Federal Railroad Administration
Office of Safety
Headquarters Assigned
Accident Investigation Report
HQ-2006-08

Amtrak (ATK)
Sprague, Washington
January 28, 2006

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-2006-8

1.Name of Railroad Operating Train #1: Amtrak [ATK]	1a. Alphabetic Code: ATK	1b. Railroad Accident/Incident No.: 099682
2.Name of Railroad Operating Train #2: N/A	2a. Alphabetic Code: N/A	2b. Railroad Accident/Incident: N/A
3.Name of Railroad Responsible for Track Maintenance: Amtrak [ATK]	3a. Alphabetic Code: ATK	3b. Railroad Accident/Incident No.: 099682
4. U.S. DOT_AAR Grade Crossing Identification Number:	5. Date of Accident/Incident: Month 01 / Day 28 / Year 2006	6. Time of Accident/Incident: 01:05: ☑ AM ☐ PM

7. 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): 01

8. Cars Carrying HAZMAT	9. HAZMAT Cars Damaged/Derailed	10. Cars Releasing HAZMAT	11. People Evacuated	12. Division
0	0	0	0	Northwest

13. Nearest City/Town	14. Milepost (to nearest tenth)	15. State Abbr	15. State Code	16. County
Sprague	44.3	N/A	WA	LINCOLN

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

21. Track Name/Number	22. FRA Track Class (1-9, X)	Code	23. Annual Track Density (gross tons in millions)	24. Time Table Direction 1. North 3. East	Code
Single Main Track		3	79.31		3

OPERATING TRAIN #1

25. Type of Equipment Consist (single entry)	A. Spec. MoW Equip.	Code	26. Was Equipment Attended? 1. Yes 2. No	Code	27. Train Number/Symbol
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		2		1	A28127 A

28. Speed (recorded speed, if available) R - Recorded; E - Estimated 40 MPH — Code: R

29. Trailing Tons (gross tonnage, excluding power units): N/A

30. 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)				
e	N/A	N/A	N/A	N/A

30a. 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

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

32. 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

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

34. 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	1	0	0	0	0
(2) Total Derailed	1	0	0	0	0

35. Cars	Loade a. Freight	Loade b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Equipment Consist	0	4	0	0	0
(2) Total Derailed	0	4	0	0	0

36. Equipment Damage This Consist	37. Track, Signal, Way, & Structure Damage	38. Primary Cause Code	39. Contributing Cause Code
121000	112168	T110	N/A

Number of Crew Members

40. Engineer/ Operators	41. Firemen	42. Conductors	43. Brakemen
N/A	N/A	1	1

Length of Time on Duty

44. Engineer/Operator	45. Conductor
Hrs 4 Mi 28	Hrs 9 Mi 20

Casualties to:	46. Railroad Employees	47. Train Passengers	48. Other
Fatal	0	0	0
Nonfatal	N/A	0	0

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

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

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

OPERATING TRAIN #2

52. Type of Equipment Consist (single entry)	A. Spec. MoW Equip.	Code	53. Was Equipment Attended? 1. Yes 2. No	Code	54. Train Number/Symbol
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		N/A		N/A	N/A

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

57. 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

57a. Remotely Controlled Locomotive? 0 = Not a remotely controlled; 1 = Remote control portable

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56. 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

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

59. 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

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

61. 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

62. Cars	Loade a. Freight	Loade 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

63. Equipment Damage This Consist: 0

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

65. Primary Cause Code: N/A

66. Contributing Cause Code: N/A

Number of Crew Members

67. Engineer/ Operators	68. Firemen	69. Conductors	70. Brakemen
N/A	N/A	N/A	N/A

Length of Time on Duty

71. Engineer/Operator: Hrs 0 Mi 0

72. Conductor: Hrs 0 Mi 0

Casualties to:	73. Railroad Employees	74. Train Passengers	75. Other
Fatal	0	0	0
Nonfatal	0	0	0

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

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

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

Highway User Involved

79. Type: 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

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

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

82. Position: 1.Stalled on Crossing 2.Stopped on Crossing 3.Moving Over Crossing 4. Trapped
Code: N/A

86a. 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

Rail Equipment Involved

83. 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

84. Position of Car Unit in Train: N/A

85. Circumstance: 1. Rail Equipment Struck Highway User; 2. Rail Equipment Struck by Highway User
Code: N/A

86b. Was there a hazardous materials release by 1. Highway User 2. Rail Equipment 3. Both 4. Neither
Code: N/A

86c. State here the name and quantity of the hazardous materials released, if any.
N/A

87. Type of 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	N/A

88. Signaled Crossing Warning (See instructions for codes) Code:

89. Whistle Ban 1. Yes 2. No 3. Unknown
Code: N/A

90. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach
Code: N/A

91. Crossing Warning Interconnected with Highway Signals 1. Yes 2. No 3. Unknown
Code: N/A

92. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown
Code: N/A

93. Driver's Age: 0

94. Driver's Gender 1. Male 2. Female
Code: N/A

95. Driver Drove Behind or in Front of Train and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown
Code: N/A

96. 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

97. Driver Passed Standing Highway Vehicle 1. Yes 2. No 3. Unknown
Code: N/A

98. 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

101. Casulties to Highway-Rail Crossing Users

Killed	Injured
0	0

99. Driver Was 1. Killed 2.Injured 3. Uninjured
Code: N/A

100. Was Driver in the Vehicle? 1. Yes 2. No
Code: N/A

102. Highway Vehicle Property Damage (est. dollar damage): 0

103. Total Number of Highway-Rail Crossing Users (include driver): 0

104. Locomotive Auxiliary Lights? 1. Yes 2. No
Code: N/A

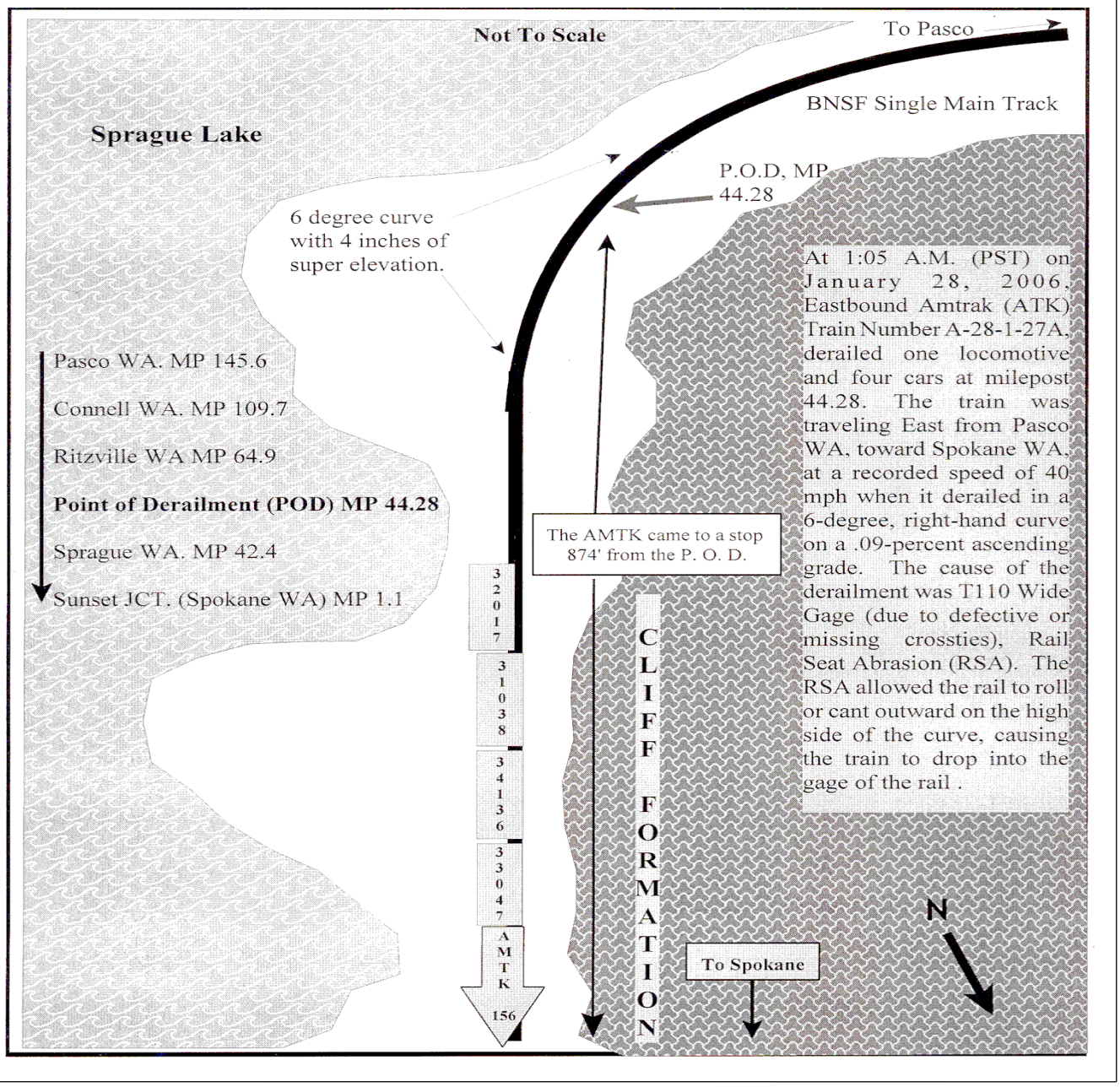
105. Locomotive Auxiliary Lights Operational? 1. Yes 2. No
Code: N/A

106. Locomotive Headlight Illuminated? 1. Yes 2. No
Code: N/A

107. Locomotive Audible Warning Sounded? 1. Yes 2. No
Code: N/A

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

HQ-08-2006 Sketch.bmp



109. SYNOPSIS OF THE ACCIDENT

At 1:05 a.m. (PST) on January 28, 2006, an eastbound Amtrak (ATK) passenger train, derailed one locomotive and four cars (all equipment in the train). The derailment occurred at Sprague, WA, approximately 35 miles southwest of Spokane, WA, at milepost 44.3 on the BNSF Railway Company's Northwest Division, Lakeside Subdivision.

A total of 86 people including 79 passengers, an un-ticketed Amtrak deadhead employee, as well as three active on board service employees and the active three person Amtrak train crew were evacuated from the train. The passengers and deadhead employee were transported to a local shelter until buses arrived to take them to Spokane, while the active train crew tended the train before being shuttled to Spokane. Two passengers, the conductor and assistant conductor, were taken to a Spokane hospital and given first aid treatment before being released. Both the conductor and assistant conductor sustained minor injuries that met the criteria for FRA reportable injuries. There were no other injuries reported.

There was no hazardous materials involved in the derailment.

The BNSF Railway Company estimated track damage of $112,168. Amtrak estimated equipment damage of $121,000.

At the time of the accident it was dark, the weather was mostly clear, with partial overcast sky and the temperature was 32° F.

Evidence found during the accident investigation indicates the rail on the high side of the curve canted outward under the train, due to rail seat abrasion on concrete crossties, creating wide gage.

The probable cause of the derailment was wide gage (due to defective or missing crossties).

110. NARRATIVE

Circumstances Prior to the Accident

The crew of the Amtrak train (symbol A-28-1-27A) included a locomotive engineer, conductor, and an assistant conductor. The locomotive engineer first went on duty at 8:37 p.m., PST, at Pasco, WA, his away from home terminal. The conductor and assistant conductor first went on duty at 3:45 p.m., (PST), at Portland, OR, their home terminal. Prior to reporting for duty, all crew members received a required statutory off duty period.

The eastbound Amtrak train consisted of one locomotive, four occupied passenger cars, was 409 feet in length and weighed 846,000 pounds. The train was traveling from Portland, OR to Spokane, WA, a distance of 384 miles.

The train received all required equipment tests including a Class One Air Brake Test on January 27, in Portland, OR, prior to departure. The train crew also performed a running brake test prior to departure in Pasco WA.

As the train approached the accident site, the locomotive engineer was seated at the controls located on the right (south) side of the locomotive. The conductor and assistant conductor were seated at the conductors table on the left (north) side of the first coach car behind the locomotive. Both the conductor and assistant conductor were performing paper work and monitoring the radio.

Approaching the accident site from the west, traveling east, there is 1689 feet of tangent track that leads into a 4- degree, 0-minute, right hand curve approximately 633 feet in length. The track speed changes from 50 mph to 40 mph at the beginning of this curve, milepost 44.5. Following this curve there is tangent track approximately 264 feet in length, followed by a 6-degree, 0-minute, left hand curve approximately 739 feet in length. The Point Of Derailment (POD) was approximately in the center of the last mentioned 6-degree, 0-minute, curve. After derailing, the train traveled through the rest of the curve and onto tangent track. The lead locomotive of the train came to a stop approximately 874 feet east of the (POD). The grade at the (POD) is .09-percent ascending grade in the eastward direction of travel.

In the accident area, trains operate on a single main track under the authority of a Traffic Control System (TCS). The BNSF's Northwest Division Timetable No. 2, effective November 5, 2003, authorizes a maximum passenger and freight train speed of 40 mph, FRA Class 3 track. The timetable and geographic direction the train was traveling at the (POD) was east, however, after the train continued through the curve and stopped, it was facing in a northeast geographical direction.

The Accident

The locomotive engineer stated that the trip was uneventful approaching the accident site. He also stated that there were no problems with the operation of the train. While approaching and at the time the accident occurred, the train was being operated at 40 mph. This speed was recorded on the locomotive's event recorder.

According to the train crew the accident occurred at approximately 1:05 a.m., PST, which was also recorded on the locomotive event recorder.

During an FRA interview, the engineer stated he felt the rail roll out on the high side of the curve and after he felt the locomotive drop onto the rolled rail, he initiated an emergency brake application, which is confirmed by the locomotive event recorder. After the rail rolled, the wheels on all the equipment on the engineer's side (south side) of the train rode in the web of the rail on the high side of the curve. The rolled rail basically acted as a trough and held the locomotive and passenger cars on the road bed and stopped them from going over the bank and into Sprague Lake. The derailed equipment all remained coupled and upright.

As soon as the train stopped, the engineer broadcasted over the radio “Emergency, Emergency, Emergency!”. The BNSF’s Fort Worth, TX, dispatcher responded and after speaking with the engineer, began contacting emergency response personal. The engineer remained in the locomotive, while the conductor began checking passengers and crew members for injuries. The assistant conductor was shaken, but after having a few minutes to gather composure, she began to assist the conductor in assessing the damages.

Emergency response personnel from the Lincoln County Sheriff’s Office as well as the Lincoln County Fire District #1 arrived and began to work with the train crew on a plan to transport the passengers to the local Sprague Public School. Two school buses were used to transport the passengers to the school until charter buses arrived to move the passengers to a hotel in Spokane, WA.

Two passengers and the conductor and assistant conductor were taken to a Spokane hospital where they received first aid treatment before being released. All sustained minor injuries.

Analysis

The accident did not meet the requirement for FRA Post Accident Toxicology Testing, as required under Title 49 CFR, Part 219, Subpart C, at the time of the accident. However, both the conductor and assistant conductor later received medical treatment that caused their injuries to meet the criteria for FRA reportable injuries.

An inspection of the data printout from the locomotive event recorder, indicated no unusual events related to train handling.

A thorough mechanical inspection of the derailed equipment, indicated no mechanical defective conditions on either the locomotive or the four passenger cars.

The track was constructed of concrete ties that were installed in 1998, and 141 lb. continuous welded rail (CWR) that was relayed in 2003.

Evidence found during the accident investigation indicates the rail on the high side of the curve canted outward under the train, causing the gage to be out of compliance with the FRA maximum allowable gage of 57-3/4 inches for FRA Class 3 Track. The rail on the high side of the curve showed ½ inch of gage side wear. The concrete ties at the (POD) showed as much as 1-inch of rail seat abrasion on the field side of the rail, allowing the rail to cant outward when loaded.

Field observations of the undamaged portion of the curve prior to the POD showed a static gage measurement of 57-1/2 inches in several places. This measurement, combined with the one inch rail seat abrasion would have caused the gage to be at least 58-1/2 inches at the POD. Investigators all agreed that the probable cause of the derailment was wide gage caused by rail seat abrasion on concrete crossties.

BNSF track inspectors conduct and record track inspections in the area of the derailment at more frequent intervals than required by Title 49 CFR Part 213.33. No FRA noncompliant conditions were recorded by BNSF track inspectors in the area of the derailment, six months prior to the derailment.

The BNSF Geometry Car-80 conducted an inspection of the BNSF Lakeside Subdivision on 10/31/2005, which revealed FRA noncompliant wide gage at milepost 44.27. This condition was reported to be corrected on the same day. Also noted during this inspection were six areas of rail cant and two other incipient gage conditions noted between milepost 44.24 and milepost 44.29. This inspection was a follow-up from the BNSF Geometry Car-80 that was conducted on 09/14/2005. During the inspection on 09/14/2005, four areas of rail cant and five incipient gage conditions were noted between milepost 44.23 and milepost 44.30.

On 09/22/2003, the FRA T-16 Geometry car conducted an inspection in the same area.. During this inspection, FRA noncompliant wide gage was found at milepost 44.27 and milepost 44.3.

Between 09/22/2003 and 10/31/2005 twenty incipient gage and rail cant conditions, including two FRA noncompliant gage conditions, were noted by FRA and BNSF geometry cars within a 370 foot segment of track between milepost 44.23 and milepost 44.3.

Conclusion

Following the Amtrak derailment at Home Valley, WA, on 04/03/2005, BNSF created a list of action items in order to prevent future rail seat abrasion derailments. Some of the items listed in the action plan were: visual inspections of all the concrete curves on BNSF’s Northwest Division, reviewing data to raise awareness, using geometry car yellow tag data to determine required walking inspections and augmenting visual and mechanical track inspections.

BNSF was not complying with its own written instructions regarding walking all curves on the Northwest Division constructed with concrete ties, or following up on geometry car red and yellow tag defects. As a result of the Amtrak derailment at Sprague, WA, on 01/28/2006, BNSF issued General Order Number 27, on 02/03/2006, changing the instructions specific to the remediation of rail cant defects on concrete ties. BNSF also issued a newsletter on 02/02/2006 regarding the correction of geometry car red and yellow tag defects.

There has been a task force created to better understand the mechanism of concrete crosstie rail seat abrasion failure, study the effects of computer simulation of F 42 Amtrak locomotives versus other locomotive types, and develop automated means to detect rail seat abrasion.

Probable Cause

Through an inspection by the Federal Railroad Administration, evidence found indicates the rail on the high side of the curve canted outward under the train, due to rail seat abrasion on concrete crossties, creating the wide gage that was determined to be the probable cause of the derailment.