Federal Railroad Administration
Office of Railroad Safety
Accident and Analysis Branch

Accident Investigation Report
HQ-2016-1136

Union Pacific (UP)
Mosier, OR
June 3, 2016

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 June 3, 2016, at 12:11 p.m., PDT, a westbound Union Pacific Railroad (UP) loaded petroleum crude oil unit train, ONETU 02, derailed 16 loaded crude oil tank cars on single main track at UP Milepost (MP) 69.3 at Mosier, Oregon. The 16 derailed tank cars were located at positions 19 through 34 from the head-end of the train. The derailment site is located on UP's Portland Subdivision near the Columbia River and is approximately 68 miles east of Portland, Oregon. The train was traveling at a recorded speed of 24 mph as it approached the derailment site.

The method of operation at the accident site is by signal indication of a traffic control system and automatic cab signals under the control of UP's train dispatcher in Omaha, Nebraska.

UP's loaded petroleum crude oil train consisted of two locomotives located on the head-end of the train and one distributed power (DPU) locomotive located on the rear of the train. The train consisted of 96 loaded rail cars (94 loaded petroleum crude oil tank cars and 2 buffer cars) and was 6,058 feet in total train length with 13,117 trailing tons.

The derailment resulted in 3 of the 16 derailed cars catching fire. During the fire, Wasco County Sheriff's Deputies ordered a partial evacuation of the local population of Mosier, evacuating a school and approximately 100 residents from an area about 1/4-mile around the incident. Interstate 84 was closed in both directions for several hours. Residents were allowed to return to their homes on Sunday evening, June 5, 2016. A Unified Command structure led by the United States Environmental Protection Agency (EPA) was formed to coordinate the emergency response. No members of the crew from Train ONETU 02 were injured and no civilian injuries were reported.

The Portland Subdivision is not an Amtrak route and this accident/incident was not PTC-preventable.

The railroad reported $1,674,996 in equipment damage and $176,811 in track damage. The derailment caused 339,581 liquid-pounds of petroleum crude oil to be released from five loaded tank cars.

At the time of the derailment, it was daylight and clear with no wind recorded. The temperature was 79 °F.

The probable cause of the accident was Federal Railroad Administration Train Accident Cause Code T111 wide gage (due to defective or missing spikes or other rail fasteners).

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1136

TRAIN SUMMARY

1. Name of Railroad Operating Train #1	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0616PD002

GENERAL INFORMATION

1. Name of Railroad or Other Entity Responsible for Track Maintenance	1a. Alphabetic Code	1b. Railroad Accident/Incident No.
Union Pacific Railroad Company	UP	0616PD002

2. U.S. DOT Grade Crossing Identification Number	3. Date of Accident/Incident	4. Time of Accident/Incident
	6/3/2016	12:11 PM

5. Type of Accident/Incident
Derailment

6. Cars Carrying HAZMAT	7. HAZMAT Cars Damaged/Derailed	8. Cars Releasing HAZMAT	9. People Evacuated	10. Subdivision
94	16	5	100	Portland

11. Nearest City/Town	12. Milepost *(to nearest tenth)*	13. State Abbr.	14. County
Mosier	69.300	OR	WASCO

15. Temperature (F)	16. Visibility	17. Weather	18. Type of Track
79 ˚F	Day	Clear	Main

19. Track Name/Number	20. FRA Track Class	21. Annual Track Density *(gross tons in millions)*	22. Time Table Direction
Main Track	Freight Trains-40, Passenger Trains-60	61.7	West

U.S. Department of Transportation
Federal Railroad Administration

FRA FACTUAL RAILROAD ACCIDENT REPORT

FRA File #HQ-2016-1136

OPERATING TRAIN #1

1. Type of Equipment Consist:	2. Was Equipment Attended?	3. Train Number/Symbol
Freight Train	Yes	ONETU 02

4. Speed (recorded speed, if available) R - Recorded E - Estimated	Code	5. Trailing Tons (gross exluding power units)	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
24 MPH	R	13117		0

6. Type of Territory

Signalization:
Signaled

Method of Operation/Authority for Movement:
Signal Indication

Supplemental/Adjunct Codes:
Q, A

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.)*	GATX 213166	22	yes		0	0
(2) Causing *(if mechanical, cause reported)*	NA	0		9. Was this consist transporting passengers?		No

10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)	a. Head End	Mid Train b. Manual	Mid Train c. Remote	Rear End d. Manual	Rear End e. Remote	11. Cars (Include EMU, DMU, and Cab Car Locomotives.)	Loaded a. Freight	Loaded b. Pass.	Empty c. Freight	Empty d. Pass.	e. Caboose
(1) Total in Train	2	0	0	1	0	(1) Total in Equipment Consist	96	0	0	0	0
(2) Total Derailed	0	0	0	0	0	(2) Total Derailed	16	0	0	0	0

12. Equipment Damage This Consist	13. Track, Signal, Way & Structure Damage
1674996	176811

14. Primary Cause Code
T111 - Wide gage (due to defective or missing spikes or other rail fasteners)

15. Contributing Cause Code

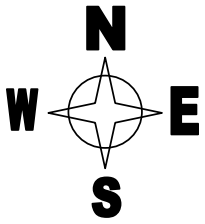
Number of Crew Members				Length of Time on Duty	
16. Engineers/Operators	17. Firemen	18. Conductors	19. Brakemen	20. Engineer/Operator	21. Conductor
1	0	1	0	Hrs: 6 Mins: 26	Hrs: 6 Mins: 26

Casualties to:	22. Railroad Employees	23. Train Passengers	24. Others	25. EOT Device?	26. Was EOT Device Properly Armed?
				Yes	Yes
Fatal	0	0	0	27. Caboose Occupied by Crew?	No
Nonfatal	0	0	0		

28. Latitude	29. Longitude
45.684417000	-121.396595000

SKETCHES

HQ-2016-1136 Site Sketch



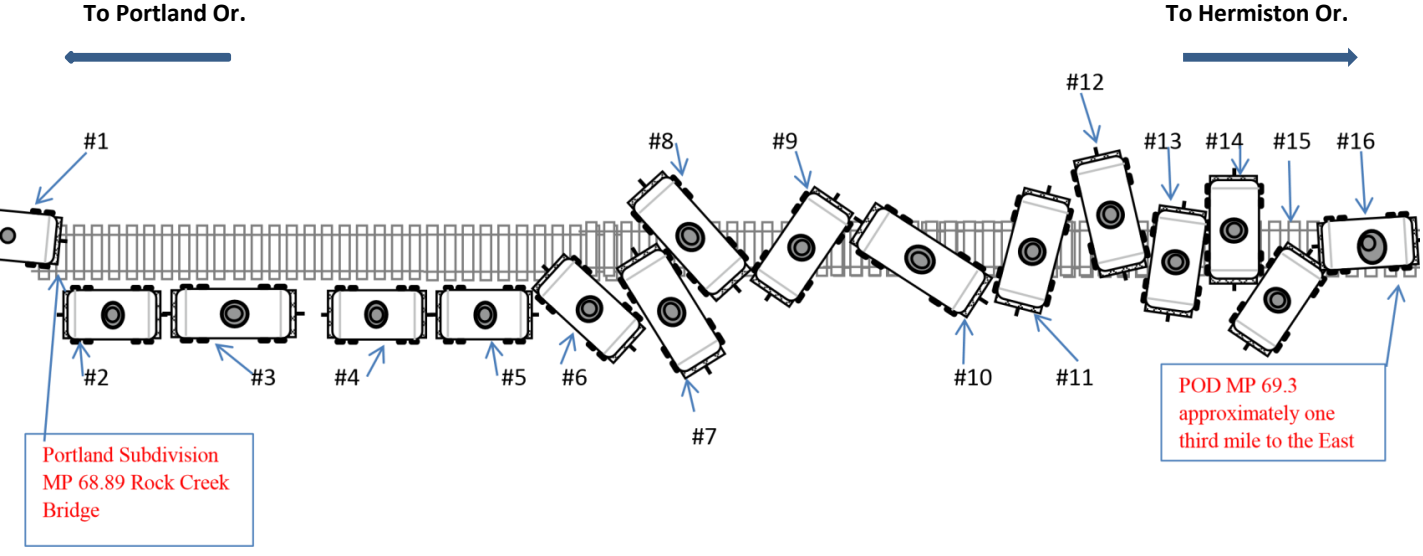
HQ-2016-1136

Not to scale

Union Pacific Railroad Derailment
Mosier, Oregon
June 3, 2016

The derailed crude oil rail cars are listed from the head end locomotive consist of the train looking east:

1. #19 GATX 213306 East end of car derailed, came to rest 432 feet west of car #20
2. #20 GATX 213166 First car to derail at POD, B end of car was down first, lying on right side
3. #21 GATX 213175 Approximately 25 feet from car #20, lying on left side
4. #22 GATX 213247 Derailed, lying on left side.
5. #23 GATX 213214 Derailed, lying on right side.
6. #24 GATX 213161 Derailed, lying on right side. Fire damaged.
7. #25 GATX 213190 Derailed, lying on right side, on fire.
8. #26 GATX 213345 Derailed, lying on right side. Fire damaged.
9. #27 GATX 213338 Derailed, lying on right side, on fire.
10. #28 GATX 213332 Derailed upright, on fire.
11. #29 GATX 213236 Derailed upright
12. #30 GATX 213341 Derailed upright
13. #31 GATX 213343 Derailed, laying on right side.
14. #32 GATX 213178 Derailed upright.
15. #33 GATX 213280 Derailed upright
16. #34 GATX 213222 Derailed upright



NARRATIVE

Circumstances Prior to Accident

On May 31, 2016, Union Pacific Railroad (UP) westbound petroleum crude oil train ONETU 02 (the train), with lead locomotive UP 5554, was released for shipment to the Canadian Pacific Railway (CP) at the petroleum crude oil loading facility in Newtown, North Dakota, with a destination of Tacoma, Washington. CP performed an extended haul inspection on the train at CP's Moose Jaw Yard in Saskatchewan, Canada on June 1, 2016, in accordance with UP's extended haul plan for the train. CP removed four tank cars from the train at Moose Jaw Yard due to the inspection revealing thin wheel flanges. CP delivered the train to UP at Eastport, Idaho at 2:00 p.m., PDT, on June 2, 2016, and the train continued to Hinkle Yard in Hermiston, Oregon, arriving June 3, 2016, at 6:05 a.m., PDT. The train departed Hinkle Yard at 8:50 a.m., PDT, on June 3, 2016, after a crew change.

The train's crew consisted of an engineer and a conductor. The crew reported for duty at their away-from-home terminal at UP's Hinkle Yard in Hermiston, Oregon, at 5:45 a.m., PDT, on June 3, 2016, after completing the required statutory off-duty period. After collecting the necessary paperwork, including the train profile and general track bulletins, the crew boarded the train at Hinkle Yard. No setouts or pickups were done en route, and the Engineer had no issues with the handling of the locomotives or the train. The crew was assigned to operate the train from Hinkle Yard to Portland, Oregon, approximately 185 miles.

Crew member interviews conducted by the Federal Railroad Administration (FRA) revealed the trip was uneventful prior to the derailment, and the second unit of the head-end locomotive consist was isolated as it was not required for power.

Immediately prior to the derailment, the Engineer stated the freight train management system instructed him to throttle up to notch 5 on the locomotive controls. The Engineer stated that he complied with the instructions, and felt a "tug". He returned the throttle back to notch 4. At this point, the train experienced an emergency brake application.

As the train approached the derailment area, the Engineer was seated at the controls of the leading locomotive on the north side of the locomotive, and the Conductor was seated on the south side of the locomotive.

The geographic and railroad timetable direction for Portland Subdivision is west. Timetable directions are used throughout this report.

Beginning at Milepost (MP) 70 and moving to MP 69, the track grade ascends an average of 0.15 percent, and then descends to a level track grade of 0.00 percent as it moves toward MP 68.0. As the train approached the derailment site heading west towards Mosier, Oregon, along single main track, it traversed a series of curves and tangent tracks. Beginning at MP 69.75, the train first traversed a 304-foot, 1-degree, 27-minute curve to the left, followed by 580 feet of tangent track that leads into a 555-foot, 2-degree, 21-minute curve to the right, followed by 317 feet of tangent track running into the west Mosier switch at MP 69.4. From the point of the west Mosier switch at MP 69.4, the train traveled 740 feet to the point of derailment (POD) at MP 69.3, which is nearing the middle of a 1,256-foot, 5-degree, 15-minute curve to the right with 2-½ inches of super-elevation on a 0.15-percent ascending grade.

The track throughout the accident area is continuous welded rail (CWR). Both the north rail (low rail) and the south rail (high rail) of the curve are 136 pound-RE rail sections manufactured by Nippon Steel. The high rail was manufactured in March 2013, and installed in 2013. The low rail was manufactured in November 2007, and installed in 2008. The track area was last surfaced and lined in 2013. The track ballast is crushed stone consisting mostly of trap rock. The tie cribs (the open areas between the ties) appear full with ballast, with an average of 12 inches of shoulder ballast. The track on average is six to eight feet above the ditch line.

The track is constructed with treated mixed wood crossties 7-inch by 9-inch by 9-feet. The rail rests on tie plates with an average spacing of 19-½ inches between tie centers. The north rail (low rail) rests on conventional double-shoulder tie plates that are 7-¾ inches wide and 14 inches long, secured to the crossties with four 6-inch long track chisel-tip cut spikes to fasten the rail to the plate (two rail-holding and two anchor spikes, one in each quadrant of the plate).

The south rail (high rail) rests on tie plates that accommodate a McKay-style (Safelok) resilient fastening system. The resilient fasteners secure the rail to tie plates that are 8 inches wide and 16 inches long. The tie plates are then secured to the crossties by four 6-½ inch long rectangular head timber coach screws, commonly referred to as a lag screw, which fastens the rail in the proper position. The spike pattern is one lag screw in each of the four lag holes connecting the tie plate to the crosstie.

The Accident

The train approached the derailment site at MP 69.3 traveling westward towards Mosier, Oregon, at a recorded speed of 24 mph. The maximum authorized speed for freight trains at the derailment location is 30 mph, as designated in SI-02 in the Portland Subdivision section of current UP Timetable No. 6, dated October 13, 2014.

The investigation revealed that the two lead locomotives, one buffer car, and the first 17 loaded tank cars traversed through the derailment site and remained on the track. A total of 16 tank cars, running from position 19 through 34 (measured from the head of the train), derailed. Three of the derailed petroleum crude oil tank cars caught fire. The train crew immediately reported to UP's dispatcher that they could see a plume of smoke and were located at approximately MP 68.5.

As 3 of the 16 derailed cars caught fire, Wasco County Sheriff's Deputies ordered a partial evacuation of the local population of Mosier, Oregon. A school and approximately 100 residents from an area about ¼-mile around the accident were evacuated. Interstate 84 was closed in both directions for several hours. Residents were allowed to return to their homes on Sunday evening, June 5, 2016. A Unified Command structure led by the United States Environmental Protection Agency (EPA) was formed to coordinate the emergency response.

The POD was determined to be at MP 69.3, (GPS Coordinates 45° 41' 0.4308" N; 121° 23'50.262" W and latitude 45.684417, longitude 121.396595), with the general pile-up occurring between the Highway 30 overpass at MP 69.06, and the Rock Creek Bridge at MP 68.89.

Following the derailment, the train crew was instructed by the dispatcher to take their paperwork, leave the train, and head for a safe place. The crew was later transported to the Hood River Hospital in Hood River, Oregon for Federal Post-Accident Toxicological Testing.

The rear portion of the train with 61 non-derailed oil cars and one buffer car was pulled east to The Dalles, Oregon by a relief crew and secured. The head-end portion of the train was later pulled to the

Albina Yard in Portland, Oregon by another relief crew.

Hazardous Materials

Due to the derailment, 5 of the 16 derailed cars released 339,581 liquid-pounds of petroleum crude oil labeled with a Hazardous Material UN Code of 1267, Class 3, Packing Group I. The tank cars in the train were general purpose specification DOT-111 tank cars, modified to the Association of American Railroads (AAR) CPC-1232 standard. The cars were equipped with full-height head shields and metal jackets with insulation. The cars did not have thermal protection. These cars are commonly referred to as "jacketed 1232s." Each tank car has the capacity of holding approximately 29,200 gallons of petroleum crude oil.

Of the 16 derailed cars, nine ended up on their side, five released product, and three caught fire. Below is a list of the 16 petroleum crude oil rail cars that derailed and the amount of product, if any, released from each car:

Position in Train	Car Number	Comments	Volume Released
19	GATX 213306	Upright	N/A
20	GATX 213166	On right side	N/A
21	GATX 213175	On left side	N/A
22	GATX 213247	On left side	N/A
23	GATX 213214	On right side	N/A
24	GATX 213161	On right side	36 liquid lbs.
25	GATX 213190	On right side, fire	190,339 liquid lbs.
26	GATX 213345	On right side	N/A
27	GATX 213338	On right side, fire	36 liquid lbs.
28	GATX 213332	Upright, fire	148,810 liquid lbs.
29	GATX 213236	Upright	N/A
30	GATX 213341	Upright	N/A
31	GATX 213343	On right side	N/A
32	GATX 213178	Upright	360 liquid lbs.
33	GATX 213280	Upright	N/A
34	GATX 213222	Upright	N/A

There were no fatalities or injuries resulting from a direct exposure to the release of the petroleum crude oil.

Emergency Response

The Mosier Volunteer Fire Department responded quickly to the derailment of the train on June 3, 2016. The Mosier Fire Chief assumed the role of the local incident commander working with the Wasco County Sheriff's Office and other nearby State and local resources. The Mosier Community School located near the derailment was evacuated, and students were transported to a school in The Dalles, Oregon, about 20 miles east of Mosier. The Wasco County Sheriff's Office began evacuating residents located in a ¼-mile radius around the derailment area. Later in the day, a formal Unified Command structure was

established and led by the EPA with Mosier Volunteer Fire Department and Rescue, Oregon Department of Environmental Quality, Washington Department of Ecology, Yakama Nation, and UP. Fifteen fire departments assisted the Mosier Volunteer Fire Department and UP responders in putting out the fire. UP hazmat response employees and response contractors from Portland, Oregon, arrived on-scene and began the cooling and extinguishing phase of the crude oil fire. UP utilized two foam trailers equipped with master streams, foam, hoses, and other appliances for the operation. All the other fire and hazmat agencies supported UP's hazmat response employees. Environmental and hazmat resources began arriving and staging to monitor and control the oil spill. Air monitoring was set up during the fire, along with containment between the oil spill and Rock Creek, and in the Columbia River near the mouth of Rock Creek. Cooling initially consisted of both trailers aiming master streams at the hot cars, and was reduced to one master stream around 8:48 p.m., PDT, on June 3, 2016. The fire was extinguished after about 10 hours of cooling at around 2:00 a.m., PDT, on June 4, 2016. Ten gallons of Alcohol Resistant-Aqueous Film Forming Foam (AR-AFFF) Class B concentrated foam solution was used. FRA Inspectors were allowed access to the derailment area at 5:00 a.m., PDT, on June 4, 2016. The cleanup and restoration phase began at that time.

Analysis and Conclusions

Analysis - FRA Post Accident-Toxicological Testing: The accident/incident met the criteria for FRA Post-Accident Toxicological Testing, as required under Title 49 Code of Federal Regulations (CFR) Part 219, Subpart C.

Conclusion: Test results were negative for both the Engineer and Conductor.

Analysis - Locomotive Event Recorder: FRA obtained data from the event recorder on leading Locomotive UP 5554 for analysis.

Conclusion: Data analyzed from the printout of the leading locomotive's event recorder indicated the train was being operated at 24 mph at the POD. The event recorder also indicated no unusual events related to train handling.

Analysis - Crew Fatigue: FRA obtained fatigue-related information for the members of the train crew for the 10-day period preceding the derailment.

Conclusion: Upon analysis of this fatigue-related information with FRA's Fatigue Analysis Scheduling Tool (FAST) program, FRA concluded that fatigue was probable for both crew members, and that the employees may have been working at a diminished level of safety (effectiveness) due to mental and/or physical attributes associated with fatigue. However, FRA determined that fatigue was not a contributing or causal factor to this accident/incident, and that any action, or lack of action, by the employees would not have prevented this accident/incident.

Analysis - Locomotive Camera: The outward-facing video from leading Locomotive UP 5554 was viewed by FRA.

Conclusion: FRA was unable to determine any conclusive causal factors from the outward-facing video as the train approached the derailment site.

Analysis - Motive Power and Equipment: A complete inspection was performed on all the locomotives, the cars which remained on the rail, and on the available components of the wreckage once the fire had been extinguished.

Conclusion: No pre-existing FRA defects were noted during the inspection. Some defects that occurred

during the derailment were noted and recorded. The inspection team identified the first wheel set to derail (GATX 213166) in the general pile-up. No mechanical factors were causal or a contributing factor in the accident.

Analysis - Hazardous Materials: An FRA Hazardous Materials Inspector reviewed the paperwork and handling of the cars from both the shipper and the railroad.

Conclusion: UP Train ONETU 02 was a unit "key train" with a total of 94 tank cars containing petroleum crude oil, which is designated by the U.S. Department of Transportation (USDOT) as hazardous for commercial transportation purposes. Commercial transport of petroleum crude oil is subject to the regulatory requirements of the Hazardous Materials Regulations (HMR) in 49 CFR Parts 100–185. The train was transporting a shipment of Bakken crude oil from New Town, North Dakota, to the US Oil and Refining Company in Tacoma, Washington. FRA determined there were no exceptions to UP's hazardous material paperwork.

Analysis - Lag Screws: A sample of lag screws from the Mosier derailment was sent to the John A. Volpe National Transportation Systems Center (Volpe) in Cambridge, Massachusetts. Volpe provided the sample to an independent laboratory for analysis outside of the USDOT.

Conclusion: The independent laboratory analysis revealed generally that material fatigue of the lag screws was likely exacerbated by the heavy corrosion on the screws.

Analysis - Track Geometry Evaluation Car Data: FRA obtained track geometry evaluation car (test car) data from within FRA and from UP for analysis.

Conclusion:

While the methodology is not required by Federal Regulations, UP conducted automated track geometry car testing of the accident/incident subdivision on numerous occasions in the year preceding the derailment. FRA also performed its own automated track geometry car testing on the accident/incident subdivision during this time.

FRA track geometry test car DOTX 220/218 traversed the subject area on September 29, 2015. A review of the report revealed no defects were noted in the accident area.

UP track geometry test car EC4 traversed the accident area on April 27, 2016. A review of the report revealed no defects were noted in the accident area.

UP track geometry test car EC602 Evaluation Test Car traversed the area of the derailment on May 11, 2016. The EC602 Test Car is a highway/rail truck mounted system that takes static geometry measurements of the track structure without placing load on it. The American Railway Engineering and Maintenance-of-Way Association requirement for standard track gage is 56-1/2 inches.

The May 11, 2016, report for EC602 indicated a tight gage measurement of 55-15/16 inches in the area around the POD. This reflects a 9/16-inch deviation from standard gage, which (if visually inspected and verified in the field) would be 1/16-inch less than the minimum gage of 56-inches allowable by FRA's Track Safety Standards for this class of track. However, FRA regulation at 49 C.F.R. § 213.13 requires that when a gage measurement is taken on track that is not under load, lateral rail movement, if any, that occurs when the track is loaded must be added to the measurement. The lateral movement is the distance the rail moves laterally or pushes outward, thereby widening the gage. However, the track at this location was damaged during the derailment and no visual inspection was made prior to the derailment to determine lateral movement. Consequently, FRA cannot conclude the gage was tight at

this location, but only that no verification of the tight gage condition occurred and no record indicating rail movement was available.

Analysis - FRA Track Inspection: The derailment occurred in a five-degree, 15-minute right-hand curve on a single main track while the train was traveling westward between MP 69.30 and MP 69.31 on UP's Portland Subdivision. The derailment occurred approximately 740 feet past the west switch at MP 69.4 in Mosier, Oregon. FRA and the Oregon Department of Transportation's track investigation team conducted a thorough investigation into possible contributing and/or probable causal factors resulting from track-related issues. This included a walking inspection on either side of the POD at UP MP 69.3.

Conclusion: After navigating the west switch at Mosier, Oregon, and as the train proceeded through a tangent section of track, the train entered a five-degree, 15-minute curve with a track super-elevation of 2-½ inches. In the westward direction of the train's travel, the south rail (the high rail of the curve) moved outward, creating a wide track gage condition, and rolled the north rail (the low rail of the curve) outward in the opposite direction, permitting the train wheels to fall inside the gage line of the track on the low side and derailing the train.

After examination of the derailment site, it was determined the track's wide gage condition was due to the failure of the track's rail screw spike fasteners (lag screws) to adequately restrain the rail laterally when dynamic loading of the track occurred. The ensuing investigation at the POD revealed that 19 consecutive crossties over a span of 33 feet, 3 inches had rail screw spike fasteners that were either sheared or broken approximately 2-½ inches below the bottom of the crosstie plate. Upon further investigation, it was determined that the sheared and/or broken screw spike fasteners were in various stages of failure, ranging from having been previously broken over a long period of time (with little or no clean surface fractures), to having first- and second-stage fatigue markings with both old and new stress fractures.

No witness marks were present to indicate a damaged wheel or other rail damage prior to the POD. Evidence of insecure rail lag screw fasteners associated with the McKay-style (Safelok) resilient rail fastening system was present in this track segment at the time of derailment. East of the POD, from the direction of train travel, numerous examples of sheared, broken, and loose lag screws were found. Within 70 feet of the POD, groupings of two or more lag screws, and often all four, that secure the McKay-style (Safelock) tie plates to the tie were missing or broken in every tie. This rendered the tie plate fasteners ineffective in securing the rail to the crosstie. Throughout the curved track segment ahead of the POD to the east, there was visible evidence of lateral deflection marks where the rail had been pushed outward and the track gage rapidly widened to an unsafe measurement.

Analysis - Weather Conditions: The ambient temperature on June 3, 2016, was 79° Fahrenheit. It was daylight with clear visibility.

Conclusion: There was no indication of track surface conditions or rail misalignment caused by heat.

Contributing Factors

After a thorough investigation of train handling, locomotive and car condition, signaling systems, and hazardous materials records and handling, FRA investigators did not identify evidence to suggest any contributing factors.

Probable Cause

The probable cause of the accident/incident was T-111 wide gage due to defective or missing spikes or other rail fasteners.