Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2009-01

Burlington Northern Santa Fe (BNSF)
Manzanola, CO
January 1, 2009

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-2009-1

1.Name of Railroad Operating Train #1: BNSF Rwy Co. [BNSF]	1a. Alphabetic Code: BNSF	1b. Railroad Accident/Incident No.: CO0109100
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.: CO0109100
5. U.S. DOT_AAR Grade Crossing Identification Number:	6. Date of Accident/Incident: Month 01 Day 01 Year 2009	7. Time of Accident/Incident: 07:33: ☑ 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	Colorado

14. Nearest City/Town	15. Milepost *(to nearest tenth)*	16. State Abbr	16. State Code	17. County
Manzanola	574	N/A	CO	OTERO

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
31 F	1	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. West — Code
Single Main Track	4	75.42	2

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	CWTMAMH010

29. Speed *(recorded speed, if available)* R - Recorded; E - Estimated: 47 MPH — Code: R

30. Trailing Tons *(gross tonnage, excluding power units)*: 17153

31. 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): g | j | N/A | N/A | N/A

31a. 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: 0

32. Principal Car/Unit	a. Initial and Number	b. Position in Train	c. Loaded *(yes/no)*
(1) First involved *(derailed, struck, etc)*	GRTX13173	22	yes
(2) Causing *(if mechanical cause reported)*	GRTX13173	22	yes

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	120	0	0	0	0
(2) Total Derailed	41	0	0	0	0

37. Equipment Damage — This Consist: $2,651,181.00

38. Track, Signal, Way, & Structure Damage: $370,834.00

39. Primary Cause Code: E53C

40. Contributing Cause Code: N/A

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: Hrs 8 Mi 48

46. Conductor: Hrs 8 Mi 48

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 — N/A

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: N/A MPH — Code: N/A

58. Method(s) of Operation *(enter code(s) that apply)*: a. ATCS; b. Auto train control; g. Automatic block; h. Current of traffic; m.Special instructions; n. Other than main track

58a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

57. Trailing Tons *(gross tonnage, excluding power units)* N/A

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)*	N/A	N/A	N/A
(2) Causing *(if mechanical cause reported)*	N/A	N/A	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	63. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	N/A	N/A	N/A	N/A	N/A	(1) Total in Equipment Consist	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A	(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

64. Equipment Damage This Consist N/A

65. Track, Signal, Way, & Structure Damage N/A

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
N/A	N/A	N/A	N/A

Length of Time on Duty

72. Engineer/Operator Hrs N/A Mi N/A

73. Conductor Hrs N/A Mi N/A

Casualties to:	74. Railroad Employees	75. Train Passengers	76. Other
Fatal	N/A	N/A	N/A
Nonfatal	N/A	N/A	N/A

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 N/A

84. Trailing Tons *(gross tonnage, excluding power units)* N/A

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)*	N/A	N/A	N/A
(2) Causing *(if mechanical cause reported)*	N/A	N/A	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	90. Cars	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	N/A	N/A	N/A	N/A	N/A	(1) Total in Equipment Consist	N/A	N/A	N/A	N/A	N/A
(2) Total Derailed	N/A	N/A	N/A	N/A	N/A	(2) Total Derailed	N/A	N/A	N/A	N/A	N/A

91. Equipment Damage This Consist N/A

92. Track, Signal, Way, & Structure Damage N/A

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
N/A	N/A	N/A	N/A

Length of Time on Duty

99. Engineer/Operator Hrs N/A Mi N/A

100. Conductor Hrs N/A Mi N/A

Casualties to:	101. Railroad Employees	102. Train	103. Other
Fatal	N/A	N/A	N/A
Nonfatal	N/A	N/A	N/A

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. Code N/A
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)*

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

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

Rail Equipment Involved

111. Equipment Code N/A
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)*

112. Position of Car Unit in N/A

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File # HQ-2009-1

110. Position 1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped	Code N/A	113. Circumstance 1. Rail Equipment Struck Highway User 2. Rail Equipment Struck by Highway User	Code 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	Code N/A	114b. Was there a hazardous materials release 1. Highway User 2. Rail Equipment 3. Both 4. Neither	Code 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	116. Signaled Crossing *(See instructions for codes)*	Code	117. Whistle Ban 1. Yes 2. No 3. Unknown	Code
Code(s) N/A N/A N/A N/A N/A N/A N/A	N/A	N/A	N/A	N/A

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

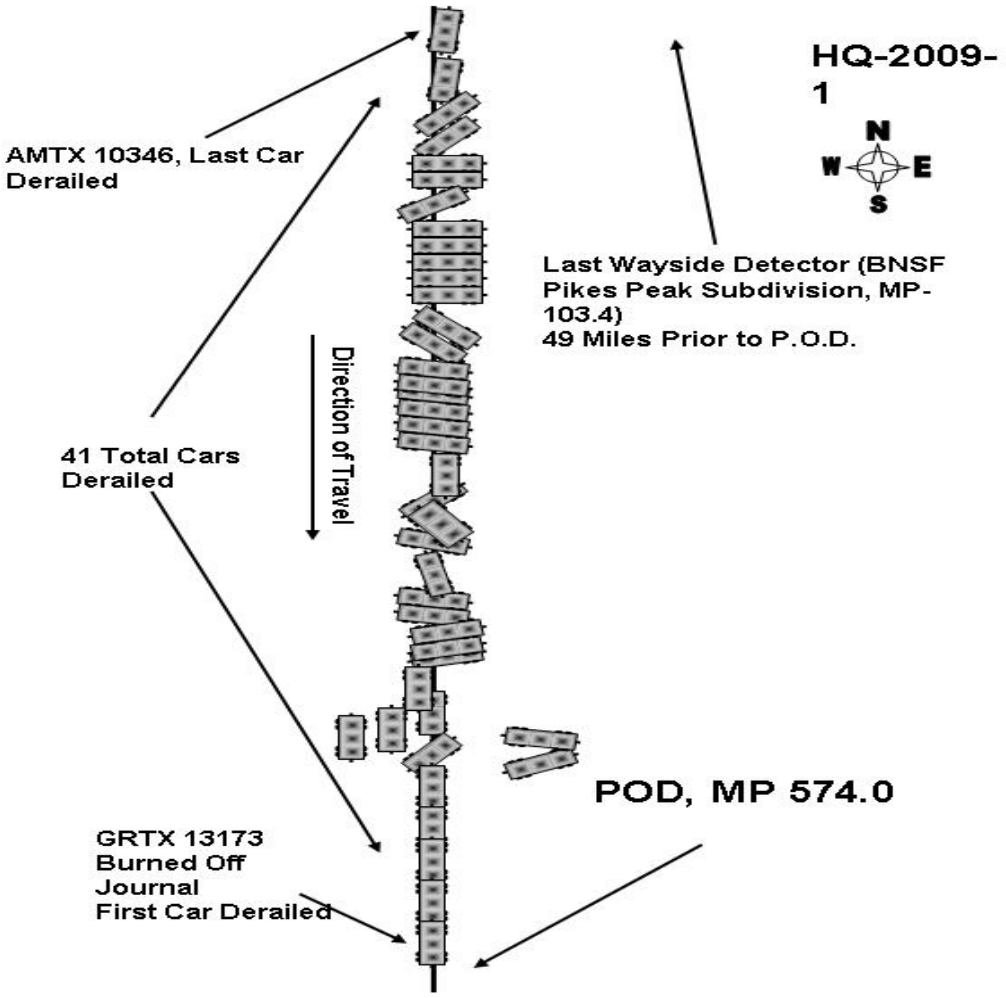
121. Age N/A	122. Driver's Gender 1. Male 2. Female	Code N/A	123. Driver Drove Behind or in Front of and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown	Code N/A	124. Driver 1. Drove around or thru the Gate 2. Stopped and then Proceeded 3. Did not Stop 4. Stopped on Crossing 5. Other *(specify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

125. Driver Passed Highway Vehicle 1. Yes 2. No 3. Unknown	Code N/A	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

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

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

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



137. SYNOPSIS OF THE ACCIDENT

A southbound Burlington Northern Santa Fe Railway Company (BNSF) loaded unit coal train derailed on January 1, 2009, at 7:33 a.m., MST. The accident occurred in the town of Manzanola, Colorado, at milepost (MP) 574.0 on the BNSF Colorado Division, Pueblo Subdivision.

Forty-one cars derailed with no injuries or hazardous material spills reported as a result of the derailment. Reported damages totaled $3,022,015.

At the time of the accident it was dawn and clear with a temperature of 31 degrees F.

The FRA's investigation determined the probable cause of the accident was Cause Code E53C - Journal (roller bearing) failure from overheating.

138. NARRATIVE

CIRCUMSTANCES PRIOR TO THE ACCIDENT

The crew of BNSF Freight Train C-WTMAMH0-10 included a locomotive engineer and a conductor. They first went on duty at 10:45 p.m., December 31, 2008, at Denver, Colorado. This is the away-from-home terminal for the engineer and the home terminal for the conductor. Both employees received more than the required statutory off-duty rest period prior to reporting for duty.

The assigned coal train consisted of four locomotives, two locomotives on the front of the train and two distributed power unit (DPU) locomotives on the rear of the train, with 120 loaded coal hopper cars. The train was 6,666 feet long and weighed 17,153 tons. The train was destined for Amarillo, Texas. A Class I air brake test was performed on the train by the BNSF Railroad staff at the West Thunder Mine in Wyoming, on December 30, 2008. There were no changes made to the train consist after receiving the Class I air brake test in Wyoming.

As the southbound train approached the accident area, the locomotive engineer was seated at the controls on the west side of the leading locomotive. The conductor was seated on the east side of the leading locomotive. Interviews performed by FRA revealed that the trip was primarily uneventful prior to the derailment.

In the area, leading up to the point of derailment (POD), the track is tangent. There is a 0.37-percent descending grade. The railroad timetable direction for the train is south. The geographic direction is southeast. Timetable directions are used throughout this report.

THE ACCIDENT

The BNSF Unit Coal Train C-WTMAMHO-10 was being operated at a recorded speed of 45 mph approaching the accident area. At the time of the accident, the recorded speed of the train was 47 mph. Both speeds were recorded by the event recorder of the controlling locomotive. The maximum authorized speed for the

train is 45 mph, as designated in the current Colorado Division BNSF Timetable No.5.

As the train was traveling southward through Manzanola at MP 574, the engineer stated that he was using dynamic brakes (locomotive braking) and sounding the horn for the highway-rail grade crossings. He then noted that there were two "pings" and then the console screen indicated that there was an undesired train-initiated emergency air brake application from the rear of the train. The train came to a stop with the front of the train at MP 573.6. The conductor stated that when the train went into emergency he notified the dispatcher. When the engineer was unable to recover the air for the brake system, the conductor walked down the side of the train to investigate. The conductor discovered that the train had derailed and notified the engineer. The engineer relayed the information to the dispatcher. The accident resulted in the derailment of 41 cars, starting from the 20th car behind the head-end locomotives and continuing through the 61st car.

BNSF management arrived on the scene shortly after the derailment occurred. Both the engineer and conductor were transported to La Junta, Colorado, for Federal drug and alcohol testing. After the test, the crew was then transported to Trinidad, Colorado, where they went off duty.

BNSF personnel from various departments and Hulcher Emergency Services responded to the scene. BNSF conducted inspections of the track and equipment following the accident.

ANALYSIS AND CONCLUSIONS

ANALYSIS - TOXICOLOGICAL TESTING:

FRA post-accident toxicology testing of the crew was conducted by BNSF officials.

CONCLUSION: Toxicology tests results were negative for both crewmembers.

ANALYSIS - OPERATING PERFORMANCE OF THE LOCOMOTIVE ENGINEER AND CONDUCTOR:

The locomotive was equipped with a speed indicator and an event recorder. The relevant event recorded data was obtained by the trainmaster at the accident site, and analyzed at the BNSF facility at La Junta.

CONCLUSION: The locomotive engineer and conductor were in compliance with all applicable railroad operating rules and train handling requirements.

ANALYSIS - FATIGUE:

FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis, which is equivalent to blood alcohol content (BAC) of 0.05. At or above this baseline, we do not consider fatigue is 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 10-day work history, for the two employees involved in the accident.

CONCLUSION:

FRA concluded that fatigue was probable for both the engineer and conductor assigned to BNSF Freight Train C-WTMAMHO-10. It is not however, considered to be a contributing factor in the cause of the derailment.

ANALYSIS- TRACK INSPECTION:

The last ultrasonic rail detection test through this area was on December 18, 2008. The track was visibly inspected by a hi-rail vehicle on December 30, 2008. Records from both these inspections were reviewed by FRA.

CONCLUSION: There were no rail or track structure defects noted in the accident area.

ANALYSIS - MECHANICAL INSPECTION:

A close examination of the derailed cars was performed at the scene directed by a BNSF mechanical manager. He concluded that that the initial car derailed was hopper Car GRTX 13173 as a result of the failure of the left number 2 journal bearing. On December 29, 2008 a manual review of this bearing was conducted by BNSF staff who determined that the bearing was cracked across the cup.

BNSF analyzed data from the last track side acoustic/warm bearing detector system (TADS) located at Kelker, Colorado, MP 78.8. The left No. 2 bearing received an acoustic defect at this location on December 29, 2008, after many previous passes with no alarms. When the train passed on January 1, 2009, this detector showed the bearing to have no acoustic defects and the bearing temperature was 78 degrees. Data from the warm bearing detector located at Pinon, Colorado, located at BNSF MP 103.4, indicated the temperature of the same bearing as 91 degrees. The detector at Pinion is not entered into the computer assisted detector (CAD) system and was unable to generate a warm bearing message. In addition, the four detectors located on the Union Pacific's portion of the Pikes Peak Subdivision were unable to access the bearing data from the train.

CONCLUSION: Results of the mechanical inspection indicated the derailment was caused by a failure of the left No. 2 journal bearing on hopper Car GRTX 13173. The acoustic detector and warm bearing detector at Kelker did not indicate any defect on the car. The warm bearing detector located at Pinon had not been entered into the CAD system and was unable to generate a "warm bearing" message for the train. In addition, the UP detectors that the train had passed were unable to access the bearing data from the train.

ANALYSIS - LAB ANALYSIS OF JOURNAL BEARING: The BNSF conducted an inspection and analysis of a journal bearing from hopper Car GRTX 13173 at their test research and development laboratory in Topeka, Kansas.

CONCLUSION: Initial findings indicate that the cause of the derailment was the result of an internal bearing failure of the left No. 2 bearing on hopper Car GRTX 13173.

OVERALL CONCLUSION

Post-accident toxicology testing was performed on the crew with the results being negative. The locomotive engineer and conductor were in compliance with all applicable railroad operating rules and train handling requirements. It was concluded that fatigue was probable for both the engineer and conductor. It is not however, considered to be a contributing factor in the cause of the derailment. There were no failed track components found in the accident area and no defects had been identified in the area through routine inspection. Results of the mechanical inspection indicated the derailment was caused by a failure of the left No. 2 journal bearing on hopper Car GRTX 13173. The last warm bearing detector that the train had passed located at Pinon had not been entered into the CAD system. Because of this, the detector was unable to generate a "warm bearing" message for the train.

PROBABLE CAUSE & CONTRIBUTING FACTORS:

The FRA's investigation determined the probable cause of the accident was Cause Code E53C - Journal (roller bearing) failure from overheating.