Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2007-20

Burlington Northern Santa Fe (BNSF)
Henry, Nebraska
April 14, 2007

Note that 49 U.S.C. §20903 provides that no part of an accident or incident report 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.

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2007-20

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: PR0407105
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident No.: N/A
3.Name of Railroad Operating Train #3: N/A	3a. Alphabetic Code: N/A	3b. Railroad Accident/Incident No.: N/A
4.Name of Railroad Responsible for Track Maintenance: BNSF Rwy Co. [BNSF]	4a. Alphabetic Code: BNSF	4b. Railroad Accident/Incident No.: PR0407105
5. U.S. DOT_AAR Grade Crossing Identification Number:	6. Date of Accident/Incident: Month 04 Day 14 Year 2007	7. Time of Accident/Incident: 04:20: ☐ AM ☑ PM

8. Type of Accident/Indicent (single entry in code box): 1. Derailment; 2. Head on collision; 3. Rear end collision; 4. Side collision; 5. Raking collision; 6. Broken Train collision; 7. Hwy-rail crossing; 8. RR grade crossing; 9. Obstruction; 10. Explosion-detonation; 11. Fire/violent rupture; 12. Other impacts; 13. Other (describe in narrative) — Code: 01

9. Cars Carrying HAZMAT	10. HAZMAT Cars Damaged/Derailed	11. Cars Releasing HAZMAT	12. People Evacuated	13. Division
0	N/A	N/A	0	Powder River

14. Nearest City/Town	15. Milepost (to nearest tenth)	16. State Abbr	16. State Code	17. County
Henry	52.7	N/A	NE	SCOTTS BLUFF

18. Temperature (F) (specify if minus)	19. Visibility (single entry) 1. Dawn 2. Day 3.Dusk 4.Dark — Code	20. Weather (single entry) 1. Clear 2. Cloudy 3. Rain 4. Fog 5.Sleet 6.Snow — Code	21. Type of Track 1. Main 2. Yard 3. Siding 4. Industry — Code
66 F	2	1	1

22. Track Name/Number	23. FRA Track Class (1-9, X) — Code	24. Annual Track Density (gross tons in millions)	25. Time Table Direction 1. North 2. South 3. East 4. — Code
Single Main Track	4	136	3

OPERATING TRAIN #1

26. Type of Equipment Consist (single entry) 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car	A. Spec. MoW Equip. — Code	27. Was Equipment Attended? 1. Yes 2. No — Code	28. Train Number/Symbol
	1	1	CNAMAMH007

29. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	31. Method(s) of Operation (enter code(s) that apply)	31a. Remotely Controlled Locomotive?
47 MPH	R	a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other (Specify in narrative)	0 = Not a remotely controlled; 1 = Remote control portable; 2 = Remote control tower; 3 = Remote control transmitter - more than one remote control transmitter

30. Trailing Tons (gross tonnage, excluding power units): 16128

Code(s): e | N/A | N/A | N/A | N/A

31a. Remotely Controlled Locomotive?: 0

32. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	GRTX13189	96	yes
(2) Causing (if mechanical cause reported)	0	0	N/A

33. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
0	0

34. Was this consist transporting passengers? (Y/N): N

35. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	2	0	0	0	2
(2) Total Derailed	0	0	0	0	0

36. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	128	0	0	0	0
(2) Total Derailed	27	0	0	0	0

37. Equipment Damage This Consist	38. Track, Signal, Way, & Structure Damage	39. Primary Cause Code	40. Contributing Cause Code
1282474	187951	M507	T001

Number of Crew Members

41. Engineer/ Operators	42. Firemen	43. Conductors	44. Brakemen
1	0	1	0

Length of Time on Duty

45. Engineer/Operator	46. Conductor
Hrs 4 Mi 50	Hrs 4 Mi 50

Casualties to:	47. Railroad Employees	48. Train Passengers	49. Other
Fatal	0	0	0
Nonfatal	0	0	0

50. EOT Device? 1. Yes 2. No: 1

51. Was EOT Device Properly Armed? 1. Yes 2. No: 1

52. Caboose Occupied by Crew? 1. Yes 2. No: 2

OPERATING TRAIN #2

53. Type of Equipment Consist (single entry) 1. Freight train 2. Passenger train 3. Commuter train 4. Work train 5. Single car 6. Cut of cars 7. Yard/switching 8. Light loco(s). 9. Maint./inspect.car	A. Spec. MoW Equip. — Code	54. Was Equipment Attended? 1. Yes 2. No — Code	55. Train Number/Symbol
	N/A	N/A	N/A

56. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	58. Method(s) of Operation (enter code(s) that apply)	58a. Remotely Controlled Locomotive?
0 MPH	N/A	a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track	0 = Not a remotely controlled; 1 = Remote control portable

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57. Trailing Tons (gross tonnage, excluding power units): 0

c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; o. Positive train control; p. Other (Specify in narrative) Code(s): N/A | N/A | N/A | N/A | N/A

2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter: N/A

59. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	0	0	N/A
(2) Causing (if mechanical cause reported)	0	0	N/A

60. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
N/A	N/A

61. Was this consist transporting passengers? (Y/N): N/A

62. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

63. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

64. Equipment Damage This Consist: 0

65. Track, Signal, Way, & Structure Damage: 0

66. Primary Cause Code: N/A

67. Contributing Cause Code: N/A

Number of Crew Members

68. Engineer/ Operators	69. Firemen	70. Conductors	71. Brakemen
0	0	0	0

Length of Time on Duty

72. Engineer/Operator: Hrs 0 Mi 0

73. Conductor: Hrs 0 Mi 0

Casualties to:	74. Railroad Employees	75. Train Passengers	76. Other
Fatal	0	0	0
Nonfatal	0	0	0

77. EOT Device? 1. Yes 2. No: N/A

78. Was EOT Device Properly Armed? 1. Yes 2. No: N/A

79. Caboose Occupied by Crew? 1. Yes 2. No: N/A

OPERATING TRAIN #3

80. Type of Equipment Consist (single entry): 1. Freight train; 2. Passenger train; 3. Commuter train; 4. Work train; 5. Single car; 6. Cut of cars; 7. Yard/switching; 8. Light loco(s); 9. Maint./inspect.car; A. Spec. MoW Equip. Code: N/A

81. Was Equipment Attended? 1. Yes 2. No Code: N/A

82. Train Number/Symbol: N/A

83. Speed (recorded speed, if available) Code
R - Recorded
E - Estimated N/A MPH: 0

84. Trailing Tons (gross tonnage, excluding power units): 0

85. Method(s) of Operation (enter code(s) that apply)
a. ATCS; b. Auto train control; c. Auto train stop; d. Cab; e. Traffic; f. Interlocking; g. Automatic block; h. Current of traffic; i. Time table/train orders; j.Track warrant control; k. Direct traffic control; l.Yard limits; m.Special instructions; n. Other than main track; o. Positive train control; p. Other (Specify in narrative) Code(s): N/A | N/A | N/A | N/A | N/A

85a. Remotely Controlled Locomotive?
0 = Not a remotely controlled
1 = Remote control portable
2 = Remote control tower
3 = Remote control transmitter - more than one remote control transmitter: N/A

86. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded (yes/no)
(1) First involved (derailed, struck, etc)	0	0	N/A
(2) Causing (if mechanical cause reported)	0	0	N/A

87. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box.

Alcohol	Drugs
N/A	N/A

88. Was this consist transporting passengers? (Y/N): N/A

89. Locomotive Units	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End c. Remote
(1) Total in Train	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

90. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	0	0	0	0
(2) Total Derailed	0	0	0	0	0

91. Equipment Damage This Consist: 0

92. Track, Signal, Way, & Structure Damage: 0

93. Primary Cause Code: N/A

94. Contributing Cause Code: N/A

Number of Crew Members

95. Engineer/ Operators	96. Firemen	97. Conductors	98. Brakemen
0	0	0	0

Length of Time on Duty

99. Engineer/Operator: Hrs 0 Mi 0

100. Conductor: Hrs 0 Mi 0

Casualties to:	101. Railroad Employees	102. Train	103. Other
Fatal	0	0	0
Nonfatal	0	0	0

104. EOT 1. Yes 2. No: N/A

105. Was EOT Device Properly 1. Yes 2. No: N/A

106. Caboose Occupied by Crew? 1. Yes 2. No: N/A

Highway User Involved

107. A. Auto; B. Truck; C. Truck-Trailer.; D. Pick-Up Truck; E. Van; F. Bus; G. School Bus; H. Motorcycle; J. Other Motor Vehicle; K. Pedestrian; M. Other (spec. in narrative) Code: N/A

108. Vehicle Speed (est. MPH at impact): N/A

109. geographical) 1.North 2.South 3.East 4.West Code: N/A

Rail Equipment Involved

111. Equipment 1.Train(units pulling); 2.Train(units pushing); 3.Train (standing); 4.Car(s) (moving); 5.Car(s) (standing); 6.Light Loco(s) (moving); 7.Light(s) (standing); 8.Other (specify in narrative) Code: N/A

112. Position of Car Unit in: N/A

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110. Position	Code	113. Circumstance	Code
1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	N/A	1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	N/A
114a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither	N/A	114b. Was there a hazardous materials release 1. Highway User 2. Rail Equipment 3. Both 4. Neither	N/A

114c. State here the name and quantity of the hazardous materials released, if any.
N/A

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

116. Signaled Crossing (See instructions for codes)	Code	117. Whistle 1. Yes 2. No 3. Unknown	Code
	N/A		N/A

118. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach	Code	119. Crossing Warning with Highway Signals 1. Yes 2. No 3. Unknown	Code	120. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown	Code
	N/A		N/A		N/A

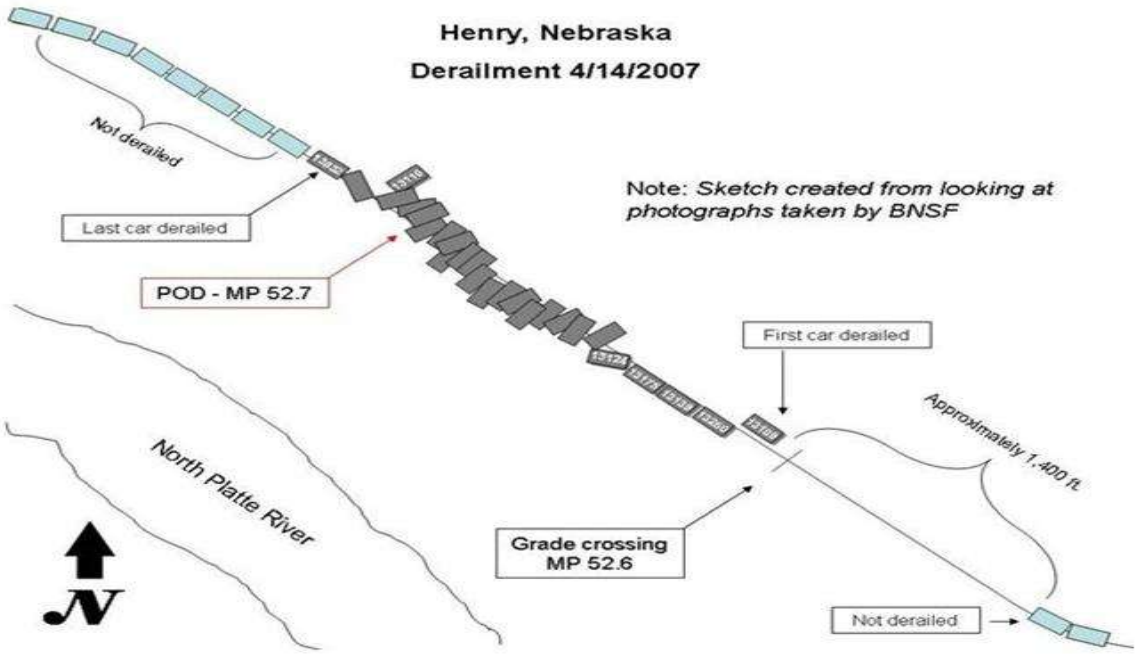
121. Age	122. Driver's Gender 1. Male 2. Female	Code	123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown	Code	124. Driver 1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other (specify in narrative)	Code
0		N/A		N/A		N/A

125. Driver Passed Highway Vehicle 1. Yes 2. No 3. Unknown	Code	126. View of Track Obscured by (primary obstruction) 1. Permanent Structure 2. Standing Railroad Equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicle 7. Other (specify in narrative) 8. Not obstructed	Code
	N/A		N/A

Casualties to:	Killed	Injured	127. Driver 1. Killed 2.Injured 3. Uninjured	Code	128. Was Driver in the Vehicle? 1. Yes 2. No	Code
				N/A		N/A
129. Highway-Rail Crossing Users	0	0	130. Highway Vehicle Property Damage (est. dollar damage)	0	131. Total Number of Highway-Rail Crossing Users (include driver)	0

132. Locomotive Auxiliary Lights? 1. Yes 2. No	Code	133. Locomotive Auxiliary Lights Operational? 1. Yes 2. No	Code
	N/A		N/A
134. Locomotive Headlight Illuminated? 1. Yes 2. No	Code	135. Locomotive Audible Warning Sounded? 1. Yes 2. No	Code
	N/A		N/A

136. DRAW A SKETCH OF ACCIDENT AREA INCLUDING ALL TRACKS, SIGNALS, SWITCHES, STRUCTURES, OBJECTS, ETC., INVOLVED.



137. SYNOPSIS OF THE ACCIDENT

An eastbound BNSF Railway Company (BNSF) loaded coal train derailed 27 cars on April 14, 2007, at 4:20 p.m. (m.d.t.). The accident occurred one mile east of Henry, Nebraska, at milepost (MP) 52.7, on the BNSF Powder River Division, Valley Subdivision.

There were no injuries or hazardous material spills as a result of the derailment. Total damages reported for the derailment totaled $1,470,425.

At the time of the accident, it was light and clear with a temperature of 66 degrees Fahrenheit.

The probable cause of the derailment is being ruled as M507 – "Investigation complete, cause could not be determined." A contributing factor is T001, "Roadbed settled or soft".

138. NARRATIVE

Circumstances Prior to the Accident

The train crew of Train Symbol C-NAMAMH0-07 consisted of an engineer and conductor. They first went on duty at 11:30 a.m., m.d.t., on April 14, 2007, at Guernsey, Wyoming. This was their away terminal, and both had received more than the statutory off-duty period prior to reporting for duty.

Their assigned train consisted of two locomotives on the head-end, 128 loaded coal cars, and two remote distributed power units (DPU's) on the rear-end. The train was 7,090 feet long and with 16,128 trailing tons. This crew was scheduled to take the train to Sterling, Colorado.

The train had received a Class I air brake test 1 day prior to the derailment. This test was performed by BNSF mechanical personnel in Guernsey, on April 13, when this cycle train was an empty heading into Wyoming to be loaded.

There was no work performed en route after departing, and the trip was uneventful for the 39 miles leading up to the derailment.

As the eastbound train approached the accident area, the locomotive engineer was seated at the controls on the south side of the lead locomotive. The conductor was seated on the north side of the same locomotive.

In this area of the railroad there are, in succession, a 1-degree curve to the right of about 3,400 feet, followed by a tangent of approximately 600 feet to the point of derailment (POD), and 1,600 feet beyond there is a 0-degree 59-minute curve to the left. There is a 0.31-percent descending grade through the derailment area. The track at and leading up to the POD is constructed of 132-pound continuous-welded rail (CWR) on wood crossties. It was box anchored on every other tie with unit channel anchors.

The railroad timetable direction of the train was east. The geographic direction was southeast. Timetable directions are used throughout this report.

The Accident

The train was being operated at 47 mph approaching the derailment area. According to the train crew, they did not observe or feel anything unusual prior to the derailment. The speed at the time of the derailment was also 47 mph. Both speeds (approaching and at the time of derailment) were recorded by the event recorder of the controlling locomotive. Maximum authorized speed for this train is 50 mph, as designated in current BNSF Powder River Division Timetable.

Approximately 600 feet after traversing 1-degree right-hand curve, the train experienced an undesired emergency application of the air brake system. Immediately following the emergency application, the train crew contacted the BNSF dispatcher and told them they were in emergency. The conductor of the train then walked back to check his train and found the 94th through 120th head cars had derailed.

Analysis and Conclusions

Analysis

The two crew members of Train Symbol CNAMAMH0-07 were Federal Railroad Administration (FRA) mandatory post-accident toxicologically tested because this accident exceeded the $1 million major accident threshold. The test results obtained from the FRA Alcohol and Drug Control Program Manager were negative.

The event recorder for the controlling locomotive revealed nothing inconsistent with normal train handling at or prior to the time of the derailment.

The last ultrasonic rail detection test through this area was on March 26, 2007, and the last geometry car survey with the railroad's Car No. 80 was on November 15, 2006, with no defects noted by either in the immediate area. The track was inspected by hi-rail vehicle on the same day as the derailment, with no exceptions taken in the area. A review by the FRA of the BNSF track inspection records revealed that this track was inspected well within the required frequency the prior month before the accident, with no exceptions noted in this area.

The track inspector stated he inspected through the derailment area approximately 5 hours prior to the accident and didn't take any exception or notice anything unusual with the track's surface. He also said he can't recall having any surface problems in the 10 plus years he has inspected this territory.

The area of single track where this derailment occurred is in part of an 11-mile stretch that is under construction to install a second main track to the south. The second main will tie into existing sidings at MP 45.4 and MP 56.6. Grading and sub-grade work began on March 1, 2007, near the eastern limits of this project, working west.

Initial grading to clear vegetation and level the area south of the track at the POD was done the previous day, April 13, 2007, by a contracting company. According to the BNSF manager in charge of overseeing this construction and the contractor performing the work, approximately 6-12" of soil were disturbed no closer than 8 feet from the nearest rail through the derailment area. Additionally, other areas further beyond the ballast line were cut in this grading process from 2 to 2 ½ feet. The conditions described by the BNSF and contractor through the accident area were consistent with other grading of this type viewed outside the derailment area. FRA investigators found no visible water or mud in the areas that had received similar type grading outside the derailment area.

According to a weather information service, there was no precipitation the previous 8 days and only 0.97 inches the 44 days prior to the accident. The temperature change on the day of the accident was almost 50 degrees in less than a 12-hour period. At 5:53 a.m., the temperature was 19°F, and at around 4 p.m., it peaked at 68 °F.

To the north of the accident area, there are several fresh water springs located in the sand hills. Presumably these springs would flow underground to the North Platte river on the south side of the accident area.

The BNSF hired a private geotechnical consulting company to evaluate the subgrade through the derailment area. All conclusions and recommendations by this company were based on their site visit after the track repairs were completed and interviews. There were no laboratory testings performed on any of the subgrade material.

The last hotbox/dragging equipment detector at MP 65.9 had no exceptions taken.

No suspicious mechanical equipment or rail was found during clean-up activities, although not all rail or mechanical components was recovered.

Conclusion

The railroad was in compliance with their own and all applicable FRA standards. There were no witnesses to the accident. The train crew on the derailing train both stated they did not see or feel anything unusual when traversing over the POD. Interviews with the contractor and BNSF maintenance people were consistent in there were no visible surface conditions in the area prior to the accident.

The data reviewed from the event recorder ruled out train handling as a cause. There were no marks found on the rail or ties prior to the POD to indicate dragging equipment. No marks were found on the flange or tread of the wheels of the two locomotives and 93 cars that made it over this area to suggest they encountered anything prior to the derailment. There were also no track components, i.e. bridges, turnouts, grade crossings at the POD that could have contributed to the cause. There was no significant grade and no curvature in the area that would have contributed to the cause.

The environmental consulting company that evaluated the subgrade through the derailment area concluded it is possible the derailment was caused by subgrade failure. But, their experience with situations such as this typically evolve over time before becoming so extreme to cause a derailment. In other words, profile or crosslevel conditions would generally appear to the extent that a train crew or track inspector would notice them before it would catastrophically fail under a train. The environmental consulting company's report states, " If the contractor removed enough material from the south side of the embankment to cut out support of the embankment below the soft clay layer, it is possible that the embankment failed under the train. If only the vegetation and 6 inches of topsoil were removed, then in our opinion it is unlikely that the embankment would have gone from no surface problems to failure under the passing of one train."

The environmental consulting company concluded, "In our opinion, it is possible that the derailment was caused by subgrade failure due to construction activities on the south side of the track. It is not possible to tell what the excavation looked like prior to the derailment, and where the clay layer was in relationship to the excavation; therefore, we cannot say

with certainty that the cause was subgrade failure."

According to interviews of the contractor who performed the work, the day before the accident, they made one pass parallel with the track at least 8 feet away with a grader to clear the vegetation. The contractor estimated they removed about six to twelve inches of material with this pass. The BNSF maintenance official who observed this grading work said it was consistent with BNSF standards. BNSF maintenance personnel stated this area had no surface or subgrade problems in the past to their knowledge.

After reviewing the consultants report of the subgrade and FRA interviews and observations, there is not sufficient evidence to determine that soft or settled roadbed may have caused this derailment.

Due to the catastrophic nature of this derailment, it is virtually impossible to recover all track or mechanical components, making the possibility it was caused by a broken rail or some kind of mechanical failure plausible.

Probable Cause and Contributing Factors

A contributing cause could be identified as T001 "Roadbed settled or soft".

The evidence found does not substantiate the BNSF's probable cause of T001 - "Roadbed settled or soft", for this derailment. The FRA's probable cause is M507 – "Investigation complete, cause could not be determined."