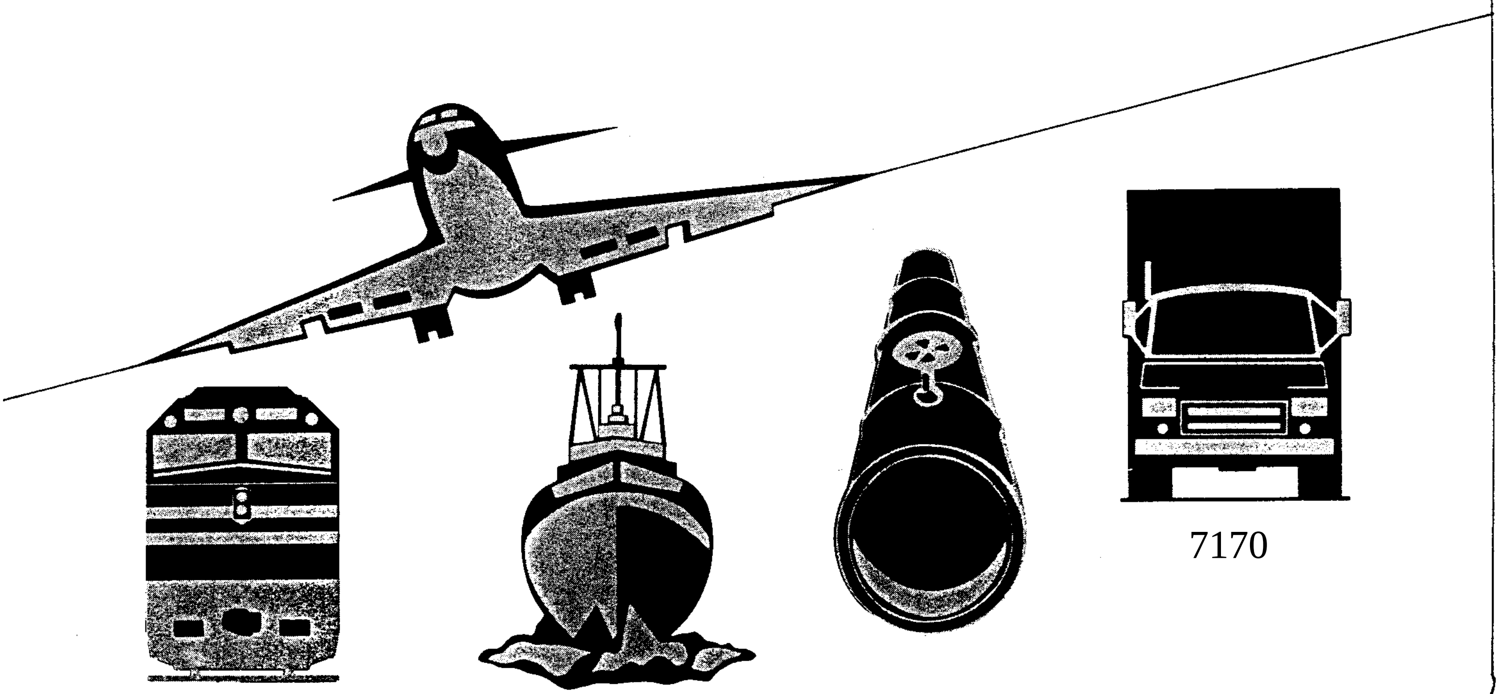
PB99-916301
NTSB/RAR-99/01

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

RAILROAD ACCIDENT REPORT

DERAILMENT OF CSX FREIGHT TRAIN Q316 AND SUBSEQUENT HAZARDOUS MATERIAL RELEASE AT COX LANDING, WEST VIRGINIA JUNE 20, 1998



National Transportation Safety Board. 1999. ***Derailment of CSX Freight Train Q316 and Subsequent Hazardous Material Release at Cox Landing, West Virginia.*** **Accident Report NTSB/RAR-99/01. Washington, DC.**

Abstract: About 12:37 p.m. eastern daylight time on Saturday, June 20, 1998, 30 of the 148 cars making up eastbound CSX Transportation, Inc., train Q316 derailed at Cox Landing, West Virginia. Of the derailed cars, three were loaded with hazardous material, and eight others contained hazardous material residue. Two of the loaded cars were damaged in the pileup and leaked a combined volume of about 21,500 gallons of formaldehyde solution. No one was injured during the derailment of the train; however, 15 persons reported minor injuries as a result of the release of formaldehyde. Total damages in the accident exceeded $2.6 million.

The major safety issue identified in this investigation was inadequate roadbed drainage and resulting roadbed instability on a portion of the CSX Ohio River Subdivision. The analysis also addresses overall track conditions on this line and the likelihood that a particular railcar could have been at fault in the accident. Finally, the analysis addresses the emergency response to this accident, with particular emphasis on communication and coordination within and among the responding agencies.

As a result of its investigation, the National Transportation Safety Board issued safety recommendations to the Federal Railroad Administration, to CSX Transportation, Inc., to Cabell and Wayne Counties' Local Emergency Planning Committee, and to Mountaineer Gas Company.

The National Transportation Safety Board is an independent Federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous materials safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The Safety Board makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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Railroad Accident Report

Derailment of CSX Freight Train Q316 and Subsequent Hazardous Material Release at Cox Landing, West Virginia June 20, 1998

NTSB/RAR-99/01
PB99-916301
Notation 7170
Adopted June 29, 1999

National Transportation Safety Board
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

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Executive Summary

About 12:37 p.m. eastern daylight time on Saturday, June 20, 1998, 30 of the 148 cars making up eastbound CSX Transportation, Inc., (CSX) train Q316 derailed at Cox Landing, West Virginia. Of the derailed cars, three were loaded with hazardous material, and eight others contained hazardous material residue. Two of the loaded cars were damaged in the pileup and leaked a combined volume of about 21,500 gallons of formaldehyde solution. No one was injured during the derailment of the train; however, 15 persons reported minor injuries as a result of the release of formaldehyde. Total damages in the accident exceeded $2.6 million.

The National Transportation Safety Board determines that the probable cause of this derailment was an unstable roadbed that resulted from the inadequate or ineffective measures taken by CSX Transportation, Inc., to permanently correct known drainage problems in the accident area.

The major safety issues identified in this investigation were the track and roadbed conditions on the CSX's Ohio River Subdivision, the effectiveness of Cabell County's emergency response procedures, the effective use of available hazardous materials information, and the coordination of safety-critical operations during wreckage-clearing operations.

As a result of its investigation, the National Transportation Safety Board makes safety recommendations to the Federal Railroad Administration, to CSX Transportation, Inc., to Cabell and Wayne Counties' Local Emergency Planning Committee, and to Mountaineer Gas Company.

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Factual Information

Accident Narrative

At 11 a.m. eastern daylight time on June 20, 1998, a two-person train crew consisting of an engineer and a conductor went on duty at Huntington, West Virginia, to take CSX Transportation, Inc., (CSX) freight train Q316 to Parkersburg, West Virginia. (See figure 1, top.) The crew received the train, consisting of 2 locomotives, 97 loads, and 51 empties, from the inbound crew at 11:30 a.m. The train contained several types of hazardous materials, including several carloads of formaldehyde and a 14-car block of liquefied petroleum gas. The conductor recorded a departure time from Huntington Yard of 12:01 p.m.

The train proceeded through Huntington on the main track at about 12 mph and, at 12:30 p.m., diverged to the Ohio River Subdivision for the northbound (designated east by the timetable) trip to Parkersburg. The crew had been authorized to proceed at track speed, and the engineer stated he applied power steadily after the entire train was on the 30-mph track in order to bring the train quickly up to the timetable speed of 30 mph.

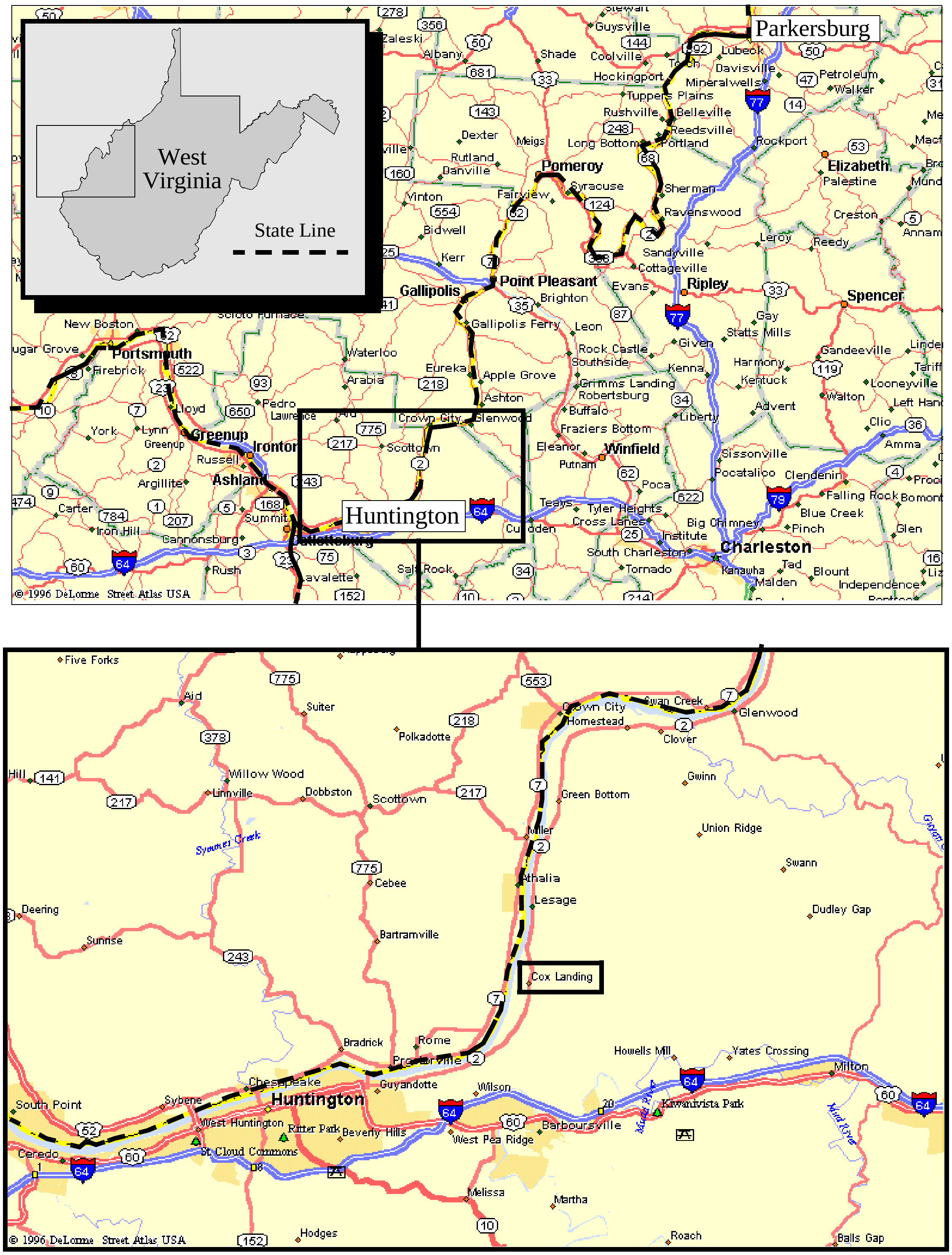
The crewmembers told the Safety Board that other than the fact that their train was longer and heavier than normal, they considered the assignment a routine tour of duty. They said they observed nothing unusual about the track or equipment and experienced no irregularities in the handling of the train as they approached Cox Landing, West Virginia.

According to locomotive event recorder data, the train brakes went into emergency application at 12:37 p.m.,[1] when the train was traveling 27 mph. At this time, the locomotive throttle had been in the eighth notch, the maximum power position, for 7 minutes 19 seconds. The throttle remained in this position for 17 seconds after the emergency brake application. The engineer stated that he kept the throttle in this position in an effort to keep the train stretched during the brake application to reduce the possibility of jackknifing cars.

The crewmembers said they felt no slack action on the head end of the train before, during, or after the train went into emergency and that the head end of the train came to a smooth stop. The crewmembers said they immediately contacted the CSX train dispatching center in Jacksonville, Florida, to inform the train dispatcher of the emergency brake application and the location of their train.

The crewmembers stated that they did not know why the train went into emergency and that they discussed possible reasons as the conductor prepared to walk back along the train to find the cause. The engineer said he noticed that when he attempted

[1] Train air brakes are applied in response to reductions in train line pressure. (See note 2.) In normal operations, the locomotive operator initiates the pressure reduction, but a broken or disconnected train line will result in an instantaneous loss of pressure that will cause an immediate full brake application.


West Virginia
State Line
Parkersburg
Huntington
Pomeroy
Gallipolis
Point Pleasant
Ripley
Spencer
Elizabeth
Portsmouth
Greenup
Ironton
Ashland
Catlettsburg
Winfield
Charleston
South Charleston
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Five Forks
Suiter
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Swann
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Linnville
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Scottown
Miller
Athalia
Lesage
Cebee
Bartramville
Dudley Gap
Deering
Sunrise
Cox Landing
Bradrick
Rome
Proctorville
Howells Mill
Yates Crossing
Milton
Chesapeake
South Point
Sybene
West Huntington
Guyandotte
Wilson
Kiwanuvista Park
Barboursville
Ritter Park
Beverly Hills
West Pea Ridge
Ceredo
St Cloud Commons
Melissa
Martha
Hodges
Roach
Balls Gap
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Figure 1.

to recharge the train line after the emergency brake application, the telemetry device did not indicate an increase in air pressure at the rear.[2] He suggested that the conductor take an air hose and a wrench with him in case an air hose had failed.

The conductor said that he took the train's consist, which included hazardous material shipping papers and emergency response information, with him as he dismounted the locomotive. He said that as he walked toward the rear of the train, he heard sirens and became concerned about the seriousness of the problem. He said that after walking about 3/4 mile, he came to the 74th car of the train and noticed that its rear trucks had derailed. He said he also noticed that the train had separated several cars behind the 74th car and that numerous other cars had derailed. About 12:58 p.m., he notified the CSX train dispatcher of the derailment. (See figure 2.) The engineer remained on the lead engine in case it became necessary to move the head end of the train and to have the use of the stronger radio transmitter located on the locomotive.

Of the 30 cars that had derailed, 3 were loaded cars of hazardous material, and 8 others contained hazardous material residue. Two of the loaded cars were tank cars containing formaldehyde at a 37-percent solution. Both tank cars were damaged during the pileup and eventually leaked a combined volume of about 21,500 gallons of formaldehyde solution.

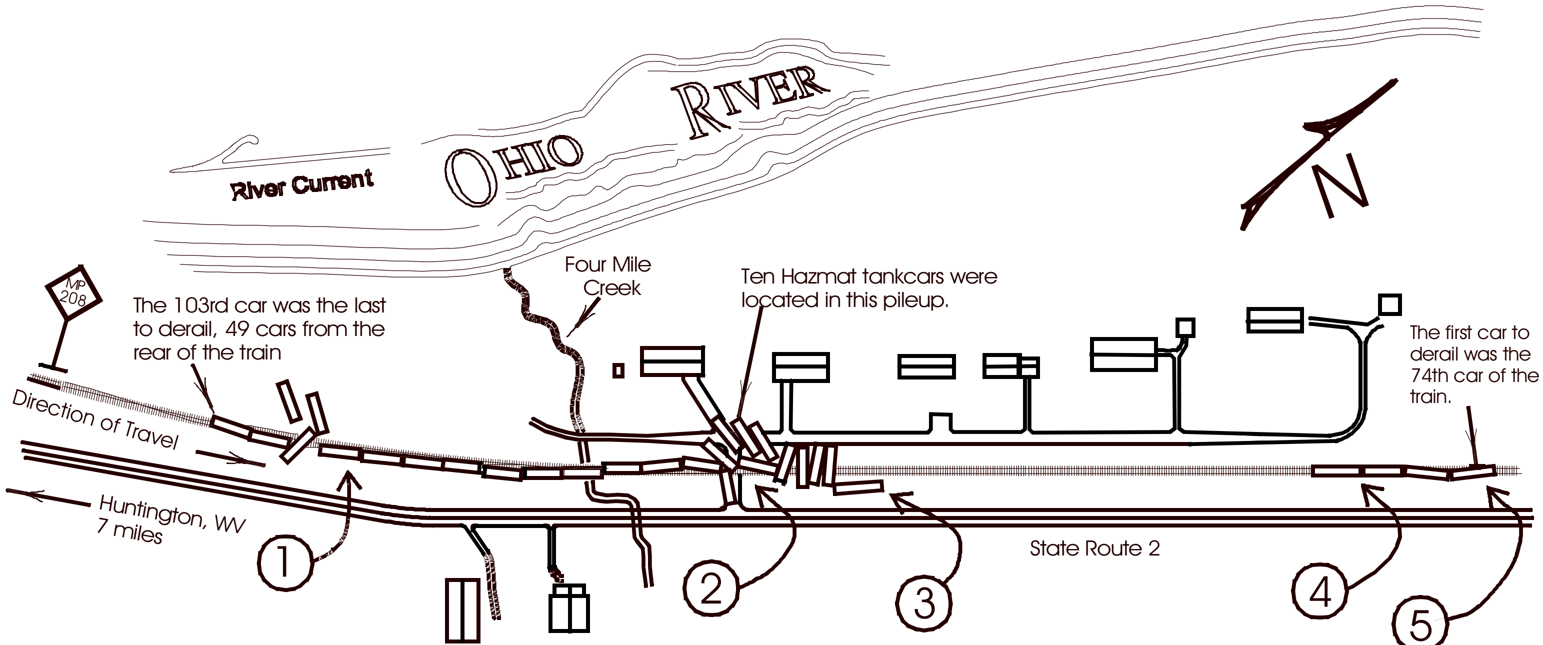
The eight derailed residue tank cars were damaged but did not leak; two were chlorine cars, three were hydrochloric acid cars, and three were sodium hydroxide cars. A derailed loaded car of molten sulfur also did not leak. Additionally, 10 derailed cars contained petroleum coke, an oily and crusty material that is environmentally harmful. Much of this product was released during the derailment and was recovered later during cleanup operations.

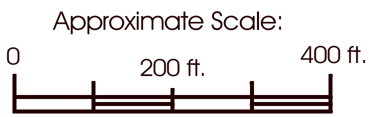
The pileup occurred near the front yards of two residences. During the derailment, a tank car struck a residential gas meter that was within 40 feet of the centerline of the track. A 2-inch gas line crossed under the tracks at this location, providing service to residential gas users on the west side of the railroad from the 6-inch gas main that paralleled the east side of State Route 2. (See figure 3.) Damage to the vertical riser of the meter caused a gas leak that lasted for several hours. No fire resulted.

Emergency Response

The initial call for emergency assistance came at 12:37 p.m. from local residents. Emergency services that were immediately dispatched to the scene included the West Virginia State Police, the Cabell County Sheriff's Department, the Huntington Police Department, the Ohio River Road Volunteer Fire Department (ORVFD), and Cabell

[2] *Train line* (sometimes referred to as the *brake pipe*) refers to the compressed-air line that extends from the locomotive, through each car, to the end of the train. The end-of-train device mounted on the last car on the train transmits the air pressure at the end of the train to telemetry devices located on the lead locomotive. After an emergency brake application, the train line must be recharged with air before the brakes can be released and the train can proceed.





1 The first wheel to derail climbed the outside rail at this location, which is about 402 feet east of milepost 208.

2 At this point, the wheels of the derailed cars displaced the outside rail, causing other cars to derail. The derailed wheels of the first loaded car contacted the crossing timbers and were radically displaced. The continued movement of this car destroyed the track structure.

3 No longer guided by the rails, this car uncoupled from the train and departed the roadbed. Reaching the ditch, this loaded car "dug in." The following cars were pushed sideways by the resulting compressive forces.

4 The first loaded car, upon being totally derailed at the crossing, radically displaced both rails, eliminating guidance for the following cars. Still coupled to the moving cars ahead, this car remained in line with the track. The train separated at this point, causing an emergency application of the brakes.

5 The third axle of this empty car was the first to derail. The lead truck did not derail, and the car remained coupled to the moving cars ahead.

Figure 2. Final resting place and point of derailment

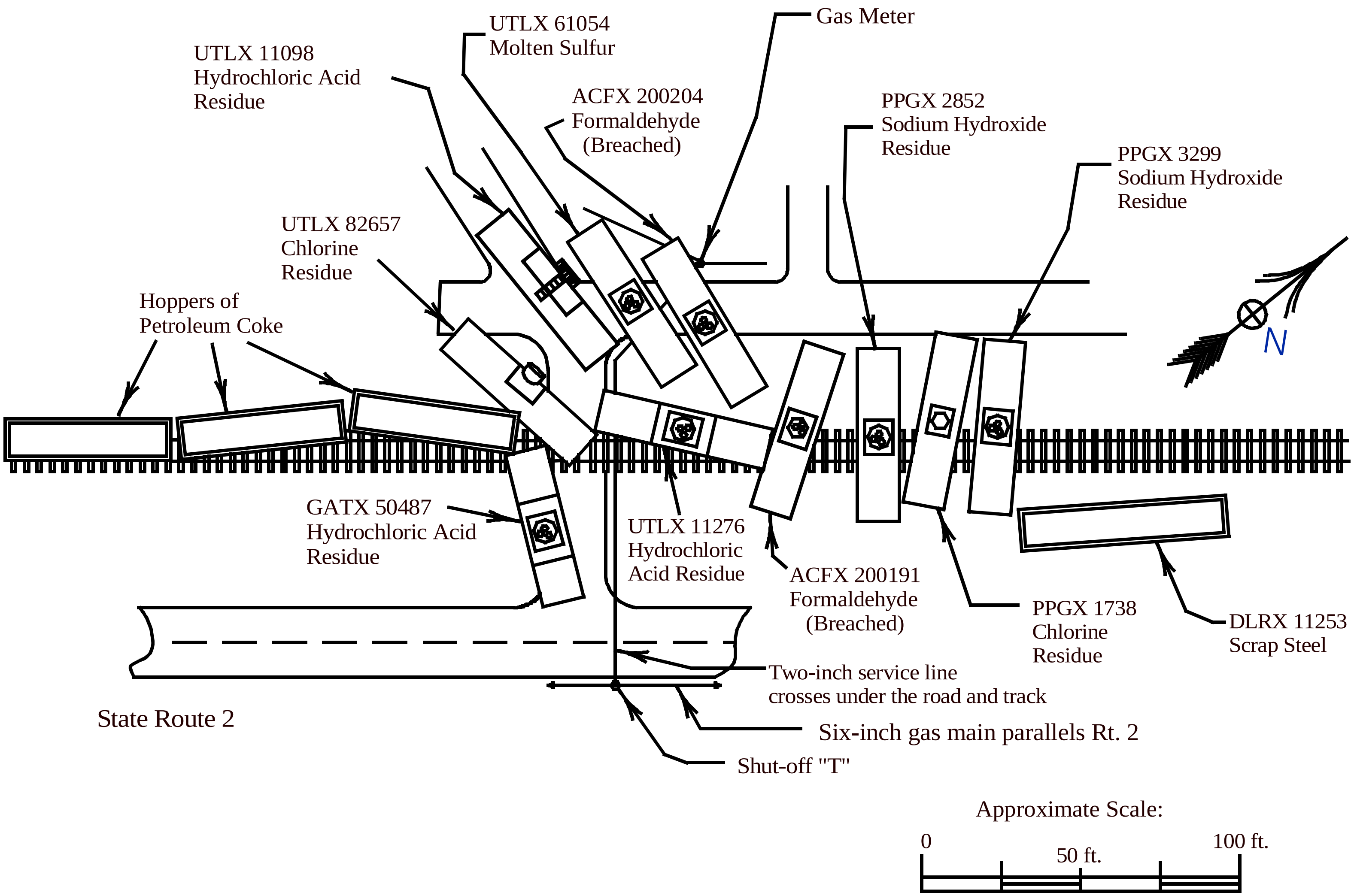


Figure 3. Overhead view of the primary pileup

County Emergency Medical Services (EMS). About 12:41 p.m., the ORVFD fire captain arrived and assumed the duties of incident commander. He established a command post and set up a roadblock at the south end of the derailment site. At 12:43 p.m., other ORVFD units arrived and established a roadblock at the north end of the derailment site. At this time, emergency response personnel evacuated local residents from homes in the immediate area. Four other fire departments also responded to provide mutual aid assistance to the ORVFD. During the initial evacuation, responders reported to the incident commander that some residents were complaining of respiratory problems, indicating a "probable" release of hazardous materials. The incident commander then widened the evacuation area to a 1/2-mile radius of the site. About 500 residents were eventually evacuated.

About 1:30 p.m., after walking the train and identifying the derailed cars, the train conductor reported to the command post. About this time, the ORVFD assistant fire chief arrived and assumed incident command from the fire captain. The train conductor, after identifying the contents of the derailed cars, remained at the accident scene for about 3 1/2 hours. During this time, he gave the emergency responders one of the two copies of the train consist, including the hazardous materials information, and also worked with them to confirm identification of the leaking chemical.

While the emergency responders identified the hazards posed by the natural gas leak and the damaged hazardous materials tank cars, immediate emergency plans were being formulated. During this period, emergency responders monitored both the natural gas leak and the chemical leaking from the breached tank cars, as well as the hazards presented by the other derailed hazardous material tank cars. At 1:02 p.m., public safety officials contacted the pipeline operator and requested that a service crew shut off gas service in the immediate area of the site. Because the condition of the other damaged tank cars, particularly those containing chlorine residue, was being assessed by chemical safety specialists, the incident commander held the pipeline operator's service crew away from the derailment area.

During this time, according to gas company officials, the gas service crew attempted to isolate the site remotely using the gas main shutoff valves located about 1 1/2 miles north and 1/2 mile south of the derailment area. In consideration of the impact of shutting off service to more than 400 residents and 12 industrial customers, the service crew did not close the valves but returned to the site and met with the incident commander. The incident commander then decided to allow the service crew to access the damaged riser and determine whether the 2-inch service line could be repaired.[3]

Following the initial train crew notification to the CSX dispatcher, the centralized train dispatching office notified the division superintendent and the on-call CSX environmental engineer. CSX also dispatched its local emergency contractor, Weaverton Environmental Group (WEG), located in Charleston, West Virginia, to coordinate

[3] Had the valves in the 6-inch line been closed, the residual gas would have continued to escape from the broken riser, at reduced pressure, for at least an hour.

emergency abatement and site remediation. Since this accident occurred during nonbusiness hours, workers were contacted at home and responded to WEG headquarters to pick up equipment before continuing approximately 45 minutes to the scene. The WEG response team arrived on site about 3 p.m. Within several hours, the CSX environmental engineer arrived at the scene. The West Virginia Division of Environmental Protection (WVDEP) monitored the site remediation activities.

The Cabell County EMS director, who was also community emergency coordinator for Cabell County, had arrived at the accident scene about 2:20 p.m. After conferring with the incident commander and conductor, the EMS director contacted Dupont's hazardous materials group in Belle, West Virginia, to request technical assistance. About 3:30 p.m., the Dupont Chlorine Emergency Response Team arrived on scene and conducted an initial assessment. The team determined that:

- The chlorine tank cars, although damaged, had not leaked and the formaldehyde cars were the only cars releasing product.
- The released chemical appeared to be contained in a ditch beside the cars.
- At least 20,000 to 25,000 gallons of formaldehyde had been released, and an additional 5,000 gallons would likely be released during the next several hours.

About 5 p.m., the gas service crew capped the 2-inch service line at the damaged riser and marked the area to give the wrecking crews an indication of the service line location. The CSX manager of environmental hazardous materials, who was in charge of the wreckage-clearing operations, said he was aware that the gas service crew had been asked by the incident commander to shut down gas in the area, and he assumed that the 2-inch line was secured. Railroad personnel in charge of cleanup operations stated that they would not have conducted wreckage-clearing operations had they known that the service line had simply been capped and was not isolated. Under the environmental remediation protocol between the WVDEP and CSX, the entire site required extensive excavation because of the formaldehyde spill, and the service line needed to be removed as soon as possible. Also, emergency response personnel said soil conditions were causing heavy excavation equipment to sink at least 12 inches at some locations near the partially buried and damaged service line.

Before leaving the site, the pipeline operator asked that the service crew be called back to the area when the tank car was removed from the riser so that they would be available in case the service line was broken. The next day, Sunday, June 21, the gas company was called as the wreckage-clearing activities moved to the area of the riser. A gas company employee reported to the command post about 5 p.m. to stand by in case he was needed. About 5:40 p.m., a formaldehyde tank was being lifted prior to removal. During the operation, the car tilted and some of the chemical from the car spilled onto the ground. In an attempt to contain the environmental damage, a wreckage-clearing contractor began immediately to use a front-end loader to scoop out the soil contaminated by the spill. In doing so, he struck and severed the gas service line. The gas employee at the command post was notified, and after determining the nature of the problem, he called a service crew to the site. By 7 p.m., the service crew had located and excavated the shut-off "tee" where the 2-inch service line branched from the 6-inch main. After cutting off the flow of gas at the tee, the service crew purged residual gas from the service line and then disconnected it.

Injuries

No one was injured during the derailment of the train; however, as a result of the release of formaldehyde, 15 persons reported minor injuries. Some of the symptoms included shortness of breath, tightness in the chest, headache, burning eyes, sore throat, and burning skin. Subsequently, 3 (2 local residents and a member of the environmental cleanup crew) of the 15 injured were treated by EMS personnel at the scene and were not transported to a medical facility. The remaining 12, including 9 emergency responders, the conductor, and 2 local residents, were taken by ambulance to two local hospitals. All patients were treated and released the same day.

Damage

Track and Roadway

Forty-three track panels were required to replace 1,675 feet of heavily damaged or destroyed track. In addition, the track ballast and subballast had to be removed from the area of the formaldehyde spill. The general pileup of the cars destroyed all the track material in the vicinity of the private crossing at milepost (MP) 207.8. Track damage was $164,000.

Equipment

Equipment damage was almost $500,000. Of the 30 cars derailed, 13 were empty or contained only residue, and 17 were loaded. All 10 tank cars involved in the primary pileup, including the formaldehyde cars, were destroyed.

Several tank car heads were struck during the derailment, but none of the heads were breached as a result of coupler impact. All the tank cars that were involved in the primary pileup were classified as destroyed because the estimated cost of repair exceeded the cars' value. All of these cars contained hazardous material or hazardous material residue. Two of these cars released product; eight did not.

Two loaded cars of formaldehyde, the 82nd and 83rd cars in the train, both leaked product. Car ACFX 200191, a tank car built in 1995 to DOT specification 111A, was struck on the right side by the coupler of the following tank car. The coupler punctured the middle of the car, creating a rectangular hole approximately 16 inches by 22 inches.

The other formaldehyde car, ACFX 200204, also a tank car built in 1995 to DOT specification 111A, was severely damaged during the derailment and showed evidence of impact with other equipment, track material, and the ground. This car leaked product both from a puncture in the bottom of the car and through tears in the shell adjacent to the tank car head.

Environment

Formaldehyde mixes easily with water and is absorbed into soil rapidly. The CSX environmental contractor determined that no formaldehyde was carried away in surface water; therefore, none of it reached the Ohio River. Approximately 11,000 gallons of formaldehyde were recovered from pools on the ground. About 10,500 gallons were absorbed by the soil and had to be removed by excavation after re-railing operations were completed. About 4,750 cubic yards of formaldehyde-contaminated soil and petroleum coke were excavated, placed in roll-off boxes (large dumpster-like rubbish containers transported by truck), and temporarily staged at the CSX yard in Barbourville, West Virginia. Soil excavation was completed within the CSX right-of-way by June 23 and within the adjacent private properties by June 28. The cost of the environmental cleanup was $1.8 million.

Wreckage-clearing and material-transfer activities damaged about 1/4 mile of State Route 2. The derailment also partially destroyed an access road and two private driveways. Residential lawns were damaged by contamination and the resultant environmental cleanup. The cost of paving roadways, landscaping, and repairing utilities was $155,000.

Train and Operations Information

The accident occurred on the CSX Ohio River Subdivision, which is the western edge of the CSX Cumberland Coal Business Unit. This business unit comprises 17 subdivisions and 713 miles of track. The Ohio River Subdivision consists of about 200 track miles extending from Wheeling to Huntington, West Virginia, where it joins a trunk line of the C&O Business Unit.

Eight trains pass through Cox Landing on an average day: Q316 and Q317, three loaded coal trains, and three empty hopper trains. Several daily local trains service industrial customers to the north but turn back before reaching Cox Landing. No passenger trains operate on the Ohio River Subdivision.

Train Q316 is a daily freight train that originates at the CSX Queensgate Yard near Cincinnati, Ohio, and terminates in Cumberland, Maryland. Between Queensgate and Cumberland, train Q316 changes crews at Huntington, Parkersburg, and Grafton, West Virginia. The counterpart to the eastbound train Q316 is train Q317, a daily westbound train originating at Cumberland and terminating at Queensgate. Trains Q316 and Q317 are the only miscellaneous through-freights that operate on this portion of the Ohio River Subdivision. The trains carry carloads of general mixed freight, a large proportion of which is hazardous material requiring the display of hazardous material placards.

After being assembled in Queensgate Yard, accident train Q316 received an outbound inspection and brake test from the car department. The train was equipped with a two-way end-of-train device that was armed and tested at Queensgate. On the day of the derailment, Q316 carried 49 cars that required hazardous material placards. The 13,901-ton train was well within the locomotive tonnage ratings for the “river grade” territory as established by the Cumberland Coal Business Unit timetable.

Trains operating on the Ohio River Subdivision are governed by the CSX rules manual that contains safety rules, operating rules, hazardous material rules, restricted equipment rules, and train handling rules. Special instructions[4] are found in the CSX Cumberland Coal Business Unit Timetable No. 3. Additional special instructions are found in the current CSX system bulletin and CSX train bulletin. Supplemental information affecting the movement of trains or the safety of employees is given orally by the train dispatcher and is copied on a form attached to the train bulletin. On the day of the derailment, the crew of train Q316 had the current bulletin, No. 39651, which contained 11 itemized speed restrictions for the Ohio River Subdivision, none of which applied to the derailment location. Train Q316 had no supplemental instructions for the derailment area.

The Ohio River Subdivision is controlled by direct traffic control (DTC), which is granted by the CSX train dispatcher in Jacksonville, Florida. Authority to occupy segments of main track are radioed by the dispatcher and recorded by the conductor or engineer on the prescribed DTC form. Before entering the main track of the Ohio River Subdivision, the crew of train Q316 was granted occupancy of three specific blocks, all of which were recorded as "clear," meaning no opposing or preceding trains were present in those blocks.

Site Description and Track Information

Cox Landing (figure 1, bottom) is about 7 miles north of Huntington and about 2 miles south of the town of Lesage, West Virginia. In the area of the derailment, MP 207.9, the railroad is bounded by the Ohio River to the west and West Virginia State Route 2 to the east. The grade of the railroad is undulating, with slight, short, and varying grades. The average grade is nearly identical to that of the river. Curvature includes left and right curves of 1º to 3º, interspersed by tangent track in 1/4- to 1/2-mile increments. A small stream, Four Mile Creek, passes under the railroad through a 5-foot stone arch at MP 207.88.

The railroad is maintained as Class III track, as specified in 49 *Code of Federal Regulations* Part 213, "Track Safety Standards." Subpart 213.9 permits freight trains to operate on Class III track at a maximum speed of 40 mph. The rail is predominantly 112-and 115-pound welded rail, rolled in the mid-1940s. Double-shoulder tie plates are in place, and every other tie is box anchored.[5] The rail is secured with four spikes per tie. Safety Board investigators noted that overall tie condition in the area was poor. CSX had scheduled a tie replacement program for October 1998.

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[4] *Special instructions* are issued by the railroad to provide specific operational information or instructions that address or modify information contained in the operating manuals.

[5] The term *box anchored* indicates that rail anchors are applied to both rails on both sides of the tie, resulting in a rectangular "box" pattern.

Speed Restrictions

According to CSX track inspector reports, the Ohio River Subdivision had been known to experience recurring surface defects.[6] During such periods, speed restrictions were put in place until additional ballast could be brought in and until completion of surfacing and inspection, after which the speed restrictions were raised, then eliminated.

At the time of the accident, speed restrictions were in place on 32 segments of Ohio River Subdivision track equal to a total of 4.9 track miles. Of these 4.9 miles, 0.9 miles were reduced from the timetable speed of 30 mph to 25 mph, and 4.0 miles were reduced to a speed of 10 mph. The nearest speed restriction to the location of the derailment was at MP 197, about 10.3 miles to the east.

Track Defects Noted During the Previous Year

Track inspection reports indicated that the area in and around MP 207.9 had experienced instances of subgrade and surface problems (see table 1), and speed restrictions had been in place at various times for the area in which the derailment occurred. Track inspection records indicated that several locations near the derailment site had had recurring surface defects, many of which the track inspectors were able to repair. If the track inspectors could not themselves repair track that they determined to be unsafe at the timetable speed of 30 mph, they lowered train speeds at that location until the repairs or improvements could be made.

Company records showed that on February 3, 1998, a slow order was put in place at the accident location because of a surface defect in the spiral of the curve.[7] The outside rail of the spiral was found to be lower than the inside rail, a condition commonly referred to as “reverse elevation.” Track inspection records indicated that this condition was corrected on March 20, 1998. On May 27, another surface defect in the curve at this location resulted in a slow order that was removed when the defect was corrected the next day.

In the fall of 1997, according to CSX, two carloads of side dump material, consisting of large limestone rocks, were placed on the river side of the fill at the location of the derailment. According to a CSX track inspector, the material was added to make the fill “sturdier.” In the spring of 1998, about 1 1/2 car loads of track ballast was also distributed in the immediate area. After the track was lined and surfaced, the speed was returned to the timetable speed of 30 mph.

The track was last lined and surfaced on June 9, 1998, 11 days before the derailment. The private crossing at MP 207.7 was also rebuilt at that time. New ties were

[6] In railroad terms, *surface* refers to the vertical alignment of the rails with respect to one another. An imaginary plane can be formed on the top surface of railroad rails. This plane should be level for straight track and have the proper angle of elevation for curved track. Defects in track surface can result in one or both rails being below, or above, the intended height.

[7] A *spiral* is the section of track at the end of the tangent and beginning of the curve. Its purpose is to provide a transition from zero curvature and zero elevation to full curvature and full elevation. The rate of change in curvature and elevation should be uniform.

Table 1. Track defects found in accident area during preceding year

Date	MP 208.2	MP 208.1	MP 208	MP 207.9[a]	MP 207.8	MP 207.7	MP 207.6
Jul 1997		57.75" gage					
Aug 1997	1.75" surface deviation	1.75" surface deviation	Two bolts missing				
Aug 1997	1.75" surface deviation						
Sep 1997	2" surface deviation			2" surface deviation		2" out of line	
Sep 1997				1.75" surface deviation			
Oct 1997	Needs ballast	Needs ballast	Needs ballast	1" reverse elevation			
Nov 1997	Needs ballast	Needs ballast	Needs ballast				1.75" surface deviation
Dec 1997	1.75" surface deviation						
Jan 1998	1.875" surface deviation	2" surface deviation					Pull-apart
Jan 1998	1" surface deviation						
Feb 1998			1" reverse elevation	1" reverse elevation		1.875" surface deviation	1.875" surface deviation
Mar 1998							Irregular surface
Apr 1998							
May 1998				1.75" surface deviation			Missing bolt
Jun 1998		2.125" surface deviation					

[a]Approximate location of initial derailment.

installed in the crossing, the track was lined and surfaced, and new blacktop was put in place.

Track Inspections

The main track of the Ohio River Subdivision was inspected twice weekly in compliance with the FRA track safety standards for Class III track. Although track inspectors sometimes worked alone, most inspections on this subdivision were carried out by two employees, a track inspector and an assistant track inspector, riding in a Hy-Rail vehicle. The track inspectors visually inspected the track and roadbed and recorded any deficiencies on a daily track inspection report. When two employees inspected track together, they were expected to correct minor track defects if they had the tools and the time to safely make repairs.

The track inspectors were responsible for inspecting about 120 miles of track between Huntington and MP 90.7. According to CSX, the days of the week on which the inspections occur could vary depending on train traffic. The inspectors normally began their workday at 7 a.m., but this was often changed to 10 a.m. on days when a higher temperature was forecast, to enable the inspectors to inspect the rail as it is subjected to the heat of the day.

CSX track inspection records indicated that the section of track on which the derailment occurred was inspected about noon on June 19, after the Friday Q316 had passed through. The track inspectors had gone on duty at 10 a.m. because of the forecast for relatively high temperatures. The inspection began at Huntington and proceeded eastward. The inspectors stopped at a crossing at MP 208.8, about 1 mile west of the derailment location, and corrected a 3 1/2-inch surface defect by raising a small section of track. No information about track exceptions or work performed near the derailment area was indicated on the track inspection report. The track inspector and assistant track inspector told the Safety Board that they had not taken exception to any track conditions in the derailment area. From the time that the track was inspected until the derailment of train Q316 the following day, two loaded coal trains, one empty train, and a train containing miscellaneous freight had passed over the track.

CSX officials told the Safety Board that when planning for track or roadbed maintenance, or when establishing track inspection standards, the CSX does not differentiate between lines that carry hazardous materials and those that carry coal or other freight. They said track maintenance plans are based on traffic patterns, gross tons carried, and the condition of the line for which the maintenance is planned.

Meteorological Information

Records at the Huntington Tri-States Airport, about 10 miles from Cox Landing, showed that the lowest temperature recorded on June 20 was 62º F at 5 a.m. At 11 a.m., the temperature was 80º F. Skies were partly cloudy. Winds were calm. At 1 p.m., the temperature was 82º F; skies were partly cloudy.

Local climatological data for the Huntington Tri-State Airport indicated that the area had received 6.89 inches of rain during June. Normal June rainfall for this area is 3.51 inches. The data also showed that 4.77 inches of rain fell during an 11-day period of thundershowers, rain showers, and fog that preceded the derailment.

Tests and Research

Track and Roadbed

A major portion of the track structure at the accident site was destroyed in the derailment, hampering investigators' efforts to reconstruct the accident scenario. In the intact section of track, distinctive wheel marks on the crossties were visible, beginning at the point of the initial derailment and continuing in a recognizable pattern to the final resting position of the 74th car on the train, an empty covered hopper, car CCX 752. The marks began at about MP 207.9 at a position on the outside of the spiral leading into the 3º left-hand curve.

The first loaded car to derail and the 77th car in the train, NS 191050, carrying steel scrap, remained upright with the front portion of the train. It was observed to be derailed with all wheels on the ground between the rails. Both rails had been displaced outward by being rolled off the tie plates. Much of the rail that had been displaced from its position on the crossties was later arranged so that it could be examined in detail. No preaccident rail or joint defects were observed.

Safety Board investigators reviewed materials documenting track conditions as noted by the CSX track inspectors for the section of track that included the accident location. In the 12 months preceding the derailment, inspectors noted track defects in cross level[8] and curve elevation. When asked about the problem in maintaining the correct track surface in the area of the derailment, a track inspector said that "the track just goes down," that is, the track, once surfaced, would not continue to support the weight of trains without surface degradation.

Along its entire length, State Route 2 follows the Ohio River Subdivision, at some locations exactly paralleling the track for a distance of several miles. In the area of the derailment, the road is located on railroad property. This proximity of the highway to the railroad roadbed results in the shedding of rainwater from the highway to the railroad property between the road and the track.

Before the accident, no culverts were located in the area between MP 208 and about MP 207.6.[9] Water from rainfall and from highway runoff would collect in a ditch on the east side of the track where, according to a local resident, it would stand for extended

[8] *Cross level* refers to the height of the top of one rail in relation to the opposite rail at the same location. The cross level of a section of tangent track should generally be zero. The cross level of main line curved track will normally indicate that the outer rail is higher than the inner rail.

[9] Four Mile Creek is contained in a 5-foot stone arch at milepost 207.87; however, this is approximately 20 feet below grade and provides no drainage for ditches near the track structure.

periods. A nearby resident told the Safety Board that the ditch between the road and the track held standing water “all the time” and that water stayed in the ditch “from one rain to the next.” This resident said she used the crossing daily and the water caused the crossing to be soft and muddy.

After the June 20 derailment, CSX placed two lateral culverts under the track to provide an exit path for the water that accumulated in the area. The company also placed additional stone material to the west side (the river side) of the fill in the area of Four Mile Creek. A contoured drainage pattern was added to the fill material to help direct water away from track bed.

In November 1998, a Safety Board team conducted a visual track survey of about 20 miles of Ohio River Subdivision track to gain an understanding of then-current track conditions. The team found that numerous bridges on the subdivision had been rebuilt or replaced, and scheduled tie and rail replacement programs had been carried out. During its inspection, Safety Board investigators found examples of relatively light rail that was worn and that, specifically in areas of curvature, had head-checks.[10] Head-checks are not addressed in the current Federal track safety standards, and the rail is thus not in violation of Federal standards. CSX had been replacing this rail, particularly in areas of curvature, with 136-pound rail.

Rolling Stock

Four cars from train Q316 were examined by the Safety Board, the FRA, and CSX at the CSX Huntington car shop. Car CCX 752, as well as others immediately ahead of and behind it, were inspected to determine whether they had contributed to the derailment.

Only the trailing truck of CCX 752 derailed. Wheel abrasions were visible on the car’s center sill that indicated that the first wheel to derail was the R-2 wheel (the leading wheel on the right rear truck of the car as seen when facing in the direction of travel). The top weld of the car’s B-end (the trailing end, in this case) coupler carrier was broken. The coupler and coupler carrier also showed deep scrape marks. The car immediately behind CCX 752, car CCX 672, was also an empty covered hopper. Only the leading truck of this car derailed.

Car CCX 752 was built in 1972. It was equipped with 33-inch, curved plate wheels, and 6- by 11-inch roller bearings. Examination of the R-2 wheel did not reveal any defects likely to have caused the derailment. A small amount of tread buildup was present, but the buildup was determined to have existed for a number of years.

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[10] *Head-checks* are small defects in the running surface of the rail. They usually occur in curves and on rail that is, or has been, heavily traversed. Although usually superficial, head-checks in rail can be the source of transverse fissures that result in a sudden break in the rail. Head-checks can also inhibit the effectiveness of ultrasonic testing in detecting internal rail defects.

Both side bearings[11] from the derailed B-end of the car were missing. Marks on the side bearing cage and side bearing wear plate indicated that the side bearings were in place before the car derailed. Investigators determined that the side bearings were probably dislodged from the side bearing cage as the car bounced and vibrated along on the ballast and ties. Two side bearings of the same type and dimensions that would have been installed in this end of the car were found about 100 feet apart near the small crossing and about 400 feet from the point at which the car came to rest. Other side bearings of the correct size were used to test side bearing clearances.

After the accident, CCX 752 was moved to the CSX repair facility in Huntington for mechanical inspection. This inspection included partial disassembly of the car and truck components for measurement and evaluation of critical components. The inspection was carried out by CSX personnel under the observation of Safety Board investigators and several FRA representatives. Inspectors gave special attention to wheel profiles, suspension components, and the ride control system. No mechanical defects were found during this inspection. Specifically:

- wheel profiles were satisfactory;
- friction castings were within specifications and without abnormal wear patterns;
- springs were within tolerances;
- side bearing clearances were within specifications;
- side bearing wear plates were not defective;
- truck bolster and side frames were in satisfactory condition, except where damaged in the derailment; and
- center plate and center pin were found to be in good condition.

This car was used to transport carbon black, a relatively light, powdery material. The interior of the car was examined to eliminate the possibility of instability caused by a partial load. The residue in the car was determined to be insufficient to have caused instability.

After the inspection, and as required by Association of American Railroads (AAR) specifications, CSX replaced the wheels and axles of the truck that had derailed and performed other repairs to enable the car to be safely moved. Subsequently, the car owner directed that the car be moved to the National Railcar Company in Roscoe, Texas, for completion of repairs, including the installation of a new truck bolster and one side frame.

On February 26, 1999, car CCX 752 was involved in another CSX derailment about 33 miles from Cox Landing. The Safety Board again examined CCX 752 in detail to determine if the mechanical condition of this car could have caused, or contributed to, that derailment. Safety Board examination of the car after the second accident revealed that the

[11] *Side bearings*, located near each corner of a car, are placed between the lower frame members and the top of the truck bolster to control the longitudinal roll of the car.

side bearing clearances at the time of the second derailment were out of tolerance, measuring 1/16 inch instead of the AAR's recommended range of 2/16 to 4/16 inch. At the time of the second derailment, the car was loaded and was passing over an area with confirmed line and surface deviations. The derailment occurred at the entrance to the spiral of a right-hand curve with a left-hand turnout and guardrail.

Other Information

Emergency Response Plans

The Cabell and Wayne Counties' Local Emergency Planning Committee (C/WLEPC) had a comprehensive combined emergency response plan. Plan revision dates indicated that components of the plan had been updated at various times, with the most recent revision dated 1997. The plan provided a separate appendix that addressed hazardous materials response and included guidelines for emergency responders in managing incidents.

One chapter in the plan addressed special hazardous materials emergency assistance, stating that

> while local emergency response organizations are receiving more and more hazardous materials emergency resolution training and are gradually equipping themselves with hazardous materials emergency resolution equipment, there are still limits to their capabilities in knowledge, clothing and equipment.

Listed in the chapter were 13 resources that emergency management personnel and emergency response incident commanders could use if hazardous materials assistance was needed. The first resource provided was the Dupont Emergency Response Team, about which the plan stated:

> This team is based at DuPont's Belle Plant. While it specializes in transportation type chemical emergencies involving DuPont products, it is available for other chemical emergencies through mutual aid requests and through the CMA Chemnet agreement. The response time normally would be within two hours depending upon the location within the [C/WLEP district] where the emergency incident occurs.

One listed resource, Ashland Petroleum Hazardous Material Emergency Response Team, was said to have a response time that "normally would be within 1 hour." The plan stated that

> there should be no hesitancy on the part of the Incident Commander to request the assistance of appropriate special hazardous materials emergency assistance resources through appropriate channels.

Nowhere in the plan was information included about the availability or use of the Operation Respond Emergency Information System (OREIS) software. (See "Operation

Respond Software" below.) According to C/WLEPC officials, the plan has not been updated since the accident to include this information.

The C/WLEPC conducted an average of three disaster drills a year, the most recent (before the accident) involving hazardous materials (hydrofluoric acid). Although the ORVFD had not participated in Cabell County disaster drills because no drills had been conducted in the ORVFD's jurisdiction, the ORVFD had taken steps to prepare for incidents by providing monthly in-house training for its members. Records indicated that before the derailment, the most recent drill was conducted on June 2, 1998, and 14 of the 24 members attended. This drill included the identification of hazardous materials using the *North American Emergency Response Guide* and Material Safety Data Sheets. The ORVFD maintained a copy of the C/WLEPC emergency response plan in the station. No evidence was found that the ORVFD used the plan in planning or conducting drills or that ORVFD officers were familiar with the contents of the plan.

CSX Hazardous Materials Training

CSX provided specialized training to all operating employees involved in transporting hazardous materials. The engineer and conductor had received this training as part of the required yearly instruction class, or interactive computer module system, or both.

According to CSX records, the company also had a program of community outreach and emergency response training assistance for rail transportation accidents involving hazardous materials. As part of the CSX *Hazardous Materials Emergency Response Plan*, a basic training program was developed for local emergency responders (fire, EMS, and law enforcement) entitled, "Emergency Response to Railroad Incidents." According to the course outline, this training consisted of a 6-hour course "to enhance the understanding of the transportation of hazardous materials by rail and the means for safely responding to emergencies involving railroad property and equipment." When the accident occurred, CSX was in the process of developing a more advanced, 8-hour course for hazardous materials team members entitled, "Advanced Emergency Responders." Company officials said this course, the development of which has been completed since the accident, will be provided to emergency responders on an "as-requested" basis.

In October 1997, CSX offered to provide training to C/WLEPC emergency responders. In January 1998, CSX provided a "hazardous materials traffic density study" and a copy of the CSX emergency response training manual to the captain of the Huntington Police Department, who is also chairman of the C/WLEPC and community emergency coordinator for the city of Huntington, along with another offer to conduct emergency response training. According to CSX, "no reply either written or verbal" was received. The company gave no indication that any further efforts were made to ensure that CSX training was made available to local emergency responders.

In April 1998, Cabell County officials contacted CSX and asked that railroad employees assist with an emergency exercise to be held in May. CSX agreed to provide assistance with planning and to participate in the exercise. Cabell County subsequently informed CSX that the scenario had been changed and that rail equipment would not be involved. CSX officials said they believed then that railroad employees were not needed, and CSX personnel did not participate in the exercise.

According to CSX officials, since the accident, CSX and Cabell County representatives have met to discuss emergency response issues and to begin planning for a disaster drill, to be held in late summer or early fall 1999, that will involve a passenger/freight train accident.

Operation Respond Software

OREIS is a communications system developed by the Operation Respond Institute[12] that can provide police and fire departments with a direct link to the databases of participating railroads and motor carriers. In the event of a railroad hazardous materials incident, emergency responders can enter the car numbers of the involved railcars to obtain detailed information about the types and amounts of hazardous materials the cars are carrying.

According to the training and user manual that accompanies the software,

> the system's principal features are the verification of contents and the formatting of hazardous materials emergency response information in a manner that is easy to use and understand by emergency personnel. The system also has stand-alone features utilizing placards, UN numbers and passenger train schematics to assist first responders.

CSX donated OREIS software to Cabell County in October 1997. The Cabell County emergency response center installed the initial OREIS program and maintained the latest versions. The C/WLEPC had not conducted disaster drills involving the use of the OREIS software, nor have drills conducted since the accident included use of the system.

Before the train conductor arrived at the command post and provided the train consist and emergency response information to responders, one of the fire officers on scene compiled car numbers and UN placard numbers from those derailed cars he could see while maintaining a "safe distance." The placard numbers were used to access hazardous materials information contained in the *North American Emergency Response Guide*. The incident commander did not request the more detailed and specific hazardous materials information that would have been available from the OREIS software. As

[12] According to a summer 1998 Operation Respond *White Paper*, Operation Respond is a program to improve information available to first responders at hazardous material and passenger train accidents. The program began in November 1992 as a cooperative effort of the FRA and the Port Terminal Railroad of Houston, Texas. Operation Respond became a not-for-profit institute in 1995. The Federal Highway Administration, the Research and Special Programs Administration, and the National Institute for Occupational Safety and Health have since joined the FRA in funding the project. In addition to hazardous materials information, the system also provides schematics for Amtrak passenger cars and locomotives, including seat configuration, emergency doors and windows, and the locations of electric and fuel sources. Participating rail and motor carriers provide funding support for Operation Respond through programming, donated computer equipment, training assistance, and printing support.

evacuation of the immediate area was concluded, the conductor met with the incident commander, making available to him information about the contents of the cars and the hazardous materials involved, as well as emergency response guidance for those materials.

Other Accidents

Several other derailments occurred on the CSX Ohio River Subdivision in the years and months preceding and following the Cox Landing accident. The Safety Board is investigating a derailment that occurred on November 5, 1998, near the town of Point Pleasant, West Virginia, some 33 miles north of Cox Landing. This accident resulted in the release of hydrochloric acid, although no one was injured. During its investigation, the Safety Board found an internal rail defect in a section of 112-pound rail that was rolled in 1945. This rail was found to be seriously head-checked. As noted previously, on February 26, 1999, a derailment occurred about 35 miles from Cox Landing involving the same car as that involved in the Cox Landing accident. A total of 11 FRA-reportable derailments other than the Cox Landing accident occurred on the Ohio River Subdivision between February 1994 and February 1999. Seven of these derailments involved either train Q316 or its westbound counterpart, Q317.

Analysis

This analysis is divided into three sections. In the first, the Safety Board identifies factors that can readily be eliminated as causal or contributory to the accident. The second reviews the accident itself, highlighting the actions and events that resulted in problem conditions. The balance of the analysis discusses the safety issues identified in this investigation.

The major safety issue identified in this investigation was inadequate roadbed drainage and resulting roadbed instability on a portion of the CSX Ohio River Subdivision. The analysis also addresses overall track conditions on this line and the likelihood that a particular railcar could have been at fault in the accident. Finally, the analysis addresses the emergency response to this accident, with particular emphasis on communication and coordination within and among the responding agencies.

Exclusions

The investigation determined that the derailment of train Q316 was not caused by a deficiency in the operation of the train. The train crew had received proper authority to proceed into the section of track where the accident occurred, and event recorder and other data indicated that the train was being operated in accordance with procedures appropriate to the circumstances.

Accident Discussion

The investigation determined that the first wheel of train Q316 to derail was on the leading axle of the trailing truck of the 74th car on the train, car CCX 752. This determination was based on the fact that all wheels of the first 73 cars were on the track when the front portion of the train came to rest. Additionally, wheel marks visible on the crossties and on the center sill of CCX 752 indicated that this car had derailed first, as did the break in the top weld of the coupler carrier, which indicated that the car had dropped off the rails and continued, at least momentarily, while the following car remained on the rails.

The first wheel to derail climbed the east rail, which was the outside rail of the beginning of a 3º left-hand curve at MP 207.9. Following cars then derailed, and the train separated between the 77th and 78th cars. As the 78th car left the roadbed and plowed into a ditch, the cars following it, many of them containing hazardous materials, left the tracks and became involved in the general pileup.

Examination of Car CCX 752

Car CCX 752 was carefully examined after the accident to determine if a mechanical defect in the car had caused the derailment. CSX inspectors partially disassembled the car and performed a detailed examination of car components in the presence of Safety Board and FRA representatives. The detailed inspection revealed no mechanical defect in the car.

On February 26, 1999, CCX 752 was involved in a second derailment about 33 miles from the first. Although the same car derailing twice in less than a year in the same relative area raises questions about the mechanical condition of the car, several important attributes of the car were different in the two derailments. Of major significance is that at the time of the second derailment, the car was loaded, as opposed to being empty at Cox Landing. Also, in the second derailment, the side bearing clearances were outside the recommended range, while investigators determined that the clearances at the time of the Cox Landing accident were within tolerance. Further, the second derailment occurred at a site of track surface deviations where special trackwork—a turnout and guardrail—complicated the track geometry. The Cox landing derailment occurred at the beginning of a slight curve with no special trackwork. Finally, the second accident occurred after substantial work had been performed on the car, including replacing the wheel sets on the B-end and replacing a truck bolster and one side frame.

No inspections of car CCX 752 performed after the Cox Landing derailment and in the presence of Safety Board investigators and FRA representatives pinpointed any defect in the car that would have caused it to derail. Although this car is a covered hopper which, as a class of car, has a higher center of gravity when loaded and is more susceptible to being “rocked” off the rails than some other car types, no evidence was found after the Cox Landing accident to indicate that car CCX 752 was more likely to derail than other cars of its type. The Safety Board therefore concludes that the Cox Landing derailment was not caused by a mechanical defect in the empty covered hopper that was the first car to derail.

Roadbed Instability

Railroad track structure supports the weight of trains by distributing the load over a relatively wide area. The weight of the train is transferred from the rails to the crossties and from the crossties to the track ballast. The track ballast and subballast rest on the roadbed.

Although different types of roadbed soil will react differently to an excessive amount of water, complete water saturation will generally destabilize a roadbed. To avoid such saturation, the track system, including ballast and subballast, must be able to guide both rain and drainage water away from the track structure. The track ballast allows water to drain through it, while the subballast should be impermeable, guiding water away from the subgrade and into the drainage ditches that parallel all railroad right-of-ways. These ditches are designed to flow water away from the track and toward culverts or terrain features that will channel the water away from the roadbed.

Before the accident, no culverts or other effective means of channeling water away from the track bed were located in the derailment area. According to statements from local residents, water stood in the ditches alongside the track until it either evaporated or soaked into the roadbed. At least partly because of the lack of effective drainage, the area in and around MP 207.9 had experienced instances of subgrade and surface problems, which had resulted in speed restrictions being placed on trackage in the derailment area. Track inspection records indicated that several locations near the derailment site had had track surface defects. In February 1998 and again in May 1998 (about 1 month before the accident), surface defects resulted in slow orders being issued for the accident area.

CSX was aware of and had attempted to address the roadbed instability in the vicinity of the derailment by adding ballast or other fill material. These measures, however, while temporarily effective, did not permanently solve the problem of roadbed instability, as indicated by the fact that in the area of the derailment, track inspectors noted numerous defects in cross level and curve elevation during the 12 months preceding the accident. In June 1998, the effects of inadequate drainage were exacerbated by above-average rainfall, which further contributed to roadbed saturation and made the roadbed even less able to maintain the integrity of the track geometry under load. With the roadbed thus weakened, the weight of trains passing through the area contributed to an irregular track surface. At some point, perhaps during the passage of train Q316 itself, the weakened subgrade allowed the cross level to degrade to the point that the cars passing through the area incurred a high degree of longitudinal roll. This rolling action would have decreased vertical force on the wheels on the outside rail of the curve and thus would have allowed, as happened in this accident, the flange of one or more wheels to “lift” and ride on top of the rail. The Safety Board therefore concludes that drainage in the accident area was inadequate and that, as a result, the roadbed in the derailment area likely became water-saturated, rendering the track structure unable to maintain track integrity under the load of train Q316.

While CSX added culverts and fill material to correct drainage problems, these measures may not address all the existing or potential drainage problems along the subdivision. Moreover, portions of the Ohio River Subdivision consist of lighter, older rail with observable, if relatively minor, defects in the form of head-checks. At least one of the several accidents that occurred on the subdivision before the Cox Landing derailment was caused by a broken rail. Also, some of the ties in the general area of the accident appeared to Safety Board investigators to be in poor condition. The Safety Board is concerned about these conditions, because the subdivision closely parallels the Ohio River, and the daily passage of two large trains carrying a variety of hazardous materials represents a significant risk to the river and the residents along it, should a derailment occur. The Safety Board therefore believes that CSX should perform a comprehensive engineering analysis and evaluation of track and roadbed conditions on the Ohio River Subdivision and develop a plan and a timetable for correcting existing or potential deficiencies, including inadequate drainage, that may affect the safe passage of trains and the safe shipment of hazardous materials through the area. The Safety Board further believes that CSX should provide the Board with a schedule to correct the deficiencies found during the evaluation.

In addition, the Safety Board believes that the FRA, in accordance with its oversight role, should review both the implementation and the management oversight of CSX’s track inspection and maintenance programs for the Ohio River Subdivision and take the actions necessary to ensure the safe passage of trains and the safe shipment of hazardous materials through the area.

Emergency Response

The local responders were effective in identifying the immediate hazards and initiating an immediate evacuation of nearby residents. Also, after some delay, responders called in chemical specialists to assess each tank car for leakage and potential risk. The Safety Board investigation did, however, identify a need for additional planning, training, and communication among the agencies responding to the accident.

Availability and Use of OREIS Software

Cabell County was equipped with OREIS software capable of printing out emergency response information, including the specific contents of affected cars and detailed information about the handling of any hazardous materials involved. Because the OREIS software was not used after the Cox Landing derailment (the train conductor was available to provide the information), the Safety Board could not evaluate its effectiveness in the response to this accident. In the view of the Safety Board, the software does appear to be a tool with potential for providing information that could be useful in the aftermath of a hazardous materials accident. In this case, however, because the C/WLEPC had not included use of the OREIS software in its disaster drills and had not updated its emergency response plan to include information about the system, responders on scene were unaware of the existence or the capabilities of the OREIS system, and they had not been trained in its use. The Safety Board therefore concludes that the full potential of the Cabell County OREIS software could not be realized, or even evaluated by emergency responders, because of a lack of information about the system in Cabell and Wayne Counties' emergency response plan and because exercises involving the system were not included in periodic disaster drills. The Safety Board believes that Cabell and Wayne Counties should revise their emergency response plan to incorporate information about the capabilities and use of OREIS software. The Safety Board further believes that the counties should include, in their periodic disaster drills, exercises designed to familiarize emergency responders with the capabilities and use of OREIS software.

Emergency Plans and Disaster Drills

Even the above measures would have been less than fully effective in this accident, because the incident commander(s) were from the ORVFD, which had not participated in Cabell and Wayne Counties' periodic disaster drills. Even though the ORVFD maintained copies of the C/WLEPC emergency response plan, the incident commanders did not initiate the call for outside assistance that was directed in the plan. The Cabell County EMS director, who was familiar with the plan, did initiate a call, but because of the delay, individuals with special chemical expertise did not arrive on scene until about 3 hours after the derailment. Had the leaking chemicals been more hazardous than formaldehyde, this delay could have had serious consequences.

The Safety Board concludes that because the ORVFD had not participated in Cabell and Wayne Counties' disaster drills and because its officers were unfamiliar with the counties' emergency response plan, the incident commanders did not use all available resources to assist in the emergency. The Safety Board therefore believes that the C/WLEPC should include in its periodic disaster drills all emergency response agencies within its jurisdiction, including the ORVFD, and ensure that those agencies are aware of Cabell and Wayne Counties' emergency response plan and its implementation.

CSX had a program of community outreach and emergency response training assistance for rail transportation accidents involving hazardous materials. According to CSX officials, on at least two occasions, in 1997 and 1998, the company offered to provide hazardous materials training to local emergency responders in the Cabell and Wayne County areas; however, these offers apparently received no response, with the result that no such CSX-sponsored training was conducted. CSX has, since the accident, developed an 8-hour advanced course for emergency responders that is provided on an "as requested" basis.

In the view of the Safety Board, CSX should much more actively promote its company-sponsored hazardous materials training. More active promotion and better follow-up on offers of training would help ensure that local emergency responders are prepared for a railroad emergency. CSX benefits from the transportation of cargo, including hazardous materials, along the Ohio River Subdivision, and the company is acutely aware of the potential hazards to persons and the environment in the event of an accident involving its trains. The Safety Board therefore believes that CSX should review and revise, as necessary, in light of this accident, its community outreach and training assistance programs to ensure that all emergency response groups that may be called upon to respond to an incident or accident involving its railroad receive the necessary training on a timely and recurring basis.

Communication With the Natural Gas Pipeline Operator

A derailed car struck the vertical riser on a residential gas meter located within 40 feet of the centerline of the tracks. Damage to the riser resulted in a gas leak that lasted for several hours. Gas service personnel were called, but they were not allowed to approach the damaged riser because of concerns that the chlorine tank cars might also be leaking. However, because of concern about the gas leak itself, the incident commander directed gas company employees to shut off gas service in the immediate area at the site.

Without access to shut-off valves at the site, gas company employees were unable to repair the damaged riser or isolate the 2-inch line. As an alternative, pipeline personnel considered isolating the 6-inch gas main by closing shutoff valves, but they were concerned about the large number of residential and industrial customers that would be affected. In any event, because of the location of the valves and the pressure in the line, blocking the 6-inch line would not have immediately stopped the leak.

The incident commander eventually allowed the gas service crew to access the damaged riser and determine if the 2-inch service line could be shut down. Following their inspection, the service crew capped the 2-inch service line, but the line remained charged with pressurized gas, since the line had not been isolated from the 6-inch main supply line.

Because railroad and gas company personnel did not coordinate their activities before railroad contractors began working in the area of the gas line, railroad contractors did not know that the gas line was still charged. They stated that, had they known, they would not have carried out the wreckage-clearing operations the next day that severed the gas line and created a second gas leak in the area. This released gas, if ignited, could have injured nearby recovery workers and destroyed or damaged property. Although the gas did not ignite, its release posed a safety hazard to those in the area. The Safety Board concludes that railroad wreckage-clearing operations and pipeline operations were not effectively coordinated and unified under an effective command structure,[13] which placed excavation personnel at risk while they worked in the vicinity of a natural gas line. A unified incident command structure would have ensured better commitment from and participation by railroad, pipeline, and public safety officials in decision-making throughout the emergency response, wreckage-clearing, and environmental remediation activities.

The need for increased communication and coordination between railroads and pipeline operators has been demonstrated in other Safety Board accident investigations.[14] In its investigation of an Amtrak passenger train derailment on CSX tracks near Intercession City, Florida, on November 30, 1993, the Safety Board concluded that the lack of a cooperative action plan between CSX and the pipeline operator contributed to a breakdown in communication during wreckage-clearing operations. After its investigation of the Intercession City accident, the Safety Board asked CSX, in Safety Recommendation R-95-32, to develop procedures for coordinating emergency response and wreckage-clearing operations with public safety officials to ensure that the actions of its employees and its contractors do not endanger personnel safety or the facilities of others on or adjacent to the railroad right-of-way. In its June 6, 1997, response, CSX stated that it had revised emergency response coordination policy to require that operations center personnel determine whether pipelines are likely to be in the area of any emergency. If they are, on-scene personnel must be notified of the possible existence of pipelines and must coordinate with the pipeline operators and public safety officials. On the basis of this response, Safety Recommendation R-95-32 was classified “Closed—Acceptable Alternative Action” on September 11, 1997.

Despite the CSX response to Safety Recommendation R-95-32, however, at least in the area of this accident, CSX did not have adequate procedures in place to facilitate the level of on-scene coordination necessary to have prevented putting railroad workers at risk

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[13] See National Response Team Incident Command Technical Assistance Document: *Managing Response to Oil Discharge and Hazardous Substances Under the National Contingency Plan,* published by the National Response Team, May 1996. (Available at http://www.nrt.org)

[14] For example, see Railroad Accident Report—*Derailment of Southern Pacific Transportation Company Freight Train on May 12, 1989, and Subsequent Rupture of Calnev Petroleum Pipeline on May 25, 1989, at San Bernardino, California* (NTSB/RAR-90/02); Railroad Accident Report—*Atchison, Topeka and Santa Fe Railway Company (ATSF) Freight Trains ATSF 818 and ATSF 891 on the ATSF Railway, Corona, California, November 8, 1990* (NTSB/RAR-91/03); Highway Accident Report—*Collision of Amtrak Train No. 88 with Rountree Transport and Riggings, Inc., Vehicle on CSX Transportation, Inc., Railroad Near Intercession City, Florida, November 30, 1993* (NTSB/HAR-95/01); and Railroad Accident Report—*Derailment of Freight Train H-BALT1-31 Atchison, Topeka and Santa Fe Railway Company Near Cajon Junction, California, on February 1, 1996* (NTSB/RAR-96/05).

during wreckage-clearing operations. The Safety Board therefore believes that CSX should develop and implement incident coordination procedures that will ensure that safety-critical operations during wreckage-clearing activities are coordinated with all parties involved in those activities. In addition, on the local level, the Safety Board believes that Mountaineer Gas Company and Cabell County should, in cooperation with CSX, develop and implement incident coordination procedures that will ensure that safety-critical operations during wreckage-clearing activities are coordinated with all parties involved in those activities.

Conclusions

Findings

1. The operation of the train did not cause or contribute to the severity of the derailment.

2. The Cox Landing derailment was not caused by a mechanical defect in the empty covered hopper that was the first car to derail.

3. Drainage in the accident area was inadequate and, as a result, the roadbed in the derailment area likely became water-saturated, rendering the track structure unable to maintain track integrity under the load of train Q316.

4. The full potential of the Cabell County Operation Respond Emergency Information System software could not be realized, or even evaluated by emergency responders, because of a lack of information about the system in Cabell and Wayne Counties' emergency response plan and because exercises involving the system were not included in periodic disaster drills.

5. Because the Ohio River Road Volunteer Fire Department had not participated in Cabell and Wayne Counties' disaster drills and because its officers were unfamiliar with the counties' emergency response plan, the incident commanders did not use all available resources to assist in the emergency.

6. Railroad wreckage-clearing operations and pipeline operations were not effectively coordinated and unified under an effective command structure, which placed excavation personnel at risk while they worked in the vicinity of a natural gas line.

Probable Cause

The National Transportation Safety Board determines that the probable cause of this derailment was an unstable roadbed that resulted from the inadequate or ineffective measures taken by CSX Transportation, Inc., to permanently correct known drainage problems in the accident area.

Recommendations

As a result of its investigation of this accident, the National Transportation Safety Board makes safety recommendations as follows:

to the Federal Railroad Administration:

> Review both the implementation and the management oversight of CSX Transportation's track inspection and maintenance programs for the Ohio River Subdivision and take the actions necessary to ensure the safe passage of trains and the safe shipment of hazardous materials through the area. (R-99-3)

to CSX Transportation, Inc.:

> Perform a comprehensive engineering analysis and evaluation of track and roadbed conditions on the Ohio River Subdivision and develop a plan and a timetable for correcting existing or potential deficiencies, including inadequate drainage, that may affect the safe passage of trains and the safe shipment of hazardous materials through the area. Provide to the National Transportation Safety Board a schedule to correct the deficiencies found during the evaluation. (R-99-4)

> Develop and implement incident coordination procedures that will ensure that safety-critical operations during wreckage-clearing activities are coordinated with all parties involved in those activities. (R-99-5)

> Review and revise, as necessary, in light of this accident, your community outreach and training assistance programs to ensure that all emergency response groups that may be called upon to respond to an incident or accident involving your railroad receive the necessary training on a timely and recurring basis. (R-99-6)

to Cabell and Wayne Counties' Local Emergency Planning Committee:

> Revise your emergency response plan to incorporate information about the capabilities and use of Operation Respond Emergency Information System software. (R-99-7)

> Include, in your periodic disaster drills, exercises designed to familiarize emergency responders with the capabilities and use of Operation Respond Emergency Information System software. (R-99-8)

Include in your periodic disaster drills all emergency response agencies within your jurisdiction, including the Ohio River Road Volunteer Fire Department, and ensure that those agencies are aware of Cabell and Wayne Counties' emergency response plan and its implementation. (R-99-9)

In cooperation with CSX Transportation, Inc., develop and implement incident coordination procedures that will ensure that safety-critical operations during wreckage-clearing activities are coordinated with all parties involved in those activities. (R-99-10)

to Mountaineer Gas Company:

In cooperation with CSX Transportation, Inc., develop and implement incident coordination procedures that will ensure that safety-critical operations during wreckage-clearing activities are coordinated with all parties involved in those activities. (R-99-11)

By the National Trasportation Safety Board

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George W. Black, Jr.
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