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4 **NATIONAL TRANSPORTATION SAFETY BOARD**

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7 **Office of Railroad, Pipeline and Hazardous Materials Investigations**
8 **Washington, DC**
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12 **TRACK & ENGINEERING GROUP FACTUAL REPORT**

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15 **DCA16FR008**

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18 **BNSF Railway Head-on Collision/Derailment with Fire**

19
20 **Head-on Collision of**
21 **Eastbound BNSF Intermodal Train ID: S-LACLPC1-26K**
22 **into Westbound Intermodal Train ID: Q-CHISBD6-27L**

23
24 **Panhandle, Texas**
25 **June 28, 2016**

26 **Accident**

27
28 NTSB Accident Number: DCA15FR008
29 Date of Accident: June 28, 2016
30 Time of Accident: 8:21 a.m. (CDT)
31 Railroad Owner: BNSF
32 Train Operator: BNSF
33 Type of Train and No: Intermodal Train ID: S-LACLPC1-26K
34 Crew Members: 1 Engineer, 1 Conductor
35 Type of Train and No: Intermodal Train ID: Q-CHISBD6-27L
36 Crew Members: 1 Engineer, 1 Conductor
37 Fatalities: 3
38 Location of Accident: Panhandle, TX
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Track Group

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Accident Summary

For a summary of the accident, refer to the *Accident Summary* report, within this docket.



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8 **Figure 1.** Aerial view of derailment site, geographical direction west toward the top of the photo. Photo
9 shows damaged and displaced rail equipment and smoke rising from the wreckage. (Photo BNSF)

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1 **Circumstances Prior to the Accident:**

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3 **Eastbound Train S-LACLPC1-26K:**

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5 On Tuesday, June 28, 2016, a BNSF train crew, consisting of an engineer and a
6 conductor, reported for duty at Amarillo, Texas. The crew took charge of the intermodal
7 train and departed Amarillo eastbound. BNSF identified the eastbound train as
8 S-LACLPC1-26K and consisted of three head end locomotives, two distributed power
9 locomotives (on rear of train) and 56 loaded intermodal cars of mixed freight with and no
10 empties. The train was 10,209 feet in total length and weighed 9,120 tons. The head
11 three locomotives, and 10 intermodal cars were derailed. All of the derailed cars were
12 loaded intermodal cars with containers.¹

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14 **Westbound Train Q-CHISBD6-27L:**

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16 On Tuesday, June 28, 2016, a BNSF train crew, consisting of an engineer and a
17 conductor, reported for duty in Wellington, Kansas. The crew took charge of the
18 intermodal train and departed westbound. The westbound train involved was train
19 number Q-CHISBD6-27L and consisted of five head end locomotives and 54 loaded
20 intermodal cars and no empties. The train was 8,497 feet in total length and weighed
21 7,451 tons. The head five locomotives and head three intermodal cars of the train were
22 derailed. All of the derailed cars were loaded intermodal cars with containers.

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24 There were no slow orders in effect for the Panhandle area.

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¹ An intermodal car is an articulated assembly and well numbers within one car can include one, three, or five separate wells.

1 **Accident Narrative**

2 **Train movement:**

3 Both trains had no car restrictions and were authorized to operate at 70 miles per
4 hour leading up to the accident area. The Panhandle Subdivision is predominantly 70
5 mph territory. Upon departing their respective crew points, both trains proceeded toward
6 the Panhandle area with the westbound train routed to enter the east end of the Panhandle
7 siding. This routing was verified by the train dispatcher and signal route information.
8 The eastbound train proceeded east of the east switch of the Panhandle siding, the point
9 of collision (POC) was on main track one at milepost 525.4.

10 **Track Description:**

11 This portion of the BNSF Railroad, the Panhandle subdivision, consists of
12 primarily double main track between milepost 325.5 and milepost 550.5 with nine
13 passing sidings.

14 In the accident area, the two main tracks are spaced with between 14 and 15 feet
15 track centers. The subdivision's average daily train count is 71 trains. According to
16 BNSF documentation, the 2015 total tonnage figure for each main track between
17 milepost 520.0 and milepost 530.0 was about 87.5 million gross tons.

18
19 The eastbound intermodal train traversed a descending grade ranging from .0
20 to .23% beginning at milepost 530.0 to milepost 525.0. From milepost 526.65 to the POC
21 at 525.4, the train was on a slightly descending grade of .23%. At milepost 527.7 on
22 main track one the train traversed a 1° left hand curve (in relation to direction of travel).

1 The westbound train would have been on a slightly undulating grade of .13 to a -
2 .23 from milepost 520.0 to milepost 526.0. From milepost 525.35 to the POC at milepost
3 525.4, the train would have been on a slightly ascending grade of .23. Main track one is
4 tangent from milepost 501.3 to milepost 527.4, throughout the accident footprint.

5
6 BNSF inspects and maintains the main track on this portion of the Panhandle
7 Subdivision to Federal Railroad Administration (FRA) Track Safety Standards (TSS) for
8 Class 5 track, which allows for a maximum operating speed of 80 mph for freight trains
9 and 90 mph for passenger trains; however, BNSF has restricted their freight and
10 intermodal train movements to a maximum operating speed of 70 mph or lower. BNSF
11 does not operate any passenger trains on the Panhandle Subdivision.

12
13 Significant track structure damage in the immediate area of the derailment
14 prevented detailed inspection of an intact track structure in the disturbed track area.
15 During post-accident observations by investigators, they noted that the track construction
16 consisted of primarily 136 pound RE, continuously welded rail² (CWR), controlled
17 cooled and manufactured by CF&I. The CWR was seated in 14 X 7 ¾ inch double
18 shoulder tie plates that lay between the bottom surface of the rail and the top surface of
19 timber crossties. The rail was fastened through the tie plates to standard wooden
20 crossties with conventional six inch cut track spikes. The spiking pattern used by BNSF
21 prior to the derailment consisted of one rail-holding spike and one anchor spike on the
22 gage side of the rail, one rail holding and one anchor spike on the field side.

² Continuous welded rail (CWR) means rail that has been welded together into lengths exceeding 400 feet.



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2 **Figure 2.** Aerial view of railroad equipment at the POC. Photo shows damaged and displaced rail
3 equipment and smoke rising from the wreckage (Photo BNSF)

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5 **Crossties, Anchors, Ballast and CWR:**

6 The crossties measured 9-inches by 7-inches by 8-feet 6-inch long, spaced 19.5
7 inches on center (nominal). The crossties were box anchored³ with rail anchors⁴ every
8 other tie to restrain longitudinal movement of the CWR. The track was supported by
9 granite and limestone rock ballast.

3 “Box Anchored” is a railroad terminology that means that each rail is affixed with two rail anchors at a given crosstie location and that those anchors (4 per crosstie) would bear on the sides of a crosstie in order to restrict the potential longitudinal movement of the rail.

4 “Rail anchor” means those devices, which are attached to the rail and bear against the side of the crosstie to control longitudinal movement. Certain types of rail fasteners also act as rail anchors and control rail movement by exerting a downward clamping force on the upper surface of the rail base.

1 Investigators did not take exceptions to the rail restraint effectiveness of the
2 anchors or fasteners, crosstie condition, or ballast condition in the area of the derailment.

3

4 **Point of Derailment:**

5 BNSF installed 15 track panels at the POC on main one track and 14 track panels
6 on main two near the POC, where the track damages required total renewal. The
7 consensus point of collision was mile post 525.4. This determination was supported by
8 aerial photography and associated landmarks. The POC was about 4,000 feet east of the
9 east switch of Panhandle siding and 4,187 feet east of the eastward absolute signal at the
10 east end of Panhandle Siding. As a result of the collision and train induced forces, there
11 was a secondary derailment of one car in the eastbound train consist. The derailed car
12 was the twenty-first car from the head end of the east bound train. This secondary
13 derailment damaged the track structure of main tracks one and two as well as one
14 intermediate signal mast at mile post 525.9.

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2 **Figure 3.** Aerial view showing signal mast at damaged switch and smoke from POC east of the switch
3 location. (Photo BNSF)

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5 On June 29 and 30, 2016, investigators inspected and photographically
6 documented the No. 20 (right hand turnout) switch point area located at milepost 526.15
7 main one track that provides access to the Panhandle siding. During these inspections,
8 investigators observed contact marks on the field side of the turnout's left hand switch
9 point, the side that fits up against the stock rail. Investigators noted that when the switch
10 was operated by hand into a reverse position; the switch points were not up against either
11 stock rail. Investigators observed the operating rod that controls the throw of the switch
12 was bent. The left-hand switch point's tip showed fresh signs of contact. According to

1 dispatcher log data, the switch had been reversed for the westbound train to take the
2 siding, while the eastbound train was to stop on main track one west of the switch.

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5 **Figure 4.** Metal flow chipped from back side of left hand switch point indicating a run through switch
6 condition. Photo shows railroad switch components. (Photo NTSB)

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2 **Figure 5.** Gap shown on left hand switch point when switch was hand thrown for entry into siding track,
3 East End of Panhandle Siding. Photo shows railroad switch components. (Photo NTSB)

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5 **Damages Estimates:**

6 BNSF engineering personnel conveyed that the initial damage estimates for engineering
7 damages were \$233,496. This figure included costs for the installation of 40 track panels⁵,
8 associated ballast and on-track materials and renewal of the CWR. This does not include
9 additional costs associated with environmental remediation efforts.

10

11 BNSF estimated the initial total damage estimates of about \$16 million dollars;
12 this estimate includes \$12 million in car and equipment, \$3.5 million in lading, about
13 \$25,000 dollars' signal damages and the aforementioned track figure.

14

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5 BNSF uses pre-built 40-foot track panels.

1 **Post-Accident Inspection/Testing of Track:**

2 On June 30, 2016, investigators conducted a walking inspection from the POC to
3 the east switch of Panhandle siding. The track had been repaired and tamped before this
4 inspection was conducted. The FRA inspector completed an inspection report showing no
5 defects noted.

6

7 **Geometry Tests:**

8 BNSF operated a geometry car over the Panhandle Subdivision on April 29, 2016.
9 BNSF provided NTSB the requested data for milepost 520.0 to milepost 530.0. From the
10 data of that test to show that the car began its inspection and measured the track structure,
11 which included the portion of track east and west of Panhandle and the immediate
12 derailment footprint. There were no geometry defects noted from a review of the data
13 within mileposts 520.0 to 530.0. Investigators did not take exception to the data.

14

15 **Internal Rail Tests Data:**

16 The Track Group reviewed the last two ultrasonic internal rail test data conducted
17 by Sperry Rail Service with detector car No. 922. According to BNSF's documentation
18 that NTSB requested, Sperry SRS922 operated and tested rail on the main one track of
19 the Panhandle Subdivision on June 8, 2016, and May 3, 2016. During the last internal
20 rail flaw inspection, there were no defective rails marked in the immediate area of the
21 POC or throughout the derailment footprint.

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1 **Track Inspection Records:**

2 FRA regulations found in 49 CFR 213 require that a rail carrier's track inspection
3 records be prepared and signed on the day of the inspection for frequency of compliance
4 with the FRA TSS. FRA track inspection records are required to reflect actual field
5 conditions and deviations from the FRA TSS. BNSF has elected to operate at FRA Class
6 5 speeds requiring BNSF's personnel to inspect the main track at least twice per calendar
7 week.

8 As part of the investigation, a qualified FRA track safety inspector conducted an
9 inspection of BNSF's track inspection records to determine compliance with FRA
10 regulations. The track inspection for one month, May 29, 2016 to June 25, 2016, from
11 milepost 491.2 to milepost 538.509 on the Panhandle Subdivision were reviewed.

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- 14 • All twice weekly main track inspection frequencies were met; Yes
- 15 • All once weekly siding inspection frequencies were met; Yes
- 16 • All bi-weekly main track traversal frequencies were met; Yes
- 17 • Once monthly siding traversals was completed for the Panhandle Siding; Yes

18

19 The track in the area of the derailment was last inspected on June 27, 2016, by a
20 FRA qualified BNSF track inspector. The track inspection record noted no defects
21 between milepost 491.2 to milepost 538.509, an area that includes the derailment
22 footprint.

1 **Regulatory Track Inspection History:**

2 On March 15, 2016, an FRA track safety inspector conducted a routine
3 walking/hyrrail inspection that began at Amarillo, Texas (milepost 539.2) and ended at
4 White Deer, Texas (milepost 518.18) and that included the area through the derailment
5 site. During this inspection, there were no defects noted in the accident area.

6

7 **FRA Automated Track Inspection Program (ATIP):**

8 FRA provided data from their last ATIP geometry test that occurred on June 10,
9 2016. The exception data indicates there were no class restrictive defects between
10 mileposts 520.0 and 530.0, which includes the immediate and surrounding areas for this
11 accident.

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15 **On-scene Sight Distance Data:**

16 As part of the on-scene investigation, it was determined that a sight distance test
17 would be conducted. The protocol developed for this activity included the test
18 locomotives moving toward the POC milepost 525.401⁶ to determine the preview
19 distance for a series of signal locations that each train would have traversed into the POC.
20 After both sets of locomotives stopped at the POC, the locomotives reversed and traveled
21 away from the POC to obtain a preview distance for the accident trains.

22 On July 02, 2016, two teams were selected to monitor and operate the test
23 locomotives for the purposes outlined above. BNSF provided locomotives of a similar

6 During GPS surveying in support of site distance testing this more accurate milepost location was identified. This milepost used throughout this report is 525.4.

1 type with the short hood positioned as they were with the accident trains. Upon exiting
 2 the Panhandle siding, locomotives (exemplar of the Stack train) exited Panhandle siding
 3 and traveled west to near milepost 538.4 (CP Roberts) to begin their eastward movement
 4 toward the next four signal locations. The other locomotives (exemplar for the Q train)
 5 went east to near milepost 518.0 (CP Cuyler) to begin their westward movement
 6 documenting the preview of the next four signals.

7 The following are the test results as measured by a survey crew (contracted to
 8 BNSF) utilizing a global positioning system (GPS) device⁷:

9
 10 **Signal Preview Distances for the Eastbound Stack Train**

Signal	Preview Location	Signal Location	Distance in Miles	Distance in Feet
Clear	534.673	533.867	0.806	4258
Approach Medium	532.805	531.582	1.223	6460
Yellow	529.813	528.882	.931	4918
Red	527.024	526.194	.83	4383

11 Table 1. Sight Measurements
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 13

14 The team aboard the Stack train test locomotive indicated that no exceptions were
 15 taken to the aspects, illumination, alignment or focus of the signals. The total distance
 16 from the first signal preview location at MP 534.673 to the last signal location, the Red
 17 (STOP) at MP 526.194, is 8.48 miles.
 18

19 **Signal Preview Distances for the Westbound Q Train**

Signal	Preview Location	Signal Location	Distance in Miles	Distance in Feet
Clear	517.642	518.065	0.423	2235
Clear	519.742	520.546	.804	4245
Approach				

7 The GPS device provided corrected milepost data that will be used in conjunction with the overall engineering survey to provide continuity of reference points for this accident investigation.

Medium	522.573	523.107	.534	2818
Diverging Approach	525.398	526.089	.691	3650

Table 2. Sight Measurements

The team aboard the Q train test locomotive indicated that no exceptions were taken to the aspects, illumination, alignment or focus of the signals. The total distance from the first signal preview location at MP 517.642 to the last signal location, the Diverging Approach at MP 526.089, is 8.45 miles.

Test No. 2—Backaway from POC—Loss of Sight Distance

Sight Distance	Stack Train Location	POC	Q Train Location	Distance in Miles	Distance in Feet
Crew can't see other train	527.023	525.401	523.67	3.35	17,704
Distance to POC	527.023	525.401	-----	1.62	8,554
Distance to POC	-----	525.401	523.67	1.73	9,140

Table 3. Sight Distance Between Trains from POC

Upon completion of the signal preview phase of the sight distance test, the two locomotives were positioned at the POC nearly coupled together. Each locomotive moved in a reverse direction until each locomotive was not seen by the other. The top line on the above matrix represents that distance. The Q train locomotive was stopped east of the POC at milepost 523.67, when the headlight of the Stack train disappeared west of their location. The Stack train was stopped west of the POC at milepost 527.023. The two locomotives were about 3.35 miles or 17,704 feet apart. The bottom two rows of the matrix represent the distance of each respective train to the POC.

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Engineering Drawings:

Measurements taken from the sight distance survey were overlaid onto the BNSF engineering track chart and this graphic has been included in this docket.

1 Parties to the Investigation - Acknowledgment Signatures

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3 The undersigned designated *Party to the Investigation* representatives attest that the
4 information contained in this report is a factually accurate representation of the
5 information collected during the investigation, to the extent of their best knowledge and
6 contribution in this investigation.

7
8
9 _____

10
11 _____ //s// Date 9/13/16
12 Robert J. Gordon, NTSB

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14 _____ //s// Date 9/13/16
15 David Roberts, FRA

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17 _____ //s// Date 10/13/16
18 Don Traylor, Texas DOT

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20 _____ //s// Date 9/13/16
21 Duane F. Befort, BNSF

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