



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

***Accident Investigation Report
HQ-2018-1253***

***Norfolk Southern (NS)
Attica, NY
February 15, 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 February 15, 2018, at approximately 4:07 p.m., EST, eastbound Norfolk Southern freight train (NS) 28NH714 traveling on single main track in Traffic Controlled System (TCS) territory, traveling eastbound derailed both lead engines and nine loaded auto cars at Milepost (MP) 390.67. The train was traveling at a recorded speed of 36 mph when it derailed. The maximum authorized speed was 40 mph. The derailment occurred in Attica, New York, on the Harrisburg Subdivision on the Southern Tier main line. The method of operation on this track segment is by signal indication of a traffic control system (TCS). The crew consisted of a locomotive Engineer and a Conductor.

The crew received a clear signal; they then saw only rails and cross ties ahead. They were then bounced around in the cab of the lead unit as the train derailed and fell into a washed-out area at MP SR 390.67. Both crew members sustained nonlife-threatening injuries. The Conductor sustained a broken arm and the Engineer a broken leg. The crew was transported to the hospital by ambulance. No Hazmat cars were in the train, but there was a locomotive diesel spill and fire on the lead locomotive (NS 9692), which the fire department allowed to burn out on its own.

The accident resulted in equipment damage estimated to be \$402,302 and structure damage estimated to be \$425,000.

Weather at the time of the accident was dusk, with clear skies and 49 °F.

The derailment was caused by a catastrophic failure of the culvert, which collapsed inward and the 40-foot fill above funneling down into the culvert and washing out. The Federal Railroad Administration determined the probable cause of the accident to be cause code T002 – Washout/rain/slide/flood/snow/ice damage to track.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. 128545
--	---------------------------	--

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. 128545
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 2/15/2018	4. Time of Accident/Incident 4:07 PM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0
	9. People Evacuated 0	10. Subdivision Harrisburg
11. Nearest City/Town Attica	12. Milepost (to nearest tenth) 390.67	13. State Abbr. NY
		14. County WASHINGTON
15. Temperature (F) 49 °F	16. Visibility Dusk	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number Single Main	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 18
		22. Time Table Direction East
23. PTC Preventable No		

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol 28NH714				
4. Speed (recorded speed, if available) R - Recorded 36.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 2971		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	
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>		NS 9692		1		no				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	2	0	0	0	0	(1) Total in Equipment Consist	43	0	0	0	0
(2) Total Derailed	2	0	0	0	0	(2) Total Derailed	9	0	0	0	0
12. Equipment Damage This Consist 402302			13. Track, Signal, Way & Structure Damage 425000								
14. Primary Cause Code T002 - Washout/rain/slide/flood/snow/ice damage to track											
15. Contributing Cause Code N/A - N/A											
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: 2 Mins: 37		Hrs: 2 Mins: 37	
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 42.857739000				29. Longitude -78.257226000							

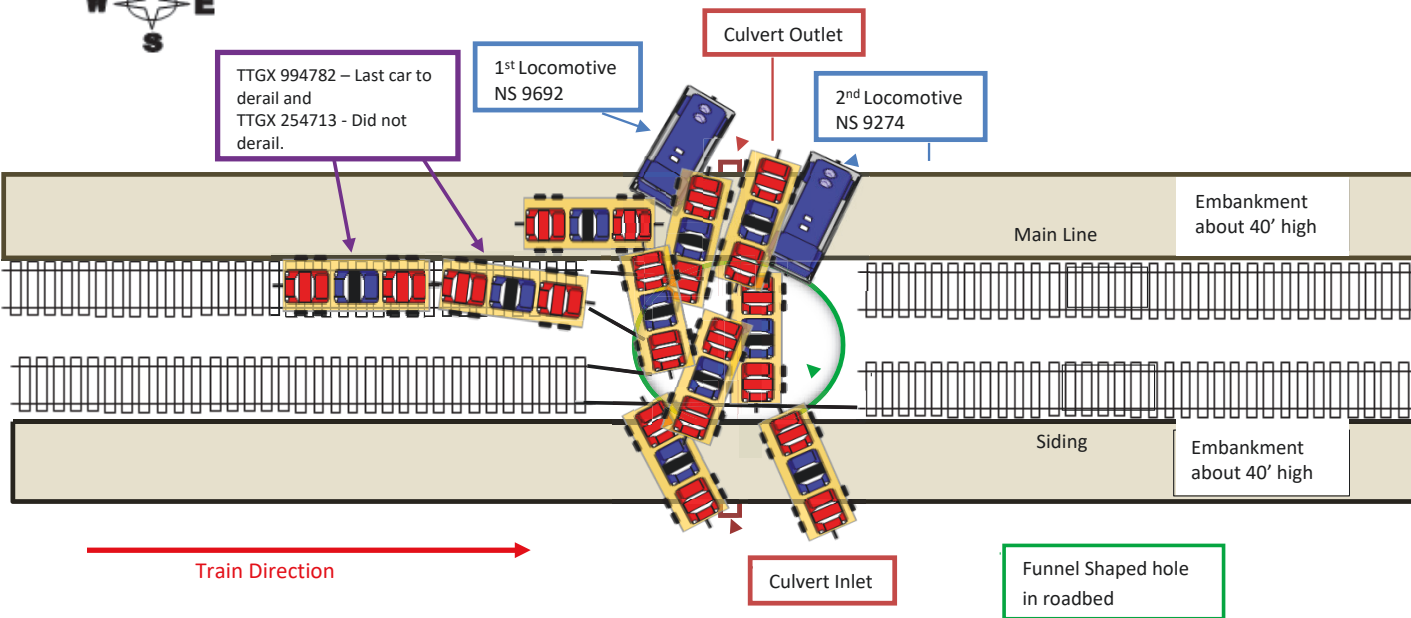
SKETCHES

Sketch - Up-dated Sketch

HQ-2018-1253

HQ-2018-1253
February 15, 2018

*Not to Scale



NS MP SR390.67 on Southern Tier in Attica, NY. First nine cars which derailed:

1. TTXG 964643
2. TTXG 995031
3. TTXG 988455
4. TTXG 852922
5. TTXG 971708
6. TTXG 985838
7. TTXG 158434
8. TTXG 985731
9. TTXG 994782
10. TTXG 254713 – Did not derail

NARRATIVE

Circumstances Prior to the Accident

On February 15, 2018, a Norfolk Southern (NS) engineer and conductor reported for duty at the Buffalo, New York, Bison train yard, Milepost (MP) SR419, at 1:30 p.m., EST. This was the home terminal for both crew members, and both received more than the statutory off-duty period prior to reporting for duty.

The crew was assigned to NS Freight Train 28NH714 (the train). The train consisted of 2 locomotives (4,400 horsepower each) and 43 loaded autoracks. The train weighed approximately 2,971 tons and was approximately 4,637 feet long. Both locomotives received daily inspections the day of the derailment, and class 1 and class 3 brake tests were done prior to departure from Bison Yard. The inspections and tests found no deficiencies on the cars or the locomotives. The train was scheduled to travel from Bison Yard to Mechanicsville, New York (MP CPF468), on the NS Harrisburg Subdivision, on the Southern Tier.

The derailment area is tangent track with an ascending grade of 1.14 degrees. The main track at this location is constructed of 140-pound continuous welded rail (CWR) on 7-inch by 9-inch wood crossties. It is fastened with cut-spikes with two gage rail holding spikes and one field rail holding spike on 14-inch by 8-inch double shouldered plates. It was anchored every other crosstie. The ballast, ties, and surface not destroyed by the derailment was in sound condition and had adequate drainage. There was about 18 inches of ballast in the derailment area. The tie spacing on average was 19 inches. The stone arch culvert at the bottom of the 40-foot fill is 72 inches by 72 inches and 144 feet long.

Weather at the time of the accident was dusk, with clear skies and 49 °F.

The Accident

The train received a clear signal indication at eastbound (and timetable direction east) signal (2E) at control point (CP) Attica located at MP SR 392.5. This was the last wayside signal the Engineer would have observed prior to the derailment. The train was operating at a recorded speed 36 mph approaching the derailment area when the train encountered a “funnel shaped hole” in the roadbed beneath the tracks. At 4:07 p.m., EST, the train derailed. The locomotives rolled to the right and down the embankment. The lead locomotive caught fire, and the crew self-evacuated before receiving help from a local citizen who transported them to a location where emergency responders were waiting to provide aid. Based on bodycam video from a police officer that responded to the accident, the train crew’s view of the track over the failed culvert was described as “a bridge without any supports.” They were referring to the rail stretched across the hole created by culvert failure where the rail was still intact with nothing supporting it.

Post-Accident Investigation

In conducting its post-accident investigation, the Federal Railroad Administration (FRA) worked with New York Department of Transportation.

The FRA investigation team performed inspections, reviewed records, and performed analysis of all aspects related to the accident. FRA used the analysis to form conclusions, and establish the probable cause and contributing factors of the accident.

Analysis and Conclusions

Analysis-Toxicology Testing: FRA does not require testing for this type of derailment.

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

Analysis-Fatigue Analysis: FRA determined that this derailment was caused by an act of nature; FRA does not require a fatigue analysis for this type of derailment.

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

Analysis-Signal: The method of operation on this track segment is by signal indication of a traffic control system (TCS). The wayside signals are color-light type. The train received a clear signal indication; the signal aspect was green over red at the eastbound signal (2E) at CP Attica, the last wayside signal the Engineer observed. The event log was downloaded from CP Attica and confirmed the clear signal indication at CP Attica on the 2E signal at 15:20 hours on February 15, 2018. The signal system was functioning as designed at the time of the derailment.

Conclusion: FRA determined the signal system was working as intended and did not contribute to the cause or severity of this accident.

Analysis-Mechanical: The lead locomotive NS 9692, which caught fire during the derailment, was left to burn off flammable liquids. The daily inspection was last performed in Buffalo, on February 15, 2018, in accordance with regulations. The remnants of the locomotive left little physical indicators of the position of the controls. The portion of the locomotive below the deck, which was not affected by the fire, had no exceptions.

Trailing locomotive NS 9274 was in the correct operator control settings for trail service. The daily inspection was last performed in Buffalo, on February 15, 2018, in accordance with regulations. All exterior valves were in good physical condition for service. Both locomotives had been de-trucked and therefore truck inspection was not possible.

FRA walking inspections were conducted on the consist of the train to verify the condition of all brake valves and brake application, and included a physical inspection of the End-of-Train device (NS 74285). The inspection did not reveal any mechanical defects which would impair the effectiveness of the brakes

or rail to wheel interaction.

On February 17, 2018, following the derailment, FRA observed a Class 1 brake test being performed on the cars in the train that did not derail. Leakage was within limits. An inspection of these cars found defects which were determined to have no impact on the cause of the derailment, and there were no exceptions to the performance of the brake system during a service application of the brakes.

Conclusion: The equipment condition did not contribute to the cause or severity of the accident.

Analysis-Track: A walking track inspection of the derailment area was conducted by NS, New York Department of Transportation, and the FRA. No FRA track deficiencies were noted outside the area of the track damaged by the derailment. The track was last inspected by hi-rail vehicle on February 14, 2018, one day before the derailment, with no defects recorded within a mile of the accident site. This area was last inspected by a geometry car on September 9, 2017, with no deviations found in the area. In July 2017, this area was surfaced per the December 6, 2017 Track Charts. The 72x72-inch stone arch culvert was last inspected on November 9, 2017. On October 24, 2017, a Right of Way Condition was put on the siding at MP SR 390.6 because there was no shoulder on the south side (inlet side) of track. This was recorded on the NS Train Sheet Summary Report.

The crosstie condition did meet the FRA Standards for Class 4 Track, and on-site measurements taken at the time of the accident did not show any geometry variances in the derailment area.

Records of inspection of this stone arch culvert were provided by NS for 2016 and 2017. The most recent inspection was on November 9, 2017. This report indicated that the inlet end was partially filled with debris and the outlet was partially obstructed by trees. It also stated that there was evidence of flooding on the inlet side as well as a recent landslide on the inlet side bank. The report stated that riprap was installed. By adding riprap to the area of the inlet headwall, it prevented the erosion of the bank to continue. From the photos, water appeared to be flowing through, not around, the culvert.

Per the inspection report photos from the 2016 report, the interior of the stone arch was coated with shotcrete. There were no apparent signs of distress in the shotcrete coating which would indicate a problem with the integrity of the stone arch. There was a photo of a small void in the base of the stone wall at one location within the culvert. The exact location of the void was not documented in the report and the void would not necessarily be considered an immediate hazard. There are no photos of the interior from 2017.

The 2016 inspection report included an overall rating of 3 – Needs attention in the future. The 2017 report included an overall rating of 2 – Needs attention within 12 months. Upon review of the latest inspection report, NS was considering excavating the inlet area and installing a pipe sleeve through the stone arch but had not yet scheduled the work. The sleeve would reinforce the culvert and eliminate the risk of arch failure. Therefore, NS knew there was likely a problem with the long-term structural integrity

of this culvert but they did not identify an immediate risk, nor signs of an imminent arch failure, and considered the culvert to be in adequate structural condition.

Due to record rainfall, flood waters may have backed up at the inlet end of the partially plugged culvert and saturated the embankment. However, NS was periodically monitoring this location and prior trains had not reported any track settlement at this location. The likely cause of the derailment appears to be a sudden, catastrophic arch failure under the track area causing a hole that allowed the soil supporting the track to fall through the hole undermining the track stability, prior to the arrival of the train. As there were no prior signs of distress inside the arch, the NS could not have predicted this failure.

This would be confirmed with the right-of-way condition which was put on in October 2017, on the siding stating that there was no shoulder on the south (inlet) side. One of the pictures with the inspection report showed a hole in the wall of the culvert which needed repair.

Conclusion: The track was in compliance with Federal requirements. The culvert collapsed in the middle causing the 40-foot fill above to funnel down into the culvert and wash out. FRA determined the sudden and catastrophic failure of the arch is the probable cause of the accident.

Analysis-Locomotive Engineer Operating Performance: The trailing locomotive was equipped with a speed indicator and event recorder, as required. The relevant event recorder data was downloaded by NS at Bison Yard on the day of the derailment and analyzed by FRA.

Conclusion: The locomotive Engineer complied with all applicable railroad operating and train handling requirements.

Overall Conclusions

Due to record rainfall, flood waters backed up at the inlet end of the partially plugged culvert and saturated the embankment. The carrier was periodically monitoring this location, and prior trains had not reported any track settlement at this location. The likely cause of the derailment appears to be record temperature days before the derailment, and record rainfall flood waters bypassing the partially plugged culvert, undermining it, causing its partial collapse, and causing a sudden, catastrophic, arch failure under the track area. A hole that allowed the soil supporting the track to fall through undermined the track stability prior to the arrival of the train. As there were no prior signs of distress inside the arch, the carrier could not have predicted this failure.

Probable Cause and Contributing Factors

The derailment was caused by a catastrophic failure of the culvert, which collapsed inward and the 40-foot fill above funneling down into the culvert and washing out. FRA determined the probable cause of the accident to be cause code T002 – Washout/rain/slide/flood/snow/ice damage to track.