



***Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch***

***Accident Investigation Report
HQ-2018-1294***

***BNSF Railway Company (BNSF) Derailment
Devore, California
August 21, 2018***

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.

SYNOPSIS

On Tuesday, August 21, 2018, at approximately 9:25 a.m., PDT, a BNSF Railway (BNSF) freight train HBARLAC1-20A (Train 1) derailed in a general pile-up on main track 3, at Milepost (MP) 71.0 of the BNSF Cajon Subdivision. The train was traveling at a recorded speed of 23 mph through the town of Devore, California when it derailed. Devore is located approximately 12 miles northwest of San Bernardino, California. Train 1 was a mixed manifest train, consisting of 4 locomotives on the head end and 2 distributed power locomotives (DPU) at the rear, 89 loaded cars and 10 empties, was 6,439 feet long, and had 11,662 trailing tons.

No injuries and no evacuations occurred. Approximately 296 gallons of petroleum distillates was released from two breached derailed cars. Equipment damage was estimated at \$1,389,767 and track and signal damage at \$2,645,180.

At the time of the derailment it was daylight, clear, and 86 °F.

FRA determined the probable cause of the derailments was E68L – Loose wheel (Locomotive).

Additionally, FRA a contributing cause to be M599 – Other miscellaneous causes.

TRAIN SUMMARY

1. Name of Railroad Operating Train #1 BNSF Railway Company	1a. Alphabetic Code BNSF	1b. Railroad Accident/Incident No. CA-0818-108
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GENERAL INFORMATION

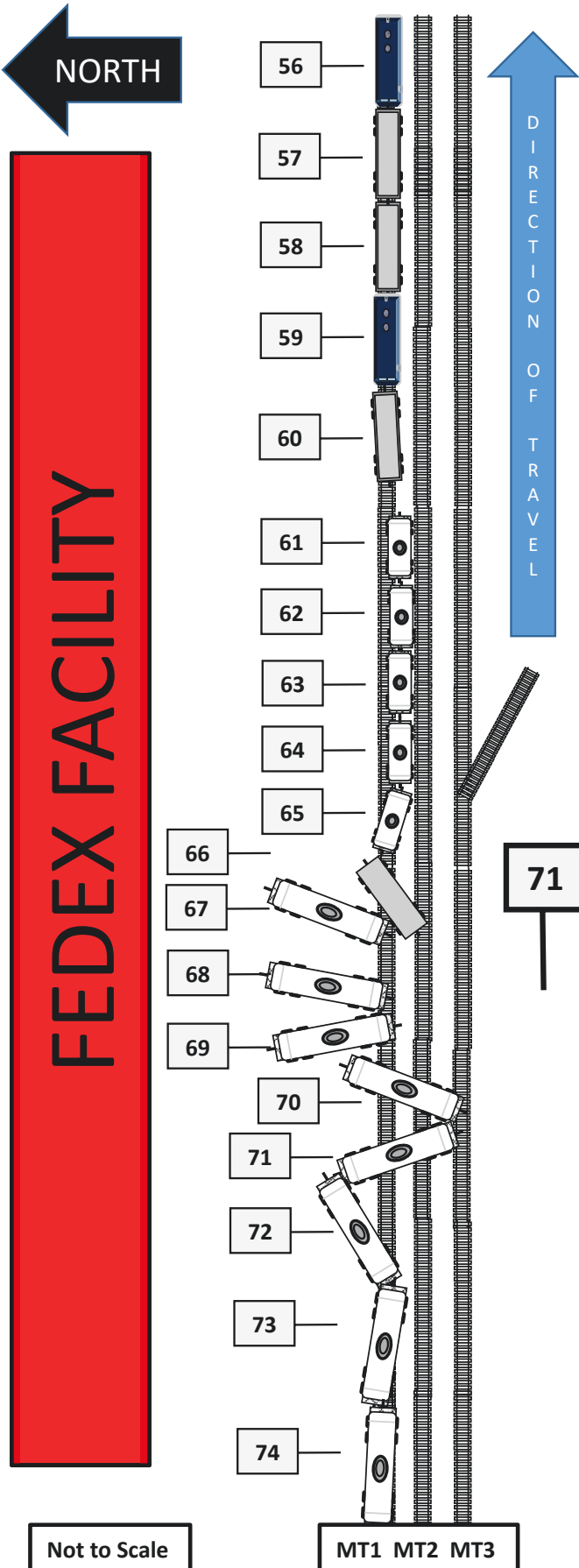
1. Name of Railroad or Other Entity Responsible for Track Maintenance BNSF Railway Company	1a. Alphabetic Code BNSF	1b. Railroad Accident/Incident No. CA-0818-108
2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident 8/21/2018	4. Time of Accident/Incident 9:25 AM
5. Type of Accident/Incident Derailment		
6. Cars Carrying HAZMAT 22	7. HAZMAT Cars Damaged/Derailed 6	8. Cars Releasing HAZMAT 2
	9. People Evacuated 0	10. Subdivision BNSF RAILWAY COMPANY -
11. Nearest City/Town San Bernardino	12. Milepost (to nearest tenth) 69.3	13. State Abbr. CA
		14. County SAN BERNARDINO
15. Temperature (F) 86 °F	16. Visibility Day	17. Weather Clear
		18. Type of Track Main
19. Track Name/Number 3	20. FRA Track Class Freight Trains-60, Passenger Trains-80	21. Annual Track Density (gross tons in millions) 61.56
		22. Time Table Direction West
23. PTC Preventable N/A	24. Primary Cause Code [E68L] Loose wheel (LOCOMOTIVE	25. Contributing Cause Code(s) M599

OPERATING TRAIN #1

1. Type of Equipment Consist: Freight Train					2. Was Equipment Attended? Yes		3. Train Number/Symbol HBARLAC1-20A				
4. Speed (recorded speed, if available) R - Recorded 23.0 MPH E - Estimated		Code R	5. Trailing Tons (gross excluding power units) 11662		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 0	
6. Type of Territory Signalization: <u>Signaled</u> Method of Operation/Authority for Movement: <u>Signal Indication</u> Supplemental/Adjunct Codes: <u>Q</u>											
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.)		SCAX 931	59	no				0	0		
(2) Causing (if mechanical, cause reported)		SCAX 931	59	no	9. Was this consist transporting passengers?			No			
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded		Empty		e. Caboose
		b. Manual	c. Remote	d. Manual	e. Remote		a. Freight	b. Pass.	c. Freight	d. Pass.	
(1) Total in Train	4	2	0	0	2	(1) Total in Equipment Consist	89	0	10	0	0
(2) Total Derailed	0	1	0	0	0	(2) Total Derailed	14	0	1	0	0
12. Equipment Damage This Consist 1389767			13. Track, Signal, Way & Structure Damage 2645180								
Number of Crew Members						Length of Time on Duty					
14. Engineers/Operators 1		15. Firemen 0		16. Conductors 1		17. Brakemen 0		18. Engineer/Operator Hrs: 5 Mins: 40		19. Conductor Hrs: 5 Mins: 40	
Casualties to:		20. Railroad Employees		21. Train Passengers		22. Others		23. EOT Device? Yes		24. Was EOT Device Properly Armed? Yes	
Fatal		0		0		0		25. Caboose Occupied by Crew?		N/A	
Nonfatal		0		0		0					
26. Latitude 34.197644000				27. Longitude -117.373628000							

SKETCHES

Sketch - Accident Sketch



**BNSF CAJON SUB DERAILMENT
AUGUST 21, 2018
Pileup at Milepost 71.0, MT #3**

- 56 – Metrolink Locomotive # 928
- 57 – Flat car # TPAX 93868
- 58 – Flat car # HTTX 93073
- 59 – Metrolink Locomotive # 931
(1 set of trucks derailed)
- 60 – Flat car # OTTX 97210
- 61 – Tank car # ADMX 19582
- 62 – Tank car # GATX 225272
- 63 – Tank car # CRGX 7270
- 64 – Tank car # CRGX 8184
- 65 – Tank car # CRGX 7808
- 66 – Box car # CNA 406117
- 67 – Tank car # GATX 22539 – (HAZ)
- 68 – Tank car # GATX 89009
- 69 – Tank car # GATX 200626
- 70 – Tank car # UTLX 201919 - (Breached HAZ)
- 71 – Tank car # GBRX 703653 - Breached HAZ)
- 72 – Tank car # GATX 223085 – (HAZ)
- 73 – Tank car # NCPX 51 - (HAZ)
- 74 – Tank car # GATX 89136 - (HAZ)
(1 set of trucks derailed)

This sketch represents the crash site of westbound BNSF train H-BARLAC-1-20A (BNSF 3755 West). The point of derailment (POD) was located on MT #3 at Milepost 69.3, at the CP Keenbrook, east switch, east cross-over Track 3 to Track 2 near the guard rail.

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NARRATIVE

Circumstances Prior to the Accident

BNSF Railway (BNSF) freight train HBARLAC1-20A (Train 1) was a mixed manifest train, consisting of 4 locomotives on the head end and 2 distributed power locomotives (DPU) at the rear, 89 loaded cars and 10 empties. Included in the consist were two locomotives, SCAX 928 and SCAX 931, moving under a One-Time Movement Authority (OTMA) Dead-in Tow (DIT), for delivery to the Southern California Regional Rail Authority (SCAX), known commercially as Metrolink. These locomotives were located at positions 56 and 59 with buffer cars at position 55, 57, 58, and 60. The buffer car positions complied with the one-time movement authority issued by FRA on January 31, 2018.

Train 1 was 6,439 feet in length and had 11,662 trailing tons. All required tests and inspections were completed in Barstow, California, on August 20, 2018, at 6:00 p.m. PDT, with no exceptions taken. A daily inspection of the locomotives had been completed while the train was at Barstow on August 21, 2018 at 12:15 a.m., PDT, with no exceptions taken. The train departed Barstow at 6:57 a.m. PDT.

The crew consisted of a locomotive engineer and conductor, and went on duty at 3:45 a.m. PDT on August 21, 2018, at BNSF Yard, Barstow, California, after having received their statutory required off-duty time.

The derailment occurred on the BNSF Cajon Subdivision, in the town of Devore, California. Per BNSF's California Division Timetable No. 2, effective June 25, 2014, the method of operation on the Cajon Subdivision is Centralized Traffic Control (CTC). The maximum authorized speed in the area of the derailment is 35, however there was a 25-mph speed restriction that applied to Train 1 due to the tons per operative brake (TOB).

Train 1 was operating westbound on main track 3 descending a 2.2 percent grade at a recorded speed of 23 mph. The train had just exited a left-hand 2'31" curve and a 4'3" right-hand curve before resolving to tangent track at CP Keenbrook. The Engineer was seated at the controls on the right side of the leading locomotive, and the Conductor was seated on the left side. The crew did not report any issues with the train prior to the derailment.

Timetable direction is west, and will be used throughout this report.

At the time of the derailment it was daylight, clear, and 86 °F.

The Accident

At approximately 9:25 a.m. PDT, Train 1, operating with moderate dynamic brake and a 14 pound reduction of the automatic brake, was traveling at a recorded speed of 23 mph, when it experienced an undesired emergency brake application (UDE). The UDE was caused by the derailment of SCAX 931 and 15 freight cars at a guard rail at the east crossover switch from track 3 to track 2 at the Keenbrook

station. The investigation determined the Point of Derailment (POD) to be at MP 69.3. The derailed equipment was dragged for approximately 1.7 miles to MP 71.0 where the pile-up was located.

Two derailed tank cars were breached, UTLX 201919 (DOT-111A100W1), and GBRX 703653 (DOT1117J100W) at positions 70 and 71, and released approximately 296 gallons of petroleum distillates. No fire resulted and no evacuations were ordered.

The crew was not injured. They were transported to BNSF Watson Yard by motor vehicle where interviews and post-accident toxicology testing were conducted.

Post-Accident Investigation

The Federal Railroad Administration (FRA) conducted an investigation in collaboration with the California Public Utilities Commission (CPUC). The investigation included an inspection of the equipment in Train 1, post-accident interviews of the train crew, and the review of all requested records, forms and test results requested from BNSF.

Evidence collected at the derailment site was preserved, and transported by Progress Rail to Henderson, Nevada, and then to Muncie, Indiana. EMD contracted Transportation Technology Center, Inc. (TTCI) to perform a reenactment of the conditions in Pueblo, Colorado.

The following analysis and conclusions represent the findings of FRA's investigation.

Analysis and Conclusions

Analysis - Operating Practices: BNSF provided the event recorder data from Train 1 for review by FRA. Based on the event recorder data, post-accident interviews, and inspection records, FRA concluded the crew was following all applicable railroad operating rules and train handling best practices.

The crew of Train 1 was certified and qualified on the territory on which they were assigned. A review of the operational testing conducted by BNSF in the accident area complied with the BNSF testing program.

Conclusion: FRA determined operating practices did not contribute to the cause or severity of the derailment.

Analysis - Track: BNSF provided test and inspections for the derailment area for review by FRA. No defects were identified that could have contributed to the derailment.

Conclusion: FRA determined track did not contribute to the cause or severity of the derailment.

Analysis - Signal System: BNSF provided test and inspection records for the signal system for the derailment area for review by FRA. No defects were identified that could have contributed to the derailment.

Conclusion: FRA determined the signal system did not contribute to the cause or severity of the derailment.

Analysis - Toxicology: This accident met the minimum requirements of Title 49 Code of Federal Regulations (CFR) § 219, and toxicological testing was performed on both crew members of Train 1.

FRA Post-Accident Forensic Toxicology Result Reports indicate that the two employees tested each had negative test results.

Conclusion: FRA determined drugs and alcohol did not contribute to the cause or severity of the derailment.

Analysis – One Time Movement: Locomotives SCAX 931 and SCAX 928 are four-axle passenger diesel locomotives, Model F125, built in October 2017 by Electro-Motive Diesel at the Progress Rail Facility in Muncie, Indiana. The wheels were manufactured and mounted on the axles by UTC/RAS (Union Tank Car/Rail & AirSources), Morton, Pennsylvania.

Progress Rail submitted a request for a One-Time Movement (OTM) on October 16, 2017, to transport the newly manufactured locomotives for delivery to Metrolink. The movement was planned from Muncie, Indiana to Los Angeles, California for the dead in tow locomotives, on their own wheels. FRA allowed the OTM with the following conditions:

1. The locomotives are moved with one buffer car on each end in consist.
2. An initial terminal air brake test and inspection must be conducted before departure.
3. All crews involved in the move must be supplied with a copy of the OTM letter, and a copy is to be kept on the locomotive.
4. The locomotives must not move beyond the Metrolink in Los Angeles, California under the OTM authority.
5. FRA's office of Technical Oversight must be notified in writing if any accident, incident, or injury occurs while these moves are being made.
6. The FRA investigation did not identify any condition that was not in compliance to the conditions of the OTM.

Conclusion: FRA determined the One-Time Movement did not contribute to the cause or severity of the derailment.

Analysis – Mechanical Inspection: The investigation team performed an inspection of the equipment involved in the derailment. FRA determined the L1, L2, R1, and R2 wheels of SCAX 931, were found to have come loose and moved inward on the axle approximately 2-2.5 inches, causing the wheels to drop into the gage of the track at MP 69.3 and caused the general pile-up derailment at MP 71.0. FRA also determined that the L2 wheels on locomotive SCAX 928 at line 52 of the consist had also come loose and moved on the axle; however, it did not derail during this event.

Both locomotives were equipped with a high performance pneumatic disk braking system designed for passenger service. As Train 1 was descending the 13 mile, 2.2-percent grade approaching the derailment site, the high performance pneumatic disk brakes would have been applied for 40 minutes. The continuous friction generated from the brakes caused the wheels to overheat as was indicated by the bluing found in the post-accident inspection, and allowed the wheels to migrate inward on the axle and derail.

Transportation Technology Center, Inc. (TTCI), Pueblo, CO, performed testing on similar wheelsets to determine the cause of the loose locomotive wheels. The test confirmed excessive heat was created by the tread brakes acting on the wheel after a long automatic brake application of 40 minutes. The train descended a 2.2-percent grade with the brakes applied and caused the wheels to heat and the wheel hubs to expand, resulting in the wheels coming loose from the axles.

FRA received a copy of the test results from EMD which confirmed the analysis performed by FRA. EMD's conclusions stated, in part:

The combination of temperatures imparted to these wheels by the tread and cheek brake systems (wheel rims and discs in the 500 °F range, wheel hub attaining 320 °F), and the lateral curving forces encountered while moving the locomotive back through a 10-degree curve once the wheels had been heated resulted in movement of the L2 wheel of approximately 3/32-inch inward on the axle. Heat from the cheek disc radiated to the outer wheel hub resulting in a reasonably large temperature differential from the exterior of the wheel hub to the interior of the wheel hub without apparent conduction through the wheel plate. This differential thermal component may have contributed to the ability of the wheel to move on the axle.

Conclusion: FRA determined the probable cause of the derailment was the excessive heat from the locomotive brakes acting on the wheels caused them to come loose on the axles of locomotive SCAX 931 and fall into the gage of the track.

Overall Conclusion

The FRA investigation concluded the wheels on locomotive SCAX 931 overheated due to the extended application of the high performance pneumatic disk brakes on the 13-mile descending grade (Cause code M599). Due to the overheating condition, the wheels on the locomotive became loose causing them to drop in and derail.

Probable Cause and Contributing Factors

FRA determined the probable cause of the derailments was E68L – Loose wheel (Locomotive).

Additionally, FRA a contributing cause to be M599 – Other miscellaneous causes.