Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2017-1234

Norfolk Southern Railway Company (NS)
Imboden, VA
November 18, 2017

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 Saturday, November 18, 2017, at 8:37 p.m., EST, Norfolk Southern (NS) Train U43U918 (the train) traveling east, derailed 38 cars on the NS St. Charles Branch (Pocahontas Division) single main track at milepost (MP) TB 1.30. The accident occurred approximately three miles west of Andover, Virginia (Wise County) in the unincorporated area of Imboden, Virginia. The closest municipality is Appalachia. The train consist included 3 head-end locomotives, pulling 54 loaded aluminum constructed high-side gondola cars, was 2,800-foot long with 7,129 trailing tons. The method of operation is NS Rule 171 (Non-Signaled Track – Mandatory Directive). The weather at the time of the accident was light rain, winds SE 7 mph, and 49 °F.

The maximum authorized speed for freight trains on the St. Charles Branch in the area of the accident is 20 mph for empty trains and 15 mph loaded trains.

As confirmed by event recorder data, the train reached a speed of 33 mph at 8:34:27 p.m. as the engineer initiated an emergency application of the brakes with no response. The train continued to increase speed up to 46 mph until all movement ceased at 8:37:44. The point of derailment occurred at MP TB 1.30. The three locomotives and cars located in positions one through eight did not derail. Car positions 9 thru 46 derailed and the remaining 8 cars did not derail. Four of the cars overturned into Pigeon Creek spilling approximately 700 tons of coal into the water causing an obstruction to the flow of water.

Approximately 1,400 feet of track was damaged (40 panels) and the total damage was reported at $1,838,857. Voluntary evacuations were instituted for the possibility of flash flooding while removing cars from the creek. Route 68 was closed (until 11:30 a.m., on Wednesday, November 22, 2017) as a result of the derailment, creating a 45-minute detour for motorists. NS restored rail service mid-day on Wednesday, November 22, 2017.

The train crew was not post-accident toxicology tested by NS. This is not an Amtrak route, nor a crude by rail route. This is not a Positive Train Control (PTC) designated route therefore PTC could not have prevented this accident. There were no injuries associated with this accident.

The Federal Railroad Administration (FRA) investigation determined that the probable cause of the derailment was human factor cause code H606 – train outside yard limits in non-block territory, excessive speed.

The contributing factors identified in the FRA investigation of the derailment include the following FRA train accident cause codes:

H992 – Operation of locomotive by unqualified person.

H499 – Other main track authority causes, crew did not make an emergency brake application when the speed of the train exceeded time table speed by 5 mph per NS-1 A-23.

H599 – Other causes to train handling or make up, crew did not follow dynamic braking guidelines in timetable general instructions.

E09C – Other brake defects, cars – The primary brake system on Train U43U918 consisted of loaded cars having ineffective brakes due to inoperative empty/load devices.

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2017-1234

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	0

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Norfolk Southern Railway Company	NS	127463

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	11/18/2017	8:37 PM

5. Type of Accident/Incident
Other Impacts

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
0	0	0	0	St Charles Branch

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Imboden	TB1.3	VA	WISE

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

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Single Main Track	Freight Trains-25, Passenger Trains-30		East

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	U43-U918

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross excluding 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
46.0 MPH	R	7129		0

6. Type of Territory

Signalization:
Not Signaled

Method of Operation/Authority for Movement:
Direct Train Control

Supplemental/Adjunct Codes:
P

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.)*	DETX000531	9	yes		0	0
(2) Causing *(if mechanical, cause reported)*	DETX000531	9	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	54	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	38	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
1593857	245000

14. Primary Cause Code
H606 - Train outside yard limits in non block territory, excessive speed

15. Contributing Cause Code
H992 - Operation of locomotive by uncertified/unqualified person

Number of Crew Members

16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen
1	0	1	0

Length of Time on Duty

20. Engineer/Operator	21. Conductor
Hrs: 5 Mins: 37	Hrs: 4 Mins: 37

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

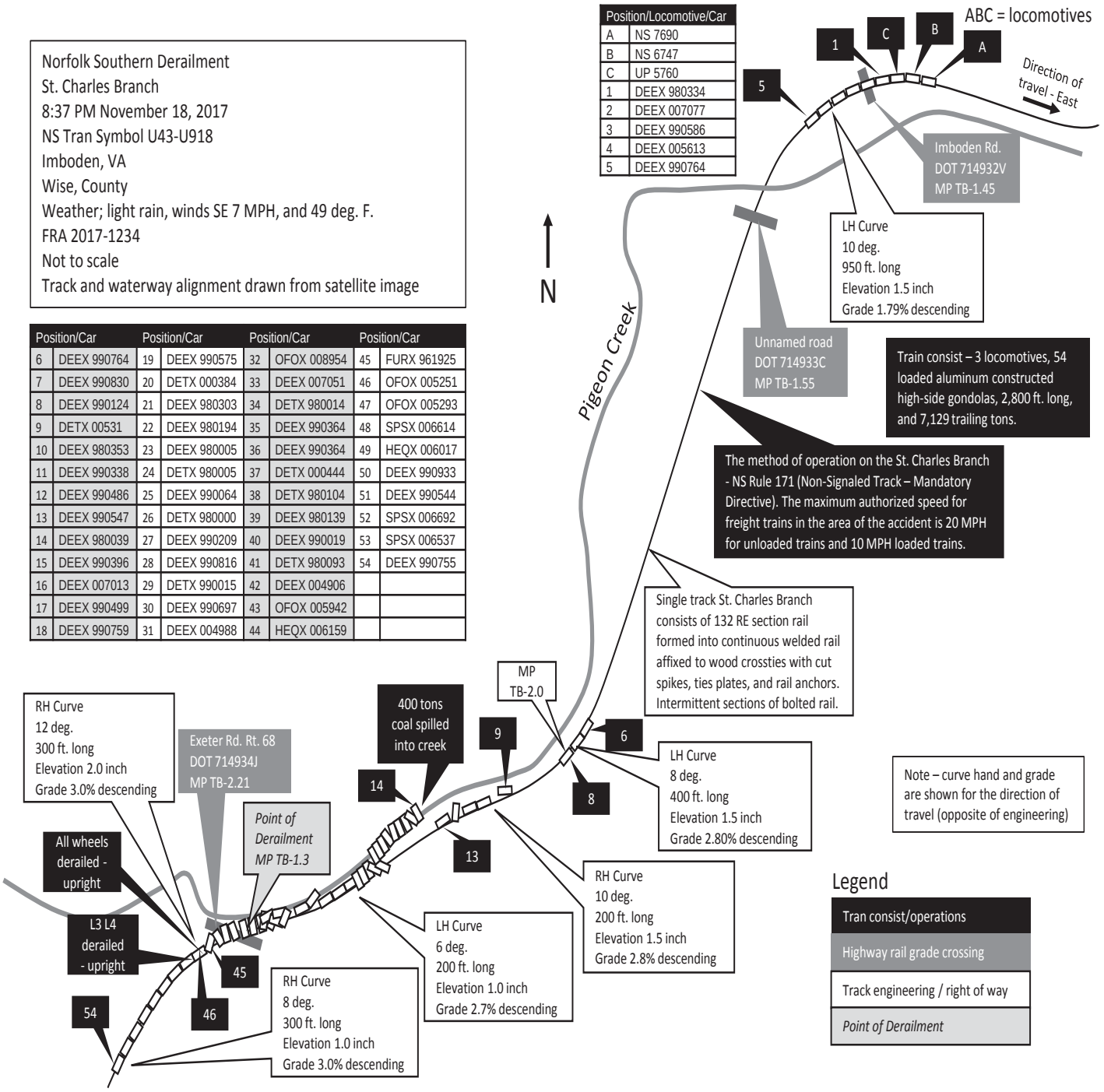
25. EOT Device?	26. Was EOT Device Properly Armed?
Yes	Yes

27. Caboose Occupied by Crew? N/A

28. Latitude	29. Longitude
36.884679000	-82.805773000

SKETCHES

HQ-2017-1234 Site Sketch



NARRATIVE

Circumstances Prior to the Accident

Norfolk Southern (NS) Freight Train U43U918 (the train) originated out of Andover, Virginia, on November 18, 2017. The crew consisted of an engineer and a conductor. The Locomotive Engineer was called out of turn from the Frisco Yard on a deadhead at 3:00 p.m. The conductor was called from the extra-board at Andover with an on-duty time of 4:00 p.m. Both employees received their required statutory off-duty rest period with 10 hours' rest before going on duty.

The crew moved some locomotives from Andover Yard to St. Charles, Virginia, before relieving the previous crew and taking control of the train at milepost (MP) TB 6.5. All required Bulletin Orders, Operating Rules, Safety and Air Brake & Train Handling Publications, Division Notices, Timetable, and Special Instructions were posted, issued, and in possession of the train crew.

The previous crew stopped movement at 6:48 p.m. The train crews held a job briefing about the condition of the equipment, then the crew performed the Class 1 brake test with no exceptions taken.

The train departed MP 6.5 at 7:03 p.m., then came to a stop to comply with district instructions at 7:42 p.m. The general instructions require loaded trains descending grade between MP TB 4.4 and Andover MP TB 0.0 to perform a brake inspection and to place all retainers at the high-pressure position. When the inspection is completed and all retainers have been put in the high-pressure position, the crew is to release the train brake and inspect for proper operation of retainer valves.

The Conductor was observed on video sitting on the left side of the operating compartment and the Locomotive Engineer was behind the controls on the right side of the engine cab approaching the accident scene.

The St. Charles Branch (Pocahontas Division) is predominately single main with a spur track used to set out cars when a train stalls. The method of operation is NS Rule 171 (Non-Signaled Track Mandatory Directive) beginning at MP TB 4.5. Traveling eastbound with descending mileposts, there is a sustained downward profile starting with a series of grades averaging 3 percent and a constant 3.04 percent grade beginning at TB 3.3 to the accident site located at MP TB 1.30. The St. Charles Branch (approximately 25 miles) consists of a series of alignment changes to include curves as sharp as 12 degrees. As viewed from the operating compartment beginning at MP TB 3.0, the train encounters two 8-degree left hand curves, a 6-degree left hand curve, an 8-degree right hand curve, and, at the accident site, a 12-degree right hand curve. The maximum authorized speed for freight trains on the St. Charles Branch is 20 mph for empty trains and 15 mph for loaded trains at the accident site. There is no passenger service operating in this area and both timetable and geographical direction run west to east. Timetable direction will be used throughout this report.

The Accident

After departing MP 7 by NS Rule 171 at the approximate time of 8:30:44 p.m., the train encounters a section of track with a descending grade of 3 percent for four continuous miles with multiple back-to-back curves.

During the interview, the Engineer stated he had to advance the throttle to move the train. The onboard event recorder shows the throttle advancing to N1, then into N2, then the Engineer throttled back down to N1 and put the throttle in idle at 8:31:57 p.m., as the speed of the train reached 6 mph. According to the event recorder, the Engineer engaged the dynamic brakes at 8:32:05 p.m. and full dynamic breaking effort was attained at 8:32:34 p.m. The Engineer went to first service with a 6-pound reduction, verified by the event recorder (brake pipe) at 8:32:58 p.m. at 13 mph. The download shows the air reducing second for second and gaining speed at the same time. The train exceeded the speed limit by 5 mph at 8:33:26 p.m. (20 mph). The train crew failed to put the train into emergency in accordance with NS-1 (Rules for Equipment Operation & Handling and General Instructions) NS-1 A-23 Emergency Brake Application. This rule states, “any train descending a grade of 1-percent or greater over a distance of 3 continuous miles must be immediately brought to a stop by an emergency brake application, if necessary, when the movement exceeds the maximum authorized speed at the location by more than 5 mph. If an emergency brake application is initiated from the automatic brake valve or emergency brake valve in the operator’s cab of a locomotive, the two-way End of Train Device (EOT), if so equipped, will be activated to initiate an emergency brake application from the rear.”

During the interview, the Locomotive Engineer answered “No” when asked if he initiated an emergency from the rear. The Conductor on the train stated in his interview that he “didn’t know the train was speeding because his screen was not visible – he had to push a button for it to turn on.” He said he turned the screen on and the speed of the train was at 22 mph. Federal Railroad Administration (FRA) investigators viewed the inward-facing camera of the crew and their statements were validated.

From 8:32:58 p.m. (first service) the event recorder shows the air being applied in 1-pound increments and the speed increases in the same manner. Full service was applied at 8:34:01 p.m. as the train speed reached 28 mph. The Engineer placed the train into emergency at 8:34:27 p.m. at 33 mph, 18 mph over the maximum authorized speed, confirmed by the event recorder as the PCS is opened and the brake pipe dropped from 36 to 0 pounds. The Engineer then tried to use the independent brake to slow the train down. After applying the independent brake, the speed of the train reached 46 mph at 8:36:30 p.m. Five seconds later, the train begins to slow down. The head end came to a complete stop at 8:37:44 p.m. at approximately MP 1.48. At this time, the Conductor left the locomotive cab to inspect his train and communicated over the radio to the Locomotive Engineer that they had derailed. The Locomotive Engineer informed the Dispatcher of the derailment with no injuries. The Dispatcher then notified the train crew that the proper authorities would be notified.

The 54-car loaded coal train (38 derailed) spilled approximately 700 tons of coal into Pigeon Creek with four cars, and their contents, coming to rest in the water. This created a short blockage of flowing water as it began to back up and the threat of flooding was a possibility. However, the water broke free and the

threat of flooding was eliminated. Local emergency responders and law enforcement arrived at the scene. No hazardous material was released and the community was not evacuated. Water samples concluded there was no negative impact to the creek or surrounding wild life.

Toxicological testing was not performed on the train crew due to the initial damage estimate not meeting the appropriate threshold.

Temperature at the time of the accident was reported at 49° F with rain.

Post-Accident Investigation

On November 18, 2017, FRA, Region 2 assigned a team consisting of Operating Practice (OP), Track, and Motive Power and Equipment (M&PE) inspectors to the accident. FRA worked with NS officials to confirm and analyze the facts to reach a conclusion regarding the cause for the accident.

Analysis and Conclusions

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. FRA obtained fatigue-related information, including a 10-day work history for the employees involved in the accident. Based on analysis of the facts reviewed, FRA concluded fatigue was not probable for the Engineer or Conductor.

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

Analysis – Qualifications: Employee training records indicated both employees were qualified to Federal standards, with their medical and training records being up to date, including passing scores on railroad operating rules and required test exams. The Conductor on the train has worked on this branch line three times in the past year. However, the Locomotive Engineer said in the interview, “I have not worked on the St. Charles Branch in the last 365 days” and could not remember the last time he had done so.

Railroad call office records supported the Engineer’s statement in the interview that he had not worked the St. Charles Branch within 365 days. Records provided by NS regarding Title 49 Code of Federal Regulations (CFR) Part 240 – Qualification and Certification of Locomotive Engineers – Section 240.231(b)(2); show the Engineer’s last day worked on the St. Charles Branch as a pusher engineer was on May 20, 2016, which exceeds one year (17 months), and the Engineer failed to comply with NS General Rule M(B)(2), which requires an engineer to contact the Division or District Road Foreman prior to accepting an assignment called to operate over main track which they have not operated over in six months. No such action was made by the Engineer, nor was a pilot provided by NS.

Conclusion: On November 18, 2017, the previously-qualified Engineer at the controls of NS Locomotive 7690 was operating on expired qualifications without the aid of a pilot.

Analysis – Train Handling: The crew on the train did not follow procedures in place to avoid operating over speed. Per District Instructions General Section 2(C) – as soon as the train begins to move, the engineer must apply full dynamic brake and sufficient air brake applications to control the speed of train not to exceed 15 mph. The onboard event recorder shows the dynamic brake being initiated at 7 mph with a first service brake application at 13 mph. Full dynamic braking did not take place until the speed reached 10 mph and a full-service application was not made until the speed reached 28 mph. At 8:33:26 p.m. the train reached 20 mph as indicated on the onboard event recorder and the crew failed to make an emergency brake application as required in NS-1 A-23 Emergency Brake Application. This rule states – Any train descending a grade of 1 percent or greater over a distance of three continuous miles must be immediately brought to a stop by an emergency brake application, if necessary, when the movement exceeds the maximum authorized speed at the location by more than 5 mph. The emergency brake application was not applied until the speed of the train reached 33 mph at 8:34:27 p.m. After the emergency brake application, the speed of the train reached 46 mph at 8:36:30 p.m., before coming to a complete stop upon derailing at 8:37:34 p.m.

Conclusion: The train crew failed to demonstrate coordination and compliance with NS-1 Rules for Equipment Operation & Handling and General Instructions listed in the timetable. The train crew failed to initiate the emergency brake application when the speed of the train was exceeded by 5 mph as NS required. The Locomotive Engineer is considered not qualified on this segment of track per 49 CFR §§ 240.231, 240.231(b)(2), and NS General Rule M(B)(2).

Analysis – Simulation: FRA conducted a simulation of the train accident to compare and analyze information gathered from the onboard event recorder of NS Locomotive 7690, reenacting the same event and then using different scenarios.

The EOT download shows that the EOT responded to the service and emergency applications initiated by the Engineer. There was no significant blockage in brake pipe preventing the signal from reaching the end of the train.

In addition to train-handling issues, the investigation included a focus on the functioning of the empty/load devices (E/L) the cars were equipped with to determine any possible deviation from normal braking forces using a variable within the simulation program. For the loaded state, the full brake pipe pressure should be available for all brake applications. The first Validation of The Train Energy and Dynamics Simulator (TEDS) simulation trial was conducted with the E/L equipment blocked in the loaded state. Thus, the full brake cylinder pressure is developed, providing the maximum braking effort. The train stopped far short of the event recorder location. Top simulated speed reached 26 mph while the event recorder showed the train reached 46 mph.

The second TEDS simulation trial was conducted with the E/L equipment blocked into the empty state. The brake cylinder pressure in this case builds to a level just high enough to provide the braking ratio with the car unloaded. The train again stopped short of the event recorder location. Top simulated speed

reached 36 mph while the event recorder showed the train reached 46 mph.

Due to the track not significantly changing grade, and the locomotive being in full dynamic braking, FRA identified the possible cause of the difference between the train speed and the TEDS simulation is a lower braking ratio on the cars. In the original TEDS simulation, the braking ratio was 9-percent. The simulation was performed after adjusting the braking ratio to 5.5-percent, and the results matched the event recorder data.
The brake pipe was not blocked since the EOT responded to the Engineer-initiated brake applications. One possible train state which matches the event recorder speed is with the braking ratio at 5.5 percent, and all the E/L devices in the loaded position.

Another simulation was conducted to initiate an emergency brake application when the train speed reached 20 mph (which is 5 mph over the maximum authorized speed) compared to 33 mph when the Locomotive Engineer used the emergency brake application. The simulation of full dynamic braking was to be triggered per Special Instructions at 1 mph (or as soon as the train begins to move) compared to the event recorder speed of 6 mph. Simulation train speed topped out at 33 mph compared to the 46 mph on the event recorder.

Conclusion: Proper loading of cars to activate E/L sensors would have reduced the top speed and possibly prevented derailment.

Analysis – Locomotives: The train consisted of three head-end locomotives and no distributed power was assigned to this train at the time of the derailment.

The lead locomotive (NS 7690) was a six-axle, two-truck design, 4400 horsepower, General Electric model ES44DC. It was built in 2007 and was equipped with a CCB2 air brake system. This locomotive had its last periodic inspection performed on August 5, 2017, at Decatur, Illinois, as recorded on the Form FRA F 6180.49A (blue card). The previous required 33-day mechanical calendar day inspection and the last calendar day inspection was dated November 18, 2017, and listed Andover, Virginia, as the location where the inspection was performed. No defects were noted on the report. However, there was an Open Trouble Report against the locomotive before its arrival in Andover, Virginia.

NS Open Trouble Report, which is used to record defective conditions and show any updates or repairs on a locomotive, had notations made by an NS engineer on November 11, 2017, at Bailey, Virginia, regarding an “Electrical Control Other” trouble with locomotive NS 7690. The engineer indicated that the locomotive would show a different notch in Dynamic braking than the lead motor in the consist but was loaded properly. The locomotive Open Trouble Report was updated on November 18, 2017, in Andover, Virginia, with “Running in lead and working OK.”
The first trailing locomotive (NS 6747) was a six-axle, two-truck design, 3800 horsepower Electro-Motive Diesel model SD60I. It was built in 1995 and was equipped with EPIC2 type air brakes. This locomotive had its last periodic inspection performed on the NS September 7, 2017, at Roanoke, Virginia, as

recorded on the blue card. The previous required 33-day mechanical calendar day inspection was dated November 18, 2017, and listed Andover, Virginia, as the location where the inspection was performed. The last calendar day inspection recorded was dated November 18, 2017, and was performed at Andover, Virginia. No defects were noted on the report.

The second trailing locomotive (UP 5760) was a six-axle, two-truck design, 4390 horsepower General Electric model C44ACCTE. It was built in 2001 and was equipped with EPIC2 type air brakes. This locomotive had its last periodic inspection performed on the Union Pacific Railroad October 6, 2017, at Hinkle, Oregon, as recorded on the blue card. The previous required 33-day mechanical calendar day inspection was dated November 11, 2017, at Buffalo, New York. The last calendar day inspection recorded was dated November 18, 2017, and was performed at St. Charles, Virginia. No defects were noted on the report.

Conclusion: The Locomotive NS 7690 en route defect with the Dynamic Braking Electrical system appears to have been corrected by putting the locomotive from a trailing position to a lead position at Andover, Virginia. The post-accident inspection was conducted by the Andover Mechanical Shop in Andover, Virginia, on November 19, 2017, and Schaffer's Crossing Locomotive Shop in Roanoke, Virginia, on November 28, 2017, finding the Dynamic Braking system operating as intended. FRA concluded the mechanical condition of the locomotives was not a factor in the derailment.

Analysis – Mechanical (Pre-Accident Inspection - Cars): The train originated at St. Charles, Virginia, as a U42U918 on November 18, 2017. The train was originally assembled by NS local crew U42U918 and included 3 locomotives, 54 cars, and an EOT (NS 77916). A Class 1 Brake Test and mechanical inspection was performed by qualified transportation department personnel with no defects reported. The train proceeded to Keokee, Virginia, MP TB 6.5, where the crew took responsibility of the train. The last Class 1 Brake Test and mechanical inspection performed by qualified mechanical department inspectors was November 8, 2017, at Andover, Virginia.

Conclusion: FRA concluded the pre-accident inspection and testing of the cars was not a contributing factor in the derailment investigation.

Analysis – Mechanical (Post-Accident Inspection): The train consisted of 54 cars; of the 38 cars derailed, 1 car was re-railed and 37 of the cars were scrapped. The remaining 16 loaded cars that were not involved in the derailment were inspected without any defects noted. Twelve of the 16 cars were equipped with an E/L valve feature mounted in the slope sheet of the car body. This type of unit is designed for bulk commodity hopper cars and when exposed to the material in the car, directly senses a loaded or empty condition providing wheel slide protection with a high gross to tare weight ratio.

Follow-up inspections at the coal facility where the loading took place and additional loaded train sets indicated that more than 50 percent of the loaded cars departing the location did not have any commodity (coal) covering the E/L devices. This information supported the probability of reduced braking forces on

the derailed train.

After a comprehensive review of the available documentation and records, FRA found no indications of defective equipment in the train prior to the derailment.

Conclusion: Based on inspections revealing a high percentage of cars loaded with no coal covering the E/L device, the FRA investigation determined that there was a presence of reduced braking forces due to ineffective brakes on the loaded train. The exact percentage of ineffective brakes could not be verified based on the general pile up of the derailed cars; however, the ineffective brakes present contributed to the reduced braking forces and are considered a contributing factor to the derailment.

Analysis – Track: The day after the accident, FRA conducted a walking inspection of damages following the derailment. The point of derailment is undetermined due to track damage from the derailment. The derailment destroyed approximately 1,400 feet of track from TB 2.2 to TB 1.9. The inspection revealed that the train derailed while descending a 3-percent grade through a series of right and left hand 6- to 12-degree curves.

Approaching the derailment site from the west, there is a descending grade of 3.04 percent from TB 3.3 to TB 2.1; then the grade reduces to 2.96 percent to 2.52 percent through the derailment site. The alignment of the track approaching the accident site from the west is curved from TB 2.4 to TB 1.9, and eastbound from TB 2.4 there is a 6-degree curve to the right for 500 feet and an 8-degree curve to the left, which compounds into a 12-degree curve for 600 feet. Next, there is a 6-degree right hand curve, which compounds into a 10-degree curve for 400 feet followed by an 8-degree left hand curve for 450 feet followed by a 10-degree right hand curve for 550 feet. The train derailed in the 12-degree curve.

The track is constructed with continuous welded rail (CWR) fastened to wood ties. Tie plates are 18 inches with five spikes and box anchored. NS visually inspects the track twice weekly as required by Federal Track Safety Standards. The last visual inspection occurred on November 16, 2017. A review of the track records determined that NS complied with the required inspection frequency. Also, the inspection records were reflective of the track conditions on the St. Charles Branch in which no defects were noted by the FRA or the NS inspector.

NS conducted a track geometry car test over the St. Charles Branch Subdivision on October 14, 2016. NS's geometry car found no defects in the derailment area during that test.

Conclusion: FRA determined rail or track defects did not cause or contribute to the derailment.

Overall Conclusion

Violations of Federal and railroad operating rules (excessive speed) were discovered during the accident, as well as a loading condition that potentially reduced the effectiveness of the train brakes.

Probable Cause and Contributing Factors

The FRA investigation determined that the probable cause of the derailment was human factor cause code H606 – train outside yard limits in non-block territory, excessive speed.

Contributing factors identified in the FRA investigation of the derailment involve mechanical and other human factor non-compliances that include the following FRA train accident cause codes:

H992 – Operation of locomotive by unqualified person. The Locomotive Engineer is considered not qualified on this segment of track per 49 CFR §§ 240.231, 240.231(b)(2), NS General Rule M(B)(2).

H499 – Other main track authority causes, the train crew did not make an emergency brake application when the speed of the train exceeded timetable speed by 5 mph according to NS 1 Rule A-23.

H599 – Other causes to train handling or make up, the train crew did not follow dynamic braking guidelines in timetable general instructions.

E09C – Other brake defects, cars – The primary brake system on Train U43U918 consisted of loaded cars having ineffective brakes due to inoperative empty/load devices.