Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2014-5

BNSF Railway Company (BNSF)
Pillager, MN
May 11, 2014

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.

U.S. Department of Transportation Federal Railroad Administration	**FRA FACTUAL RAILROAD ACCIDENT REPORT**	FRA File #HQ-2014-5

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
BNSF Railway Company	BNSF	TC-514-104

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
BNSF Railway Company	BNSF	TC-514-104
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	5/11/2014	11:05 PM

5. Type of Accident/Incident
Derailment

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

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Pillager	133.1	MN	CASS

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
52 °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-60, Passenger Trains-80	35	East

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OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	C-DKMSUD-0-44

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross exluding power units)	6a. Remotely Controlled Locomotive? 0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter	Code
43 MPH	R	17262		0

6. Type of Territory

Signalization:

Not Signaled

Method of Operation/Authority for Movement:

Direct Train Control

Supplemental/Adjunct Codes:

P, N/A

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.)*	DEEX 990411	7	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 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	2	0	0	0	1	(1) Total in Equipment Consist	122	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	45	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
2355371	533450

14. Primary Cause Code

T002 - Washout/rain/slide/flood/snow/ice damage to track

15. Contributing Cause Code

T002 - Washout/rain/slide/flood/snow/ice damage to track

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	2	0	Hrs: 6 Mins: 35	Hrs: 6 Mins: 35

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?	26. Was EOT Device Properly Armed?
				No	N/A
Fatal	0	0	0	27. Caboose Occupied by Crew?	
Nonfatal	0	0	0		N/A

28. Latitude	29. Longitude
46.326234000	-94.493889000

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CROSSING INFORMATION

Highway User Involved		Rail Equipment Involved
1. Type		5. Equipment
2. Vehicle Speed *(est. mph at impact)*	3. Direction *(geographical)*	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? N/A		8b. Was there a hazardous materials release by N/A

8c. State here the name and quantity of the hazardous material released, if any.

9. Type of Crossing Warning	10. Signaled Crossing Warning	11. Roadway Conditions
1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other *(spec. in narr.)* 3. Standard FLS 6. Audible 9. Watchman 12. None N/A		N/A

12. Location of Warning	13. Crossing Warning Interconnected with Highway Signals	14. Crossing Illuminated by Street Lights or Special Lights
N/A	N/A	N/A

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 *(primary obstruction)*

Casualties to:	Killed	Injured	21. Driver was	22. Was Driver in the Vehicle?
23. Highway-Rail Crossing Users	0	0	24. Highway Vehicle Property Damage *(est. dollar damage)*	25. Total Number of Vehicle Occupants *(including driver)*

26. Locomotive Auxiliary Lights?	27. Locomotive Auxiliary Lights Operational?
N/A	N/A
28. Locomotive Headlight Illuminated?	29. Locomotive Audible Warning Sounded?
N/A	N/A

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

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SYNOPSIS

On May 11, 2014, at 11:05 p.m., CDT, BNSF Railway (BNSF) Train C-DKMSUD-0-44 derailed 45 loaded coal hopper cars in Pillager, Minnesota. The accident occurred as the train operated eastbound on the Brainerd Subdivision at Milepost 133.1. There were no injuries, no release of hazardous materials, and no evacuation as a result of this accident. The estimated monetary damage was $2,355,371 to equipment and $533,450 to track and signal.

At the time of the accident, it was dark with moderate east winds and heavy rain. The temperature was 52 degrees F.

The probable cause of the accident was a failed sub-grade due to heavy rain.

NARRATIVE

Circumstances Prior to the Accident

The crew of Train C-DKMSUD-0-44 included a locomotive engineer, a conductor, and a student conductor. They reported for duty at 4:30 p.m., on May 11, 2014, at BNSF's Office in Dilworth, Minnesota. Prior to reporting for duty on this day, the Engineer last went off-duty on May 8, 2014, at 7:10 p.m.; the Conductor on May 9, 2014, at 11:02 a.m.; and the Student Conductor on May 9, 2014, at 3:33 p.m. All of the crew members received more than the statutory off-duty period prior to reporting for duty. Dilworth is the home terminal for all three crew members.

The crew's assigned freight train consisted of two head-end locomotives, 122 loaded hopper cars of coal, and one distributed power unit locomotive at the rear of the train. The total length of the train was 6,476 feet with 17,262 trailing tons. The train received a Class 1 terminal train air brake test at the yard in Mandan, North Dakota, at 4:16 a.m., on May 11, 2014.

The railroad timetable direction of the train was east. The geographic direction was northeast. Timetable directions will be used throughout this report.

The crew was taxied from Dilworth to Fargo, North Dakota, where their train was tied down. The Conductor and Student Conductor released the hand brakes and the Engineer performed a set-and-release brake test. The train then departed Fargo on signal indication at approximately 6 p.m. The train operated on signal indication until the end of the Centralized Train Control (CTC) territory at Staples, Minnesota, Milepost (MP) 147.8. At 10:25 p.m., the Conductor received track authority 538-48 giving Train C-DKMSUD-0-44 authority to operate east from the end of CTC at Staples to the east siding switch at Kimberly, Minnesota, MP 78.3 on the Brainerd Subdivision.

On the approach to the derailment area, the track is tangent for approximately 1.9 miles. The grade in the mile preceding the derailment area gradually changes from .25 to .05 percent descending.

As eastbound Train C-DKMSUD-0-44 approached the accident area, the Locomotive Engineer was seated at the controls on the south side of the lead locomotive, the Conductor was standing to the left of the Engineer and the Student Conductor was seated on the north side of the cab in the conductor's seat.

The Accident

Train C-DKMSUD-0-44 was being operated at a recorded speed of 43 mph when the derailment occurred. The maximum authorized speed for freight trains is 49 mph, as designated in BNSF's Twin Cities Timetable Number 5. The train was restricted to a maximum of 45 mph by Special Instruction 1(A).

Train C-DKMSUD-0-44 was operating eastbound on the Brainerd Subdivision approaching the derailment site when the Engineer and Conductor felt a gentle run-out. Moments later, an unintentional emergency application of the air brakes occurred and the train came to a stop. The Conductor immediately announced "emergency" on the radio. He and the Student Conductor then walked toward the rear of the train to determine the cause of the emergency application. The Conductor reported to the Engineer over the radio that the fifth car of the train and many after it were derailed. The Conductor and Student Conductor returned to the locomotive and the Engineer reported the information to the train dispatcher.

A total of 45 cars derailed, positions 5-49, all of which were loaded hoppers of coal. The first three cars derailed upright while the following 42 cars were piled-up on their sides.

First responders were dispatched from the Cass County Sherriff's Office. There was no release of hazardous materials and no evacuations ordered.

ANALYSIS AND CONCLUSIONS

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 was tested under this authority at a local hospital. The test results for the three crew members were negative.

Conclusion: 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 the collected work/rest data from each of the crew members.

FRA uses an overall effectiveness rate 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 an 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 three employees involved in this accident.

Conclusion: Upon analysis of that information, FRA concluded that fatigue was not probable for any of the employees.

Analysis – Locomotive Engineer Operating Performance: FRA analyzed the event recorder data provided by BNSF for Lead Locomotive BNSF 6087.

Conclusion: The Locomotive Engineer was in compliance with all applicable railroad operating and train handling requirements.

Analysis – Mechanical: A Class 1 air brake test was performed at 4:16 a.m., on May 11, 2014, by the mechanical department at Mandan. After receiving the air test, no additional cars were picked up or set out prior to the accident.

FRA reviewed the relevant records for the equipment involved in the incident and took no exceptions.

The locomotives involved in the incident were not equipped with cameras.

Conclusion: The condition of the mechanical equipment was not a causal factor in this derailment.

Analysis – Track Structure: A walking inspection was conducted by FRA of the derailment area. No FRA Part 213 deficiencies were noted outside the area of track damaged by the derailment.

The last track inspection prior to the accident was performed by a qualified BNSF track inspector on May 11, 2014, and no defects were noted within the area of the derailment. The last detailed switch inspection of West Siding Switch (WSS) at Pillager was May 7, 2014, with no defects noted. During the May 7, 2014, inspection, the inspector did note a small washout at MP 115.4 that he repaired by shoveling ballast back into place. He also placed a 25 mph slow order at the location.

A BNSF geometry test car operated over the Brainerd Subdivision on April 1, 2014. There were no defects noted at the derailment site. One FRA Part 213 defect was noted west of the derailment site at MP 133.23. This defect was a measurement of 1 11/16 inches of runoff in 31 feet. The defect was repaired within a day or two after the test.

BNSF utilizes a technology called Vehicle Track Interaction (VTI), which is an accelerometer attached to random locomotives throughout the system. The device sends automated alerts to the appropriate supervisor when an exception is detected. There were no VTI alerts received in the area of the derailment in the months preceding the accident.

The terrain in the derailment site is very flat, poorly drained, and swampy. The ditches to both sides of the track structure were completely filled with water at the time of the derailment. The area had a history of drainage issues and the railroad has had a difficult time maintaining track surface in the area. In the 2 weeks preceding the derailment, the area had heavy rainfall and there was standing water in many locations on the Brainerd Subdivision. A few locations on the subdivision had speed restrictions due to the standing water, but not at the derailment site. At the time of the derailment, the train crew had traveled in heavy rain for approximately 2 hours prior to the derailment and it

standing water, but not at the derailment site. At the time of the derailment, the train crew had traveled in heavy rain for approximately 2 hours prior to the derailment and it was raining heavily at the derailment site during that time.

The track leading up to and at the derailment site was constructed of wood cross ties and 141-pound continuous welded rail with the exception of the WSS at Pillager which was 115-pound rail. The WSS at Pillager was a Number 11, left-hand, hand-throw switch with Sampson undercut switch points and floating heel blocks. The point of derailment was east of this switch on tangent track, however; the switch was completely destroyed in the derailment.

Examination of the broken rail ends at the POD revealed that they were stress breaks resulting from the derailment with no visible internal defects.
Conclusion: Post-accident investigation concluded that the persistent heavy rains combined with the relatively flat, poorly draining terrain caused the sub-roadbed to saturate and weaken. This allowed the track structure to flex downward under load and break the rail.

Analysis – Signal: The area of the derailment is non-signaled “dark territory.” The method of operation is the General Code of Operating Rules. The train was operating under track authority number 538-48 which had an “OK” time of 10:25 p.m., on May 11, 2014.

Conclusions: Signal equipment was not a causal factor in this derailment.

Probable Cause and Contributing Factors

The probable cause of the accident was a failed sub-grade due to heavy rain.