE OIL, 3, PG I. The train originated at Berthold, North Dakota, and was destined to Walnut Hill, Florida. The train operated on BNSF from point-of-origin to Amory, Mississippi as BNSF Train U-BERAGW0-21T, and interchanged to the AGR at Amory, Mississippi. At Amory, it began operating as AGR Train 501.

Analysis – Tank Car Damage Assessment:

The head 29 tank cars listed below were damaged in the derailment. Of those, the head 26 tank cars released hazardous materials. Of those, the head 25 tank cars derailed and succumbed to puncture, tears, and/or thermal tears. Damage assessments were conducted on the head 25 tank cars and corresponding damage assessment forms are included in this report.

1. SHPX 208858 – Derailed and released hazardous materials
2. UTLX 210592 – Derailed and released hazardous materials
3. UTLX 206227 – Derailed and released hazardous materials
4. SHPX 209047 – Derailed and released hazardous materials
5. UTLX 207353 – Derailed and released hazardous materials
6. SHPX 209511 – Derailed and released hazardous materials
7. UTLX 210579 – Derailed and released hazardous materials
8. UTLX 206237 – Derailed and released hazardous materials
9. UTLX 210213 – Derailed and released hazardous materials
10. UTLX 210141 – Derailed and released hazardous materials
11. SHPX 209103 – Derailed and released hazardous materials
12. SHPX 209108 – Derailed and released hazardous materials
13. UTLX 206826 – Derailed and released hazardous materials
14. UTLX 208594 – Derailed and released hazardous materials
15. UTLX 209014 – Derailed and released hazardous materials
16. UTLX 210543 – Derailed and released hazardous materials
17. SHPX 205277 – Derailed and released hazardous materials
18. UTLX 210235 – Derailed and released hazardous materials
19. SHPX 208885 – Derailed and released hazardous materials
20. SHPX 208890 – Derailed and released hazardous materials
21. SHPX 208867 – Derailed and released hazardous materials
22. SHPX 205274 – Derailed and released hazardous materials
23. UTLX 206786 – Derailed and released hazardous materials
24. UTLX 210577 – Derailed and released hazardous materials
25. UTLX 208926 – Derailed and released hazardous materials
26. UTLX 208516 – Not derailed but released hazardous materials
27. UTLX 210566 – Not derailed but sustained fire impingement
28. UTLX 207346 – Not derailed but sustained fire impingement
29. UTLX 209041 – Not derailed but sustained fire impingement

Conclusion: The tank cars were not a causal factor in this accident.

Track Performance

Analysis – The track at MP 683.0 is single main track with a 1-degree right hand curve and designed superelevation of 3/4 inches. Approaching the derailment location in the direction of travel, at MP 682.0 there is a descending grade of 0.5 percent continuing for 4,013 feet. About 211 feet north of County Road 2, (Inventory ID: 664989G) the track begins a 0.4 percent ascending grade for 4,435 feet to MP 683.6. The rail (112-pound) is continuous welded rail (CWR) fastened to wood cross ties with cut spikes, with anchors applied in a box anchored pattern on every other cross tie. The 112-pound CWR rail through the area of derailment has several different manufacture dates to include 1937/1939 Head-free OH (open hearth), 1944 RE OH, and 1947 control cooled, all from U.S. Steel, Tennessee Mill (Tennessee). Most recent records showed rail installed in 1978, numerous plug rails were observed in track and were of the same rail type, make, and date of originally installed rail.

Track measurements were taken at 15-foot intervals on the undisturbed track from the suspected point of derailment north 200 feet. This section of track had an average curvature of 1.2 degrees with 15/16 inches of superelevation, about 0.2 degrees less curvature and 3/16-inch more superelevation than designed. Maximum speed for the curve based on measured values, Vmax formula, and 3-inch cant deficiency, was determined to be 68 mph.

The bridge located at MP 683.0 (Bridge Number 683.0) over an unnamed waterway was a 50-foot long open deck pier trestle (ODPT) type structure. It consisted of four spans with five bents. Each bent was constructed with concrete caps supported by six driven timber piles. On May 11, 2013, the Pointer Smith Contracting Corporation completed bridge repairs and modifications on the structure. They shot elevations on the bridge; epoxy welded between all caps and piles, and tamped both bridge approaches. The bridge was completely destroyed as a result of the accident.

The AGR completed a cross tie replacement project in March 2013, and track surfacing in May 2013. The track work was done in preparation to raise the track speed from 25 mph over this segment of track, including the bridge. The track and bridge speeds were increased to 40 mph on July 3, 2013.

The main track at the accident location has a maximum speed of 40 mph, FRA Class 3, with an estimated 9 million annual gross tons. Weekly track inspections with at least 3 calendar days between inspections are required for this segment of track. The accident location was last inspected, three days prior, by the AGR Track Inspector on November 4, 2013, with no exceptions noted at the accident location. Track inspection reports reviewed for the months of August, September, October, and November 2013, through the time of the accident show proper frequency of inspections, with no defective conditions recorded in the area of derailment. AGR Train 111 was the last train to pass through the area of the derailment at MP 683.0 at 10:30 p.m. on November 7, 2013.

On July 30, 2013, Sperry Rail Service conducted a test for internal rail defects at this location with no exceptions noted. FRA Rail Integrity Division Chief reviewed the July 30, 2013, Sperry Rail Services test tapes 300 feet in each direction of MP 683.0. His analysis did not identify any remarkable indications of internal defects existing at the time of the test.

On January 23, 2014, Rail Sciences conducted an investigation into the AGR accident and produced a 116-page report. Although FRA was not afforded a copy of the report, a review of the report was conducted on August 18, 2014, by FRA. As observed by FRA, general forensics in the report were consistent with FRA's findings. Additional forensics and statements in the report included; longitudinal forces, from simulated analysis showed train buff forces at 25 percent loaded, with drawbar forces of the first 5 cars under 50 kips and a maximum of 40 kips. The report ruled out train handling or mechanical probable causes, and focused on track and broken rail.

Efforts were made to recover all rails through the derailment site. Recovered rail pieces were marked and graphed on a diagram in an attempt to determine a significant POD. All rail pieces recovered were removed from the immediate site and reconstructed at a location where measurements could be taken. A total of 727 track feet of railroad was disturbed and destroyed from the derailment; this includes about 1,454 linear feet of rail. Rail recovery efforts produced 38 pieces of rail, totaling about 1,400 feet in length.

disturbed and destroyed from the derailment; this includes about 1,454 linear feet of rail. Rail recovery efforts produced 38 pieces of rail, totaling about 1,400 feet in length. The remaining 54 feet of rail was not recovered. The recovered rail pieces were reconstructed by matching rail ends, rail wear, bolt holes, and rail stampings. The missing 54 feet of rail left several gaps of continuity in the reconstruction efforts. One piece of rail recovered (identified as "JJ" by Rail Science, was 2 feet, 11 inches long) showed signs of rail-end batter measuring 3/8-inch, heavy shelling, two vertical cracks in the railhead, and cracks running horizontally along the fillet of the web. These indications showed signs of possible split web defect. The legible portion of the rail stamping on this piece was 11228 RE OH (open hearth) Tennessee USA 1944 //// (each slash following the year represents 1-month; therefore, this rail was manufactured in April). Piece "JJ" was not matched with any other pieces of rail recovered. The rail wear pattern and impact striking place the subject piece on or near the south end of the bridge on the east rail side.

In its conclusion, the Rail Science report stated, "Overall track conditions were good, however swampy area with marginal vertical stability may exaggerate internal rail defects, and cause rapid growth." The report also stated there were no suspected weld failures. Page 69 of the report stated, "Fracture of the rail occurred prior to derailment, causing significant head (end) batter; therefore, the derailment was a result of a broken rail."

Conclusion:

The suspect rail section "JJ" demonstrates rail end impact batter and cracks in the web and fillet areas. The rail end batter indicates the train ran over this broken rail causing the batter, due to a broken rail prior to derailment. The section of rail preceding the suspect rail was not recovered. Rail recovery and reconstruction efforts remain incomplete, leaving discontinuity in rail pieces recovered. One section of rail recovered, identified as piece "JJ," was 11228 RE OH (open hearth) Tennessee USA rolled in April 1944. Piece "JJ" was not matched with any other pieces of rail recovered. Based on the evidence discovered during the investigation, and the Rail Science report not provided to the FRA, piece "JJ" contained a split web defect. Piece "JJ" is the suspected probable cause of the derailment.

Overall Conclusion:

Investigation shows that mechanical, operating and hazardous material performances did not play a part in the cause of this accident. Fatigue and toxicological findings were negative. During the on-scene investigation, FRA found the suspected broken rail, aka "JJ", near the point of derailment. It exhibited signs historically found at broken rail derailments. The suspect broken rail also appeared to include a split web defect. These facts were contained in the report prepared by Rail Science and reviewed by, but not provided to, FRA. Although the railroad claims to not have been able to determine the cause, the associated facts lead to the suspected broken rail containing a split web defect, AKA "JJ", as being the probable cause of this accident.

Probable Cause

The probable cause of the derailment is a broken rail containing a split web defect.