DEPARTMENT OF PUBLIC SERVICE REGULATION
BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MONTANA

IN THE MATTER of the Public Service Commission's Investigation into Railroad Safety.	)))	REGULATORY DIVISION DOCKET NO. N2015.11.84

Railroad Safety in Montana: Risk Assessment and Action Plan

Prepared for the
Montana Public Service Commission
October 31, 2016

By the Montana Public Service Commission Staff:

Will Rosquist
Jeremiah Langston
Brenda Koch
Dave Jackson
Bob Decker
Robin Arnold

Railroad Safety in Montana: Risk Assessment and Action Plan

Contents

Executive Summary

Although railroad safety regulation is largely the responsibility of the federal government, the Montana Public Service Commission (Commission or PSC) has participated in railroad safety regulation enforcement for the past two decades. Between 2005 and 2014, the transport of crude oil from the Bakken Formation, centered in North Dakota and extending into eastern Montana, increased significantly. Bakken crude transported by BNSF Railway Company (BNSF) grew from 21,042 tons in 2005 to 9.1 million tons in 2015. Across the continent, the increased shipments of Bakken crude, together with the higher volatility of that particular petroleum product, has resulted in a number of severe train accidents, including fiery events in Lac-Mégantic, Quebec, in 2013, and more recently in Mosier, Oregon, in 2016.

The increase in the volume of crude being transported in Montana prompted the Montana Legislative Audit Division to publish a performance audit of railroad safety in October 2015. One of the recommendations of the audit was for the Commission to conduct a state rail safety risk assessment. In response to the Legislative Audit Division's recommendations, the Commission undertook an internal review of its railroad safety program and compiled this statewide rail safety risk assessment and action plan.

Due to the limited scope of state authority in rail safety issues, the Commission decided to focus its risk assessment and action plan on preventative measures, and not to address the other major category of railway safety work, emergency response, which is largely the responsibility of other federal and state agencies. In a public work session in April 2016, the Commission directed staff to complete a state rail risk assessment and action plan by November 2016.

This study analyzes the legal background of railroad safety inspection programs, the scope of Commission authority in that effort, the volume of freight being transported by rail in and across Montana, the relative volatility of crude oil from the Bakken Formation, and accident history information provided by the Federal Railroad Administration (FRA). Upon that foundation, staff applied a qualitative risk assessment methodology to identify high-risk areas within the state. The methodology focused on identifying the volume and frequency of crude oil shipments, the routes used, human populations and environmental resources along routes, and incident intensity (based on number of accidents in the 10 year period, 2006-2015) for each county along the state's principal rail routes. A weighted score was assigned to counties to identify which counties had the highest risk profile.

Based to a significant degree on the high volume of crude oil carried on Montana's northern line, which is owned by BNSF and also traveled by Amtrak, the national passenger rail service, staff's assessment finds that the northern line holds the greatest potential risk in the state. A strong argument exists for the joint rail inspection effort of the Commission and the FRA in Montana to dedicate the greater part of its time and resources to the state's northern line.

Staff recommends a near-term action plan focused on making operational improvements to the Commission's existing rail safety program. The railroad safety program could operate similar to the Commission's pipeline safety program, with a technically proficient manager who can monitor and provide input during the development of the FRA's inspection plans and integrate the FRA's plans into the Commission's railroad safety effort. In addition to improving regular communication and collaboration with the FRA, the Commission will increase its involvement in both the National Association of State Rail Safety Program Managers and the State Emergency Response Commission (SERC).

Staff concludes that making operational improvements to the existing rail safety program will lead to improved insight into, and coordination with, FRA's inspection planning process, which will allow the Commission to make more informed decisions about how to address the risks identified in this report and in any future risk assessments.

Section 1) Background: Legislative Audit and PSC Response

In October 2015, the Montana Legislative Audit Division published a performance audit of railroad safety managed by the Public Service Commission, Department of Military Affairs, and Department of Transportation.[1] The audit included recommendations for improving statewide emergency planning, training and equipping, and hazardous materials response at Department of Military Affairs; and rail safety program administration at the Public Service Commission.

The audit was prepared in the context of a significant increase in the volume of railroad freight traffic in Montana in recent years, with most of the increase attributable to the transport of crude oil by rail, predominantly from the Bakken field in North Dakota and eastern Montana.

The audit identified the agency responsibility of the Public Service Commission (PSC) as "the supervision [in partnership with the FRA] of the railroads through inspection and enforcement of safety and security measures governed by federal law."[2] The audit concluded that the PSC's state rail safety inspection is inadequate and made these recommendations:

1) The PSC should be actively involved in the Association of State Rail Managers to ensure that Montana has a voice at the national level;
2) The PSC should conduct a state rail safety risk assessment, establish rail safety goals and objectives, and develop a state rail safety plan for Montana that is reviewed annually with the Federal Railroad Administration (FRA);
3) The PSC should actively engage with Montana Disaster and Emergency Services (DES), a division of the Montana Department of Military Affairs, and other state and federal agencies, in emergency planning to ensure that rail safety program is proactively addressing risk in the state;
4) The PSC should increase its railroad safety inspection capability across the state through increased inspection coverage and frequency.

After the audit was published, the PSC responded to the audit recommendations in a letter to the Legislative Auditor.[3] The PSC agreed to act on recommendations one and three, as referenced above. With regard to completion of a risk assessment and state

[1] Legislative Audit Division, "Performance Audit: Railroad Safety," Oct. 2015, http://leg.mt.gov/content/Publications/Audit/Report/14P-13.pdf
[2] Legislative Audit Division, 7.
[3] Public Service Commission, letter to Tori Hunthausen, Legislative Auditor, Oct. 7, 2015.

safety plan, the PSC pledged to open an investigative docket and consider the possibility; Docket N2015.11.84, was opened on November 4, 2015, and this risk assessment and action plan is one product of the subsequent investigation. As for adding additional inspectors to its staff, the PSC observed that the authority to increase employee levels rests with the Montana Legislature, and that the inclination of the Legislature in its 2015 session was oriented to reducing, not increasing, staff levels in state government. (A subsequent section of this document further addresses this topic.)

After opening N2015.11.84, the PSC hosted a public roundtable on railroad safety.[4] Several interested citizens participated, as did representatives of the FRA, BNSF Railway Company (BNSF), Montana Rail Link, the Montana Department of Environmental Quality, the Montana Disaster and Emergency Services Division, Roosevelt County, the Brotherhood of Locomotive Engineers labor union, and others.[5]

On April 19, 2016, the PSC held a work session to discuss activities after the roundtable and consider next steps. The PSC directed the staff to execute five actions, including engagement with relevant rail safety organizations, filling a vacant rail inspector position, and completion of a risk assessment and action plan by November 2016.[6]

[4] Public Service Commission, N2015.11.84, "Notice of Roundtable and Request for Comments," Dec. 8, 2015, http://psc.mt.gov/Docs/ElectronicDocuments/pdfFiles/N2015-11-84_OUT_20151208_NOR.pdf
[5] Public Service Commission, N2015.11.84, "Summary of January 20, 2016 Roundtable," Feb. 2, 2016, http://psc.mt.gov/Docs/ElectronicDocuments/pdfFiles/N20151184RR-rdtblsumm2-1-16.pdf
[6] Public Service Commission, N2015.11.84, "Notice of Commission Action," Apr. 27, 2016, http://psc.mt.gov/Docs/ElectronicDocuments/pdfFiles/N20151184NCA.pdf

Section 2) Legal

Federal Preemption

In the early 20th Century, states had a significant role in regulating railroads for economic and safety purposes. This changed dramatically with the enactment of the Federal Railroad Safety Act of 1970 and the Interstate Commerce Commission Termination Act of 1995. Under these two acts, the federal government assumed responsibility for the vast majority of railroad regulation:

- The U.S. Department of Transportation (USDOT), through the Federal Railroad Administration (FRA), primarily regulates rail safety;[7]
- The Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates movement of hazardous materials, including crude oil, by rail;[8]
- The National Transportation Safety Board investigates accidents involving rail transportation;[9]
- The Department of Homeland Security's Transportation Security Administration regulates security aspects of rail transportation.[10]
- The Surface Transportation Board is an independent adjudicatory and economic regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers.[11]

Although all of these federal agencies regulate one or more elements of rail activity, the FRA is the primary agency tasked with regulating day-to-day railroad safety practices.

Courts have consistently found that the entire field of railroad regulation is now under the purview of the federal government. For example, in 1997, the PSC went to court[12] in an attempt to defend its jurisdiction over station closings. The federal district court in Montana found that the PSC no longer had authority to perform that function and stated that the field of economic regulation was preempted by federal law. Other courts have found the same for local environmental and public health and safety laws.[13] The

[7] 49 C.F.R. § 209.1.
[8] 49 C.F.R. § 174.1 to 174.750.
[9] 49 U.S.C. § 1111(g)(3); 49 C.F.R § 840.1 to 6.
[10] 49 U.S.C. § 114; 49 C.F.R. § 1580.1 to 1580. 203.
[11] 49 U.S.C. § 10501.
[12] *Burlington Northern Santa Fe Corp. v. Anderson*, 959 F. Supp. 1288 (D. Mont. 1997).
[13] *Friberg v. Kan. City S. Ry. Co.*, 267 F.3d 439 (5th Cir. 2001); *City of Auburn v. United States*, 154 F.3d 1025 (9th Cir. 1998).

lack of state authority in the field of railroad regulation creates serious challenges for state regulatory bodies attempting to expand or enhance their oversight of rail safety.

The states retain some authority over railroad safety through the savings clause established in Federal Railroad Safety Act and may regulate in two scenarios: (1) when the federal government has not prescribed a regulation or issued an order covering the subject matter of the state requirement; and (2) when, even if the federal government has covered the subject matter, the state seeks to enforce an additional or more stringent law or regulation to address an "essentially local safety hazard."

Meeting these requirements has proven difficult. In an attempt to regulate an essentially local safety hazard, the California Public Utilities Commission (CAPUC) attempted to regulate 13 sites located in mountainous terrain as local safety hazards.[14] The state agency had done so based on historical data of rail incidents occurring at specific locations. CAPUC conducted tests to determine, among other things, the appropriate track strength and speed at which trains should travel at those locations.

Despite CAPUC's targeted and informed approach, the U.S. Court of Appeals for the Ninth Circuit found that the problems identified by CAPUC did not result in a localized concern noting a "high derailment rate is, itself, unremarkable" and high grade/sharp curve combinations are not unique in mountainous western states. Under this high bar and the considerable effort made by the CAPUC, it is hard to imagine a scenario constituting an essentially local safety hazard. Even with a lack of regulatory control demonstrated in the CAPUC case, the PSC still has options for addressing rail safety in Montana, as outlined in the following section.

Scope of State and PSC Responsibility

The PSC's primary role in railroad safety is prevention and risk mitigation; the PSC does not engage in emergency response work. The PSC performs these roles in large part through the national State Safety Participation Program. PSC records indicate it has participated in this program since 1999 and remains actively engaged in it, having signed the Federal Railroad Safety Program Revised Schedule of Current Participation on February 16, 2016.

The State Safety program emphasizes planned, routine compliance inspections through trained state inspectors. In addition to these basic roles, "FRA encourages further State contributions to the national railroad safety program consistent with overall program

[14] *Union Pac. R.R. Co. v. Cal. PUC*, 346 P.3d 851 (9th Cir. 2003).

needs, individual State capabilities, and the willingness of the States to undertake additional investigative and surveillance activities."[15] The FRA provides support to the states by providing training and tools for carrying out the state inspection programs.

The FRA also provides on-the job-training for state inspector candidates, and it assists states in developing rail safety programs. However, the FRA does not provide funding for the employees hired to execute the state inspection programs.

In addition to participation in the federal program, the Commission has traditionally addressed local concerns facing railroads. The Commission has overseen interactions between landowners and the railroads to maintain adequate fencing along railroad rights-of-way.[16] Additionally, railroads are required by state law to control fire hazards (e.g., dry grasses and weeds) along both sides of their rights-of-way or they face state law liability for damages from resulting fires.[17] The Commission may also supervise the proper construction and maintenance of water drainage around railroads.[18] Highway crossing statutes remain within Title 69, Chapter 14 of the Montana Code Annotated,[19] however, a number of recent state and federal court decisions have found blocked crossing regulations at the state level are preempted by federal law.[20] When problems arise outside state jurisdiction, the Commission strives to assist in disputes between private individuals and the railroads as a form of constituent services.

A significant portion of Title 69, Chapter 14 of Montana Code Annotated was amended in the 2015 Montana legislative session through HB 61. This bill removed many sections that conflicted with federal law and were considered preempted. Many of these removed sections previously applied to the PSC. HB 61 did add some state authority by making clear the PSC could participate in the State Safety Participation Program.[21] HB 61 also explicitly allows the PSC to use sections of federal law to bring a lawsuit in district court if the Secretary of Transportation fails to prosecute a violation of federal railroad safety regulations[22] and regulate rail safety through the savings clause in Federal Railroad Safety Act described above.[23]

---

[15] 49 C.F.R. § 212.101(d).
[16] Mont. Code Ann. § 69-14-701.
[17] Mont. Code Ann. § 69-14-721 to -722.
[18] Mont. Code Ann. § 69-14-240.
[19] Mont. Code Ann. § 69-14-601 to -627.
[20] *Csx Transp. v. City of Plymouth*, 283 F.3d 812, 814 (6th Cir. 2002); *Eagle Marine Indus. v. Union Pac. R.R.*, 227 Ill. 2d 377, 380 (2008).
[21] Mont. Code. Ann. § 69-14-111(2)(a) (citing 49 U.S.C. 20105).
[22] Mont. Code Ann. § 69-14-111(2)(b) (citing 49 U.S.C. 20113).
[23] Mont. Code Ann. § 69-14-111(2)(a) (citing 49 U.S.C. 20106).

Scope of Responsibility of Other Montana Agencies

Several other agencies have railroad safety under their purview.

- The Department of Military Affairs' Disaster and Emergency Services (DES) assists with disaster and emergency prevention among state and local governments and organizations in the state.[24]
- The State Emergency Response Commission (SERC) comprises 29 members that represent private industry, local governmental and responder groups, state agencies, and federal military partners for the purpose of fulfilling the powers and duties under the federal Emergency Planning and Community Right to Know Act of 1986.[25] SERC also maintains reports of local shipments of crude oil by rail in Montana.[26]
- Local responders are primarily responsible for local emergency response and recovery.
- Local Emergency Planning Committees (LEPCs) develop localized emergency response plans, review these plans annually, and provide information about potential hazardous materials in their communities.
- State regional HAZMAT teams—located in Bozeman, Billings, Great Falls, Helena, Kalispell, and Missoula—consist of hazardous materials emergency response personnel with specialized equipment to respond to the most acute and critical hazardous emergencies in the state.
- Montana Department of Environmental Quality regulates the railroads for environmental contamination.[27]
- Montana Department of Transportation's (MDT) Traffic and Safety Bureau works with the railroads to ensure appropriate signals at public crossings in the state, but does not regulate signals at private crossings of railroads. MDT's Planning Division hosts a small loan program supporting rail improvements to enhance rail service to Montana communities and businesses.

---

[24] Mont. Code Ann. § 10-3-101.

[25] Mont. Code Ann. § 10-3-1204.

[26] *Available at* http://readyandsafe.mt.gov/Home/Articles/ArtMID/41421/ArticleID/4479/Crude-Oil-Shipments.

[27] Mont. Code Ann. § 75-10-715; 42 U.S.C. § 9614 (describing the relationship between federal and state hazardous substance laws); *State ex rel. Dep't of Envtl. Quality v. BNSF Ry. Co.*, 2010 MT 267, 358 Mont. 368, 246 P.3d 1037.

Section 3) Existing Railroad Safety Inspection Programs

Federal Railroad Administration

The Federal Railroad Administration (FRA) was created in 1966 and has a mission to "enable safe, reliable, and efficient movement of people and goods."[28] The FRA is divided into eight regions, which collectively employ 400 federal safety inspectors. Montana is part of the FRA's Region 8, which is headquartered in Vancouver, WA, and includes the states of Alaska, Idaho, Montana, North Dakota, South Dakota, Oregon, Washington, and Wyoming. Nine FRA specialists and inspectors are based in Billings, MT, one in Glendive, and one in Great Falls. The Billings inspectors include a Chief Inspector, Signal and Train Control Specialist, Hazardous Materials Specialist, Operating Practices Specialist, Track Inspector, Operating Practices Inspector, Signal and Train Control Inspector (currently vacant), Motive Power and Equipment Inspector (MP&E), and Hazardous Materials Inspector. The Glendive inspector is an MP&E Inspector, and the inspector in Great Falls is an Operating Practices Inspector. The FRA is also looking into the possibility of adding a Highway/Rail Grade Crossing Inspector in Billings. These inspectors spend approximately 50-60% of their time covering rail activity in Montana, the rest is spent in adjoining states.[29] Inspectors from the Spokane, WA and Stanley, ND offices also conduct inspections in Montana, and spend 35-40% of their time in Montana.

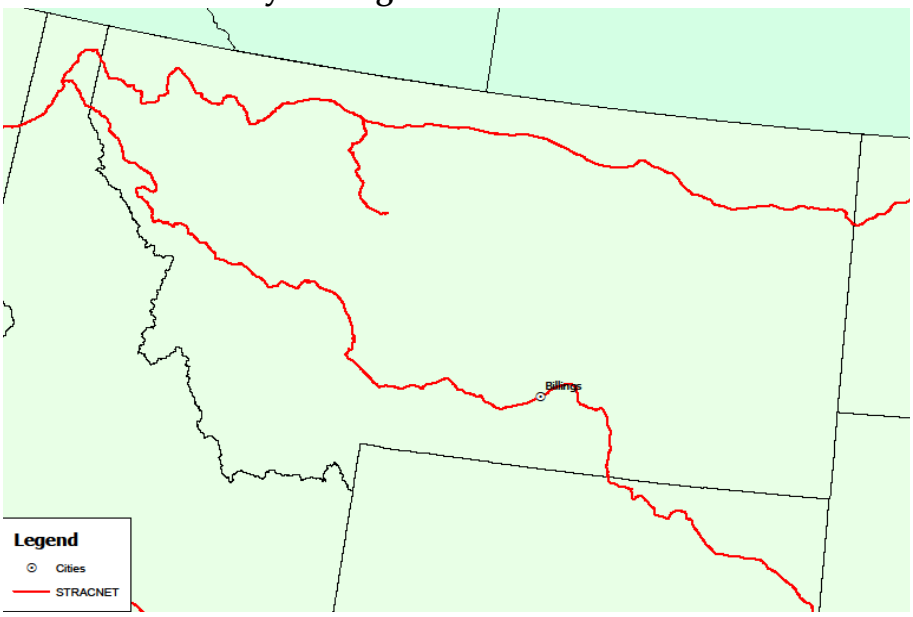
FRA inspectors based in Montana filed 751 reports from January 1, 2016 to September 6, 2016, finding 4,571 defects and issuing 55 violations.[30] The most inspection reports and defects found were from the MP&E discipline, with 308 reports and 2,272 defects. The numbers for the MP&E discipline also include reports filed by Montana's state MP&E inspector. The second largest number of defects, 2,021, were found in 188 reports filed in the track inspection discipline. The largest number of violations, 17, were found in the operations discipline.

The FRA relies on an analysis of historical accidents and injuries to determine where inspection activities need to be increased. It also relies on the inspection reports, and increases inspections in areas that had a high number of defects reported. Emphasis is placed on track used to transport high volumes of hazardous materials, and on track

[28] U.S. Department of Transportation Federal Railroad Administration, *About FRA*, https://www.fra.dot.gov/Page/P0002 (Sept. 1, 2016).
[29] William Ken Naylor, e-mails, (Sept. 4, 2016 and Sept. 7, 2016).
[30] William Ken Naylor, email, (Sept. 7, 2016).

that is part of the Military Strategic Network (which is used to move military equipment and supplies during times of crisis).[31]

Military Strategic Network in Montana[32]



FRA State Rail Safety Participation Program

The FRA has a State Rail Safety Participation Program, which was created in 1970 to supplement federal inspection efforts. The FRA states that "the present workload exceeds the Federal inspector workforce" and thus encourages state participation in the federal inspection program.[33]

As of June 2016, a total of 31 states participate in the program with 197 inspectors.[34] The four states with the largest inspection programs account for 43% of the state inspectors participating in the FRA program. California is the largest state with 43 inspectors, followed by Texas (15), New York (14) and Ohio (13). State inspectors may conduct compliance investigations and assist the FRA in accident and complaint investigations, but the enforcement authority to prosecute violations is the jurisdiction of the FRA.[35]

---

[31] William Ken Naylor, email, (Sept. 12, 2016).
[32] Mike Calhoun, "State of Montana Rail Safety Overview," (Jun. 1, 2016), 47.
[33] Federal Railroad Administration, "State Rail Safety Participation Program Manager's Handbook," Apr. 2016, 3.
[34] Calhoun, 4, 14.
[35] Calhoun, 12, 15.

Before a state may participate in the FRA's state program, it must enter into a multi-year agreement with the FRA that delegates investigative and surveillance authority in the five inspection safety disciplines.[36] The Montana Public Service Commission signed a multi-year agreement with the FRA in 1995, and has submitted an annual report, Revised Schedule of Current Participation, with any updates on changes to the program or the number of inspectors. The status of the inspection program (developmental, active, or inactive) must also be reported in the Revised Schedules.

State inspectors must meet FRA qualifications in order to perform inspection activities, and must work at least 50 inspection days per year to receive FRA reimbursement of classroom training costs. The FRA also provides computers to state inspectors for reporting purposes. Rules for the State Safety Participation Program can be found at 49 CFR part 212.[37]

States that participate in the FRA program also participate in the Association of Rail Safety Mangers (Association). The Association holds annual meetings, which are training sessions with the goal of "establishing communication among States and between State and Federal officials, discussing issues of State or Federal concern, and promoting uniformity in the application of Federal rail safety standards."[38]

Montana Public Service Commission

The Montana Public Service Commission (Commission) employs two railroad safety inspectors in partnership with the FRA's state program. The two inspectors are MP&E inspectors, and each spend 80% of their time investigating railroads and 20% of their time investigating other transportation violations.

Currently, the Commission's two railroad safety inspectors use a multifaceted approach to allocate inspection resources and plan inspection activities. First, because the Commission's railroad safety inspectors are also transportation enforcement officers and because their activities take place over large geographic areas, the inspectors attempt, when possible, to coordinate inspection activity with motor carrier investigation and enforcement activities for reasons of efficiency and practicality.

---

[36] Federal Railroad Administration, "Manager's Handbook," 11.
[37] US Government Publishing Office, "Electronic Code of Federal Regulations," http://www.ecfr.gov/cgi-bin/text-idx?SID=ac1f3a2261697e13781516b64ad0e98b&mc=true&node=pt49.4.212&rgn=div5 (Sept. 20, 2016).
[38] Federal Railroad Administration, "Manager's Handbook," 73.

Second, inspectors participate monthly in regional FRA conference calls in which defect and violation activities occurring within the region are discussed. Commission inspectors also frequently communicate with FRA inspectors in Montana, railroad company employees and union representatives, and railroad company subcontractors. Those communications guide the inspectors' activities by identifying potential problem areas deserving special attention. Commission inspectors frequently plan and perform joint inspections with FRA inspectors.

Third, inspectors' recent investigations and findings may guide future activities. For example, recurring defect observations at a particular location (such as a repair shop) may suggest a need to more frequently inspect at that location.

Fourth, inspections of hazardous trains and train cars, i.e., those carrying petroleum and chemical products, are generally prioritized over inspections of general freight cars. However, inspectors are keenly aware that general freight cars that are in poor repair may impact a manifest train (a mix of general freight cars and cars containing hazardous products) or a passing hazardous unit train.

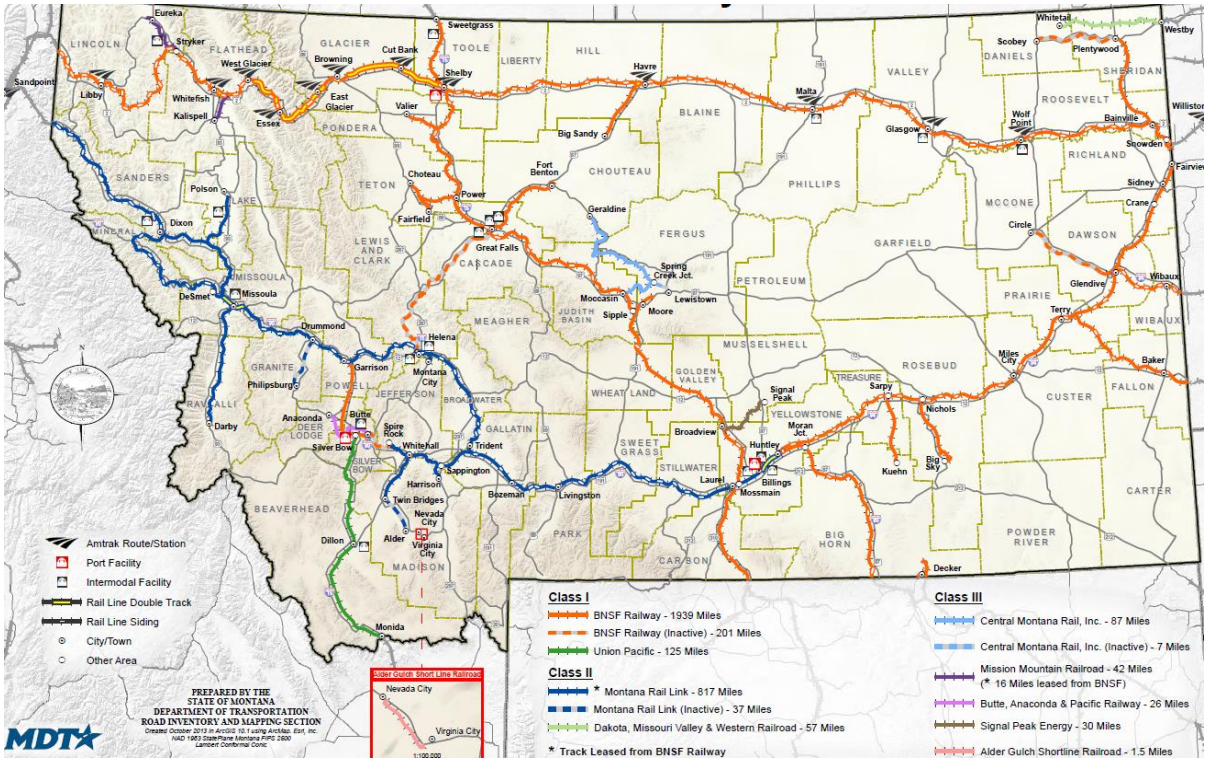
Generally speaking, Commission inspectors attempt to prioritize inspection activity based on an ongoing and informed assessment of the risks of derailments to the people of Montana and the state's environment. Those qualitative risk assessments are informed by the above-described factors and made largely by the inspectors themselves, working as members of a team of state and federal inspectors and based on their personal knowledge and experience.

While state inspectors have the authority to inspect passenger trains, they are limited in the amount of time spent on inspections. An inspector may conduct inspections during a crew change, for example, but may not delay the train from its schedule. For this reason, a majority of inspections of passenger trains are done at the origin and destination points, which are in Chicago and Seattle for the Amtrak line that passes through Montana.

Section 4) Railroad Freight Transport in Montana

Montana has a total of 3,200 miles of operated rail track. The two main types of railroad companies are identified as Class I or Regional (also called Class II). Class I railroads have 2012 operating revenues of at least $452.7 million, and Regional railroads have annual revenues of at least $40 million or operate least 350 miles of track and have revenues of at least $20 million.[39] Two Class I railroads operate in the state: BNSF and Union Pacific Railroad Company (UP). Two regional railroads operate in Montana: Montana Rail Link (MRL) and Dakota, Missouri Valley, & Western. MRL operates in Montana, Idaho, and Washington, with a majority of its track in Montana. Dakota, Missouri Valley, & Western Railroad operates in North Dakota, South Dakota, and Montana. Together, BNSF and MRL account for 88% of the rail track miles operated in Montana. Amtrak, the federally supported passenger service, operates a passenger line along the Montana's northern rail route.

Montana Rail System[40]



[39] Association of American Railroads, *Freight Railroads in Montana: Rail Fast Facts for 2012*, Jul. 2014, https://www.aar.org/Style%20Library/railroads_and_states/dist/data/pdf/Montana%202012.pdf (Sept. 2, 2016).

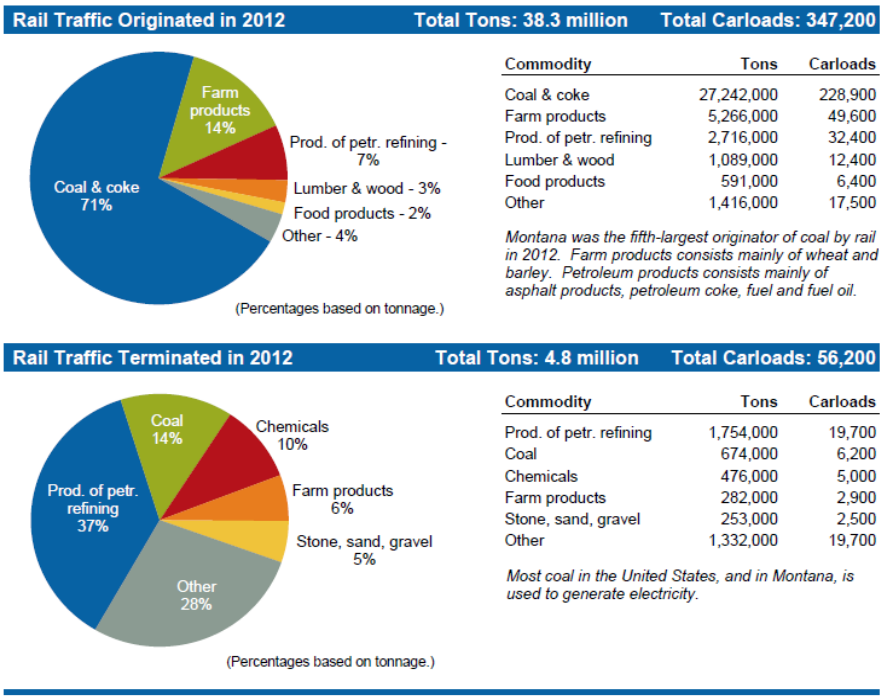
[40] Montana Department of Transportation, "Montana Rail System," 2013, https://mdt.mt.gov/travinfo/docs/railmap.pdf, (Sept. 6, 2016).

BNSF operates 2,625 miles of track in Montana and maintains three main lines across the state.[41] The northern line traverses the Hi-Line, from Montana's border with North Dakota, near Bainville, to the Idaho border, east of Libby. Another line runs from Fairview, southwest of Williston, North Dakota, to Huntley, east of Billings, while the third line runs south from Sweetgrass, on the Canadian border, north of Shelby, through Great Falls and to the Wyoming border, south of Laurel.

MRL operates more than 900 miles of track, with its main line running from Huntley through Livingston, Bozeman-Belgrade, Helena, and Missoula, and across Montana's western border to Sandpoint, Idaho.[42]

Union Pacific has 125 miles of track in Montana, running south from Butte to the Idaho border at Monida Pass.[43]

Rail Freight Originating and Terminating in Montana, 2012[44]



[41] Surface Transportation Board, *BNSF R-1 Annual Report*, 2015, https://www.stb.dot.gov/econdata.nsf/f039526076cc0f8e8525660b006870c9/dc263dbcfeda783385257f88004608e2?OpenDocument, (Sept. 6, 2016).
[42] Montana Rail Link, *About Montana Rail Link*, http://www.montanarail.com/, (Sept. 6, 2016).
[43] Surface Transportation Board, *Union Pacific R-1 Annual Report*, 2015, https://www.stb.dot.gov/econdata.nsf/f039526076cc0f8e8525660b006870c9/e5758363740dd57585257f8800469515?OpenDocument (Sept. 6, 2016).
[44] https://www.aar.org/Style%20Library/railroads_and_states/dist/data/pdf/Montana%202012.pdf.

According to the Association of American Railroads, 94.8 million tons of freight was carried by rail through Montana in 2012, including 38.3 million tons of rail freight originating in the state and 4.8 million tons with a final destination in Montana.[45] The largest freight commodity originating in Montana was coal and coke, at 27.2 million tons, and the largest imported commodity was products of petroleum refining at 1.8 million tons.[46] In 2012, Montana ranked 14th nationally for the number of tons originating in the state, and fourth for the tons of coal originated in the state.[47]

By 2015, freight carried by rail in Montana had drastically increased. BNSF carried 133 million tons of freight in and through Montana in 2015, 38 million more tons than what was carried by freight in the state by all rail companies operating in Montana in 2012.

The top three commodities carried by BNSF in 2015 were coal, farm products, and crude petroleum natural gas and natural gasoline.[48] MRL carried 53 million tons of freight in Montana in 2015; its top commodities were coal, farm products, and petroleum and coal products.[49] Union Pacific carried 840,249 tons of freight in Montana in 2015; its top commodities were farm products, metallic ores, and stone, clay, glass, and concrete products.[50]

In 2015, an average of four shipments of Bakken crude oil transited through Montana each day. A new crude oil transfer facility in North Dakota was expected to increase shipments across Montana by five per week, and at full capacity the new facility could increase shipments by up to 40 trains per week.[51] Railroad companies, however, have instead seen a decrease in crude oil shipments due to a sharp decline in global oil prices that began in 2015. As of September 30, 2016, crude oil accounts for 0.6% of MRL's shipments[52] and 2% of BNSF's total shipments nationally.[53] MRL has also seen a decline in coal shipments, which decreased 41% in June 2016 from June 2015.

---

[45] Association of American Railroads, *State Rankings,* 2012,https://www.aar.org/Style%20Library/railroads_and_states/dist/data/pdf/State%20rankings.pdf (Sept. 6, 2016).
[46] https://www.aar.org/Style%20Library/railroads_and_states/dist/data/pdf/Montana%202012.pdf.
[47] https://www.aar.org/Style%20Library/railroads_and_states/dist/data/pdf/State%20rankings.pdf.
[48] BNSF, *2015 Surface Transportation Board Annual Report* (Mont. Pub. Serv. Comm'n, Mar. 31, 2016).
[49] MRL, *2015 Surface Transportation Board Annual Report* (Mont. Pub. Serv. Comm'n, Mar. 31, 2016).
[50] Union Pacific, *2015 Surface Transportation Board Annual Report* (Mont. Pub. Serv. Comm'n, Mar. 31, 2016).
[51] Montana Legislative Audit Division, "Performance Audit: Railroad Safety," Oct. 2015, http://leg.mt.gov/content/Publications/Audit/Report/14P-13.pdf, (Sept. 6, 2016).
[52] Jim Lewis, MRL, email, Oct. 18, 2016.
[53] Matt Jones, BNSF, email, Oct. 21, 2016.

Before the plunge of global oil prices in 2015, crude oil shipments increased significantly on MRL and BNSF from 2005 to 2014. BNSF carried 21,042 tons of crude oil in 2005, which increased to 9.1 million tons—a growth of 43,000%—by 2014. MRL carried 21,958 tons of crude oil in 2005, which increased to 819,721 tons by the end of 2014.[54] In 2015, BNSF and MRL carried 8.4 million tons and 793,862 tons of crude oil, respectively.

Nationally, the tonnage of rail-shipped coal, petroleum, and petroleum products is lower through June 25, 2016, from the same date in 2015. Coal traffic has decreased 31% through June 25, 2016, from 2015, and petroleum and petroleum products have decreased 22%. From January 1, 2016, to June 25, 2016, there were 6 million carloads of rail traffic in the U.S., of which 5% carried petroleum and petroleum products and 29% carried coal.[55]

The United States Department of Transportation requires railroads to notify the State Emergency Response Commission (SERC) for each state in which it operates trains transporting 1 million gallons or more of Bakken crude oil, with updates whenever there is a material change in volume.[56] BNSF's most recent update posted to SERC's website was made on July 24, 2015; it reported 10-18 trains per week traveling across northern Montana, in Blaine, Flathead, Glacier, Hill, Liberty, Lincoln, Phillips, Roosevelt, Toole, and Valley counties. BNSF also reported 0-2 trains per week through Broadwater, Cascade, Custer, Dawson, Fergus, Gallatin, Golden Valley, Granite, Jefferson, Judith Basin, Lewis & Clark, Mineral, Missoula, Park, Pondera, Powell, Prairie, Richland, Rosebud, Sanders, Stillwater, Sweet Grass, Teton, Treasure, Wheatland, and Wibaux counties, as well as 0-3 trains per week through Yellowstone County.[57]

On June 6, 2016, Montana Rail Link reported 1 train per week carrying Bakken crude oil at or above the reporting threshold, traversing Yellowstone, Stillwater, Park, Gallatin, Broadwater, Lewis & Clark, Powell, Granite, Missoula, Lake, Mineral, and Sanders

---

[54] BNSF and Montana Rail Link, *Surface Board Annual Reports* (Montana Public Service Commission, 2005-2015).

[55] 6.4 million intermodal units have also traveled rail lines to date this year, for a total traffic of 12.4 million units. American Association of Railroads, *US Rail Traffic Week 25, 2016—Ended June 25, 2016,* Jun. 29, 2016, https://www.aar.org/newsandevents/Freight-Rail-Traffic/Documents/2016-06-08-railtraffic.pdf (Sept. 6, 2016).

[56] Montana Department of Military Affairs, *USDOT Emergency Order May 17, 2014 – Petroleum Crude Oil Railroad Carriers*, http://montanadma.org/crude-oil-shipment-information (Sept. 9, 2016).

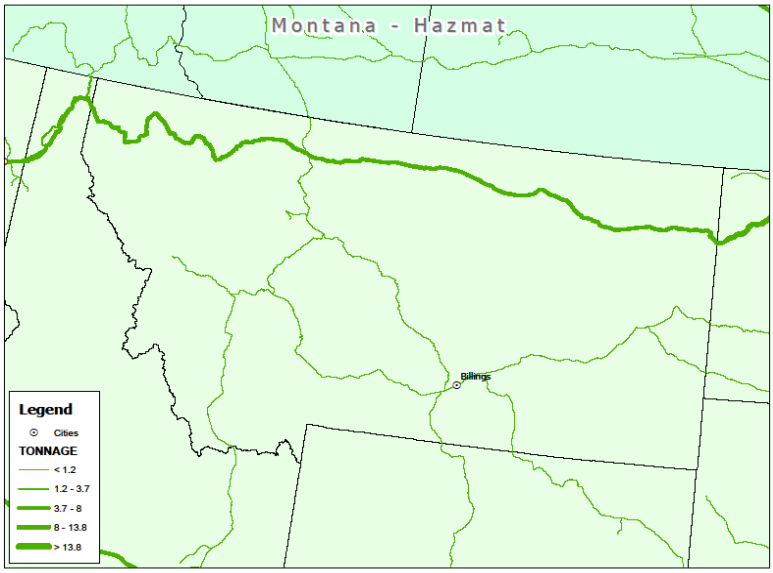
[57] BNSF, "Bakken Crude Oil Transport in Montana by County," Department of Military Affairs, July 28, 2015, http://montanadma.org/sites/default/files/BNSF%20Update%20072815.pdf (Sept. 6, 2016).

counties, with a note that Lake County would only be traversed in the event of a service interruption between Missoula and Paradise.[58] As of September 30, 2016, MRL has transported a total of 18 loaded crude trains, or about one train every two weeks.[59]

Union Pacific notified SERC on June 2, 2014 that it did not have any trains meeting the reporting threshold to report, and thus has not submitted any updates.[60]

As shown in the following map, hazardous materials are transported by rail along a number of routes through Montana. A predominate amount of the volume of hazardous materials is transported by rail along BNSF's northern route.

Volume of Hazardous Materials Shipped by Rail in Montana[61]



[58] Montana Rail Link, "State of Montana SERC Notification of Bakken Crude Oil Shipments," Department of Military Affairs, June 6, 2016. http://montanadma.org/sites/default/files/SERC-June62016.pdf (Sept. 6, 2016).
[59] Jim Lewis, Montana Rail Link, email, Oct. 19, 2016.
[60] Union Pacific, "Notice Letter," Department of Military Affairs, Jun. 2, 2014, http://montanadma.org/sites/default/files/MT.pdf(Sept. 6, 2016).
[61] Calhoun, 45.

Section 5) Incident History in Montana

Train accidents with more than the reporting threshold are reported by the railroads to the FRA and posted on the FRA's website, with causes attributed to human factors, equipment issues, track issues, or miscellaneous causes.[62] Human factors include operational causes such as brake usage, physical condition of the employee, flagging and radio signals, train handling, and use of switches. Track issues include causes related to track geometry, rail anchoring, and roadbed problems. Equipment issues involve mechanical and electrical failures of the train such as brakes, wheels, or locomotives. Incidents classified as miscellaneous may include accidents caused by environmental conditions, loading procedures, or unusual operation situations, among others.[63]

Nationally, 21,340 train accidents occurred from 2006-2015, with human factors causing 37 percent of accidents and track issues causing 33 percent.[64] A total of 339 train accidents, excluding highway-rail collisions, occurred in Montana from 2006-2015.[65] The leading cause of Montana railroad accidents during that period was human factors, which accounted for 165 accidents, 49 percent of the total. The second leading cause of accidents was track issues, which accounted for 31 percent of accidents during the period.

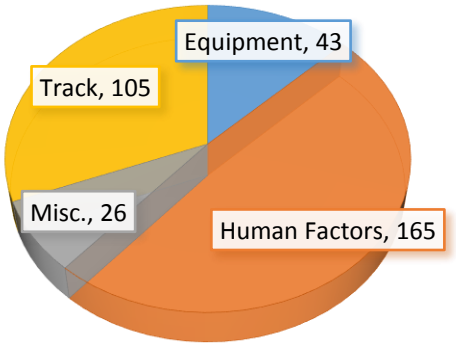
[62] The reporting threshold was $7,700 in 2006 and increased each year to $10,500 in 2014-2016. Federal Railroad Administration Office of Safety Analysis, "Railroad Equipment Accident/Incident Reporting Threshold," https://safetydata.fra.dot.gov/OfficeofSafety/ProcessFile.aspx?doc=RAILROAD_REPORTING_THRESHOLD.doc, (Oct. 21, 2016).

[63] Federal Railroad Administration Office of Safety Analysis, "Train Accident Cause Codes," http://safetydata.fra.dot.gov/officeofsafety/publicsite/downloads/appendixC-TrainaccidentCauseCodes.aspx?State=0 (Sept. 6, 2016).

[64] Federal Railroad Administration Office of Safety Analysis, "Ten Year Accident/Incident Overview by Calendar Year," 2006-2015, http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/TenYearAccidentIncidentOverview.aspx (Sept. 6, 2016).

[65] Mike Calhoun, "State of Montana Rail Safety Overview," (Jun. 1, 2016), 18.

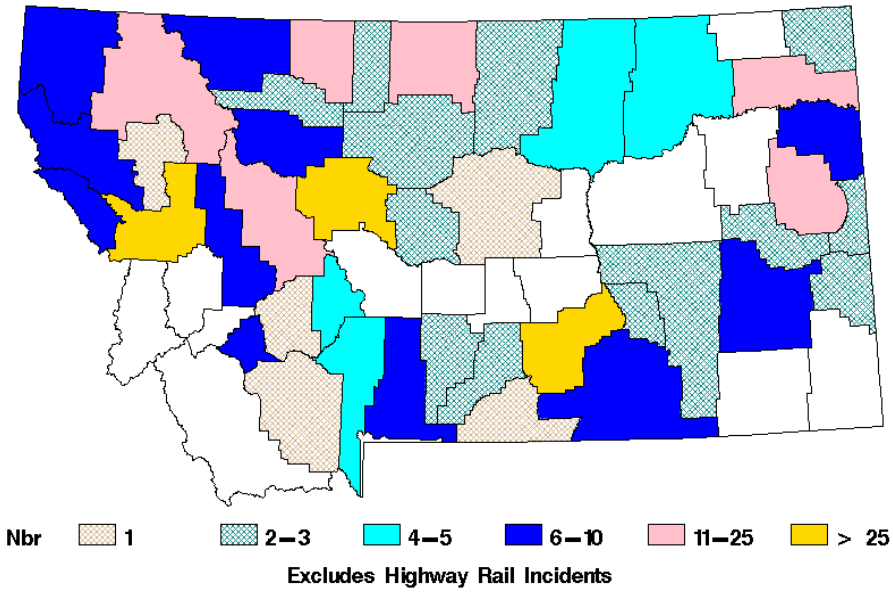
Montana Railroad Accident Causes 2006-2015[66]



Of the 56 counties in Montana, 42 experienced at least one train accident from 2006-2015. The county with the most accidents was Yellowstone, with 51, followed by Missoula (30) and Cascade (26).[67]

Roosevelt County had the highest reported financial damage from train accidents from 2006-2015, $8.3 million. The county experienced 16 accidents during the period, 10 caused by track issues. Yellowstone County had the second most reportable damage, $6.5 million; the majority of the accidents, 40 of 51, were caused by human factors.[68]

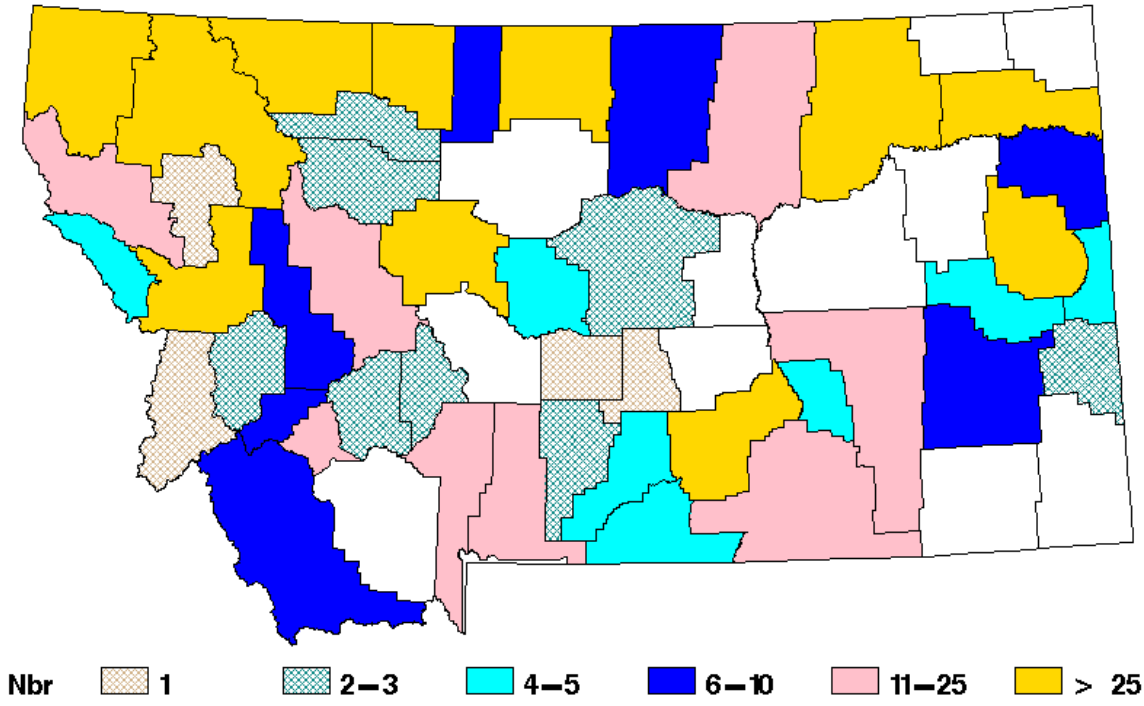
Train Accidents for Montana, January 2006-December 2015[69]



[66] Calhoun, 19.
[67] Calhoun, 37.
[68] *Ibid.*
[69] Calhoun, 36.

There were 155 highway rail incidents and 20 associated fatalities from 2006-2015. Most (24) of those accidents occurred in Yellowstone County, while the most fatalities (3) occurred in Glacier County. Nearly 72% of the incidents occurred at public crossings.[70] In addition to the 20 highway rail fatalities, there were 25 trespasser fatalities and 934 people injured during the 2006-2015 period[71] While 12 of those injuries resulted from train accidents, the majority of the reported injuries were reported in FRA Form 55a, which includes accidents of varying causes, from bee stings to more serious incidents.[72] The highest incidence of fatalities and injuries occurred along the northern train route traveled by BNSF and Amtrak.

Railroad Injuries and Fatalities in Montana, 2006-2015[73]



Hazardous Materials Incidents

From 2006-2015, 2,035 train cars carrying hazmat materials in or across Montana were involved in accidents, of which 241 were damaged or derailed in five accidents.[74] One of

[70] http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/TenYearAccidentIncidentOverview.aspx.
[71] *Ibid.*
[72] FRA Office of Safety Analysis, "Railroad Safety Data, Frequently Asked Questions," https://safetydata.fra.dot.gov/officeofsafety/Documents/Railroad%20Safety%20Data%20Frequently%20Asked%20Questions.pdf?V=9 (Oct. 20, 2016).
[73] Calhoun, 40.
[74] http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/TenYearAccidentIncidentOverview.aspx.

Montana's more recent hazmat accidents occurred on July 16, 2015, when a buckle in the track caused an accident involving a train carrying 106 hazmat cars in Roosevelt County near the city of Culbertson. Five of the 22 damaged cars released more than 34,000 gallons of North Dakota crude oil, and 50 people were evacuated from the area.[75]

One of Montana's most serious hazmat rail accidents occurred in 1996, when a Montana Rail Link train derailed two miles outside of Alberton and released 130,000 pounds of chlorine, 17,000 gallons of potassium hydroxide, and 85 dry gallons of sodium chlorate. Approximately 1,000 people were evacuated from the town of Alberton, 123 people were injured, and one person riding the train died. Part of Interstate 90 was closed, and some residents were evacuated for 14 days. The National Transportation Safety Board determined that the cause of the accident was a vertical split head on a rail that broke under the moving train. Visual inspection records and ultrasonic rail defect detection equipment used a month prior to the accident did not reveal any defects.[76]

[75] Federal Railroad Administration Office of Safety Analysis, "Accident Detail Report," Jul. 2015, http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/incrpt.aspx (Sept. 6, 2016).

[76] National Transportation Safety Board, "Railroad Accident Brief: Derailment and Hazardous Materials Release with Fatality; Montana Rail Link; Alberton, Montana," Apr. 11, 1996, https://app.ntsb.gov/investigations/summary/RAB9807.html (Sept. 6, 2016).

Section 6) Transport Risks/Bakken Crude

The evaluation of incident history is a necessary step toward making an accurate assessment of current risk and a subsequent plan to ameliorate that risk. But another factor looms perhaps even larger in assessing risk for railroad accidents in Montana: the frequent transport—in large volumes—of Bakken crude oil, a particularly volatile and, when spilled, potentially dangerous cargo. The transport of Bakken crude was an emphasized topic in the legislative audit[77] and is similarly treated in this assessment.

Bakken crude, named for its source geological formation that underlies western North Dakota, northeastern Montana, and southern Saskatchewan and Manitoba, is a type of light, sweet oil of relatively high quality. Yet some of the chemical characteristics that make Bakken crude easier to refine than heavier oils also make it more challenging to transport: it possesses volatile organic compounds, which contribute to giving the oil high volatility and low viscosity. Bakken crude's flash point, or temperature at which an organic compound gives off sufficient vapor to ignite in air, is comparatively low.[78]

Reid Vapor Pressure (RVP) is a test method which measures the vapor pressure of crude oil and petroleum refined products. Comparing the RVP of crude oils is difficult, as there can be a range of RVP values depending on the techniques used and where in the supply chain the test was conducted. Variations in conditioning, storage, and transport can also influence the RVP value. When compared to heavier, blended oils stored at the U.S. Strategic Petroleum Reserve, Bakken crude on average has a higher true vapor pressure.[79] According to an analysis performed by the *Wall Street Journal*[80], Bakken crude possesses the highest volatility by this measure compared to other crude types commonly processed in U.S. refineries.

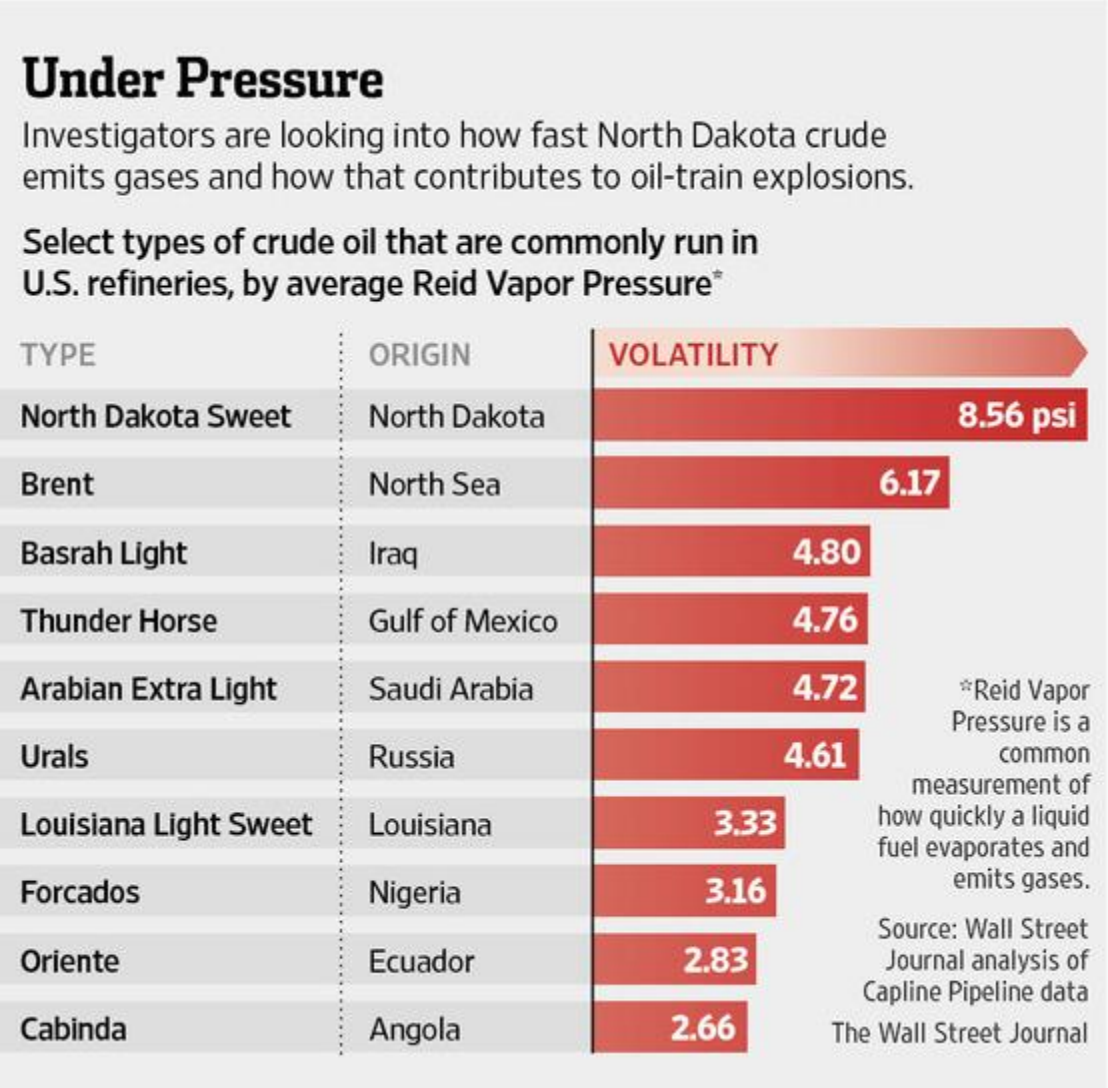
---

[77] Legislative Audit Division, "Performance Audit: Railroad Safety," Oct. 2015, http://leg.mt.gov/content/Publications/Audit/Report/14P-13.pdf

[78] Eric de Place and John Abbotts, "Why Bakken Oil Explodes," Sightline Institute, Jan. 21, 2014, http://www.sightline.org/2014/01/21/why-bakken-oil-explodes/

[79] Sandia National Laboratories, "Literature Survey of Crude Oil Properties Relevant to Handling and Fire Safety in Transport," Mar. 2015, 11-13.

[80] Russell Gold, "Bakken Shale Oil Carries High Combustion Risk," *Wall Street Journal*, Feb. 23, 2014, http://www.wsj.com/articles/SB10001424052702304834704579401353579548592



In its study of the Bakken crude involved in the 2013 derailment in Quebec that killed 47 people and destroyed the city center of Lac-Mégantic, Canada's Transportation Safety Board concluded that the train's cargo of Bakken crude had a "volatility comparable to that of a condensate or gasoline product"[81] and the "large quantities of spilled crude oil, the rapid rate of release, and the oil's high volatility and low viscosity were likely the major contributors to the large post-derailment fireball and pool fire."[82]

In a safety alert of January 2014, the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation stated that "recent derailments and resulting fires indicate that the type of crude oil being transported

[81] Transportation Safety Board of Canada, "TSB Laboratory Report LP148/2013," modified Aug. 19, 2014, http://www.tsb.gc.ca/eng/enquetes-investigations/rail/2013/R13D0054/lab/20140306/LP1482013.asp, §4.3.
[82] Transportation Safety Board of Canada, §4.6.

from the Bakken region may be more flammable than traditional heavy crude oil."[83] It further reinforced a requirement "to properly test, characterize, classify, and where appropriate sufficiently degasify hazardous materials prior to and during transportation."[84]

The volatility of Bakken crude, when combined with the large volumes of the substance being shipped from the oil fields of western North Dakota and far eastern Montana, make oil transport by rail a high-risk endeavor. Since 2010, when production of Bakken crude exceeded pipeline export capacity, the number and severity of oil-related rail accidents have increased dramatically. Here is a sampling of the incidents:

- In July 2013, a runaway oil train derailed and burned in Lac-Mégantic in Quebec, killing 47 people and destroying much of the town center.
- In November 2013, an oil train from North Dakota derailed and exploded near Aliceville, Alabama. 749,000 gallons of oil spilled from 26 tanker cars.
- In December 2013, a collision involving oil tankers occurred near Casselton, North Dakota, started a fire and led to the evacuation of 2,000 residents.
- In July 2015, more than 20 cars of a 108-car BNSF oil train derailed east of Culbertson, Montana, spilling an estimated 35,000 gallons of oil.
- In June 2016, a Union Pacific oil train derailed and spilled 42,000 gallons of crude in the small town of Mosier, Oregon. The resulting fire burned for 14 hours.

After the Mosier incident, the Oregonian newspaper reported that "[a]t least 27 oil trains have been involved in major derailments, fires or oil spills in the U.S. and Canada during the past decade, according to an AP analysis of accident records." This relatively new type of railroad accident may be attributed to the similarly new phenomena of oil production from fracking and oil transport by rail, and the severity of the accidents are heightened by the volumes and volatility of the cargo.

Crude Oil Transport Regulations

Railroad companies have taken measures in regard to railroad safety in addition to what is required by the FRA. Some of these measures include increased inspections, use of safety technologies, and decreased speed for crude oil trains.[85]

---

[83] The Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, "Preliminary Guidance from OPERATION CLASSIFICATION," Jan. 2, 2014, http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/1_2_14%20Rail_Safety_Alert.pdf, 1.

[84] The Pipeline and Hazardous Materials Safety Administration, 1.

[85] Matt Jones, BSNF, "Crude Oil Safety Measures Implemented by Railroads, "email, Oct. 21, 2016.

PHMSA and the FRA issued a final rule on May 1, 2015, "Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains."[86] The rule applies to trains that have 20 or more continuous tank cars loaded with flammable liquids, or 35 or more tank cars loaded with flammable liquid dispersed throughout the train. The rule requires enhanced braking and design standards for new tank cars and retrofits for existing tank cars. It also restricts speeds for trains carrying high-hazard flammable materials and requires more accurate classification of unrefined petroleum products.

North Dakota has also taken measures to enhance safety of Bakken crude oil. The North Dakota Industrial Commission approved an order on December 9, 2014, requiring oil producers in the state to install equipment to reduce the vapor pressure of Bakken crude oil.[87] The goal of the rule is to produce crude oil that does not exceed a vapor pressure of 13.7 pounds per square inch (psi) at the well site, which is stricter than the federal standard of 14.7 psi for stable oil.

[86] U.S. Department of Transportation, "Rule Summary: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains," May 1, 2015, https://www.transportation.gov/mission/safety/rail-rule-summary (Oct. 25, 2016).
[87] North Dakota Oil and Gas Division, https://www.dmr.nd.gov/oilgas/ConditioningFAQ040215.pdf (Oct. 25, 2016).

Section 7) Risk Profile for Montana

Overview of Risk Assessment Methods

The notion of risk combines two concepts: probability (likelihood) and severity (costs/consequences). Thus, the assessment of risk requires asking and answering two questions: (1) how likely is it that some event will happen; and (2) what will be the costs or consequences if it happens?

Risk can be assessed either quantitatively or qualitatively. If both the probability and the severity of an event can be quantified, the risk of the event can be calculated as: risk = probability x severity. For example, if the probability of a hazardous train car derailment with a release and ignition of the hazardous product (say, crude oil) along the BNSF rail line that crosses northern Montana is 10^{-5} (one in one hundred thousand) in any given year and the severity of such a derailment is $50 million in damages, the risk is $500 per year (these numbers are purely illustrative). With a quantified risk assessment, it is possible to evaluate alternative preventative measures in terms of their costs and benefits.

Quantitative risk assessments can become complex when multiple probabilities and severities must be accounted for. For example, a derailment event is likely the culmination of a long chain of preceding events, each with their own probabilities, and the severity of a derailment event will vary along the route of a rail line based on factors involving populations, physical structures, and environmental characteristics. Sophisticated computer models are often used for complex quantitative risk analysis.[88]

Overview of Staff's Risk Assessment Method

Time and resource constraints dictated the use of qualitative risk assessment methods for this analysis. Commission staff are not experts in quantitative risk assessment techniques and do not have access to required computer models. A comprehensive quantitative risk assessment would also require the development of detailed data on probabilities and severities, and it is not clear that such data exists and is publicly available. Thus, staff relied on qualitative risk assessment methods. Importantly, a qualitative risk assessment still requires combining the likelihood of events and their consequences. However, those variables are assigned qualitative values (e.g., high, medium, or low likelihood) based on informed judgment.

[88] See e.g., Comments of DNV-GL, Docket No. N2015.11.84 (Aug. 15, 2016).

Staff's qualitative risk assessment involved the following key steps:

1. Characterize the hazardous materials transported over the major rail routes in Montana in terms of the type of material (e.g., crude oil, ethanol, gasoline, or other refined crude oil products, or other chemicals), the amount of the material, and the frequency with which it is transported over Montana rail routes.
2. Analyze historical data on rail incidents in Montana in terms of their causes and impacts in order to identify factors that increase the likelihood of serious incidents and accidents.
3. Assess vulnerabilities along rail routes used to transport hazardous material in Montana. Vulnerabilities centered on the possibility of exposure by humans and the environment to releases of hazardous materials and damage to property/infrastructure caused by train derailments.
4. Based on the results of steps 1-3, develop qualitative measures of risk for major rail routes in Montana.

With the understanding that the most significant categorical hazard associated with rail freight transport in Montana is the shipment of hazardous materials—particularly Bakken crude oil—the Commission staff has utilized a risk assessment method centered on the risks associated with crude oil transport. This method involved refining the general method described above into the following steps:

- Identification of the routes to be analyzed. Most freight tonnage is carried across four major routes in Montana: 1) the "North" line, owned and operated by BNSF, which crosses Montana's northern tier across the Hi-Line for 665 miles; 2) the "South" line, owned and operated by BNSF (and utilized by MRL between Huntley, near Billings, and Sand Point, Idaho), which runs 847 miles along the Yellowstone River to Livingston, then generally northwest through Bozeman, Helena, and Missoula, and then along the Clark Fork River to the Idaho border; 3) the "Diagonal" line, owned and operated by BNSF, which runs 363 miles between Laurel and the Canadian border at Sweetgrass; and 4) the "Southwest" line, owned and operated by Union Pacific, which runs 125 miles south from near Butte and exits Montana over Monida Pass, on the Idaho border.[89] We segmented each route on the basis of counties transected by the route.

[89] Because the five short-line railroads serving Montana carry a small fraction of the rail freight tonnage in Montana and relatively little, if any, Bakken crude oil, they were not included in this risk analysis.

- Identification of the human and natural features along each route and within each relevant county that could be most damaged by a rail incident of derailment, spill, explosion, and/or fire. We selected population metrics along the routes as the best proxies for vulnerabilities of human population and cultural, institutional, and socio-political resources.[90] For important natural and environmental resources, we selected the most sizable streams, lakes, and reservoirs, as well as mountain passes and protected areas.

- Associating an incident intensity rating for each county along each route. Utilizing a summary of train accidents in Montana published by FRA for the 10-year period, 2006-2015, the staff extrapolated general incident intensity ratings, of "Low," "Medium," and "High" in order to juxtapose a historical element to the risk context.

- Assemblage of risk data into a table for each route. The resources and incident data described above were used to assemble a "Railroad Risk Elements" table for each of the three routes. Those tables are found in Appendix A of this report.

The tables do not provide statistically generated risk figures, but offer a visual aid for subjectively considering varying levels of risk in counties along the same rail line. For example, in the table for Montana's north line, the collective risk in Liberty County differs markedly from that of Flathead County. Liberty County has a relatively small potentially affected population, no significant streams paralleling the rail line, a relatively level rail grade, and a recent history of few rail incidents. In contrast, the north line through Flathead County passes through a much greater potentially affected population, over Marias Pass on the Continental Divide, along 46 miles of the Flathead River, and adjacent to Glacier National Park for 50 miles, and has a 10-year history of more rail incidents. Such a comparison suggests that, along the north line, Flathead County poses a higher risk for rail incidents than Liberty County.

Risk differentiation between lines involves additional factors. By the standard of track length, Montana's south line, at 847 miles, offers more risk than the north line, at 665

[90] For the North, South, and Diagonal lines, we utilized county-based estimates of population potentially affected by a rail incident submitted by BNSF and developed according to guidelines in the U.S. Department of Transportation Emergency Response Guidebook. (Matthew Jones, BNSF Railway, "BNSF_MT_CountyPopulation_HalfMileRadius," email, Oct. 12, 2016.) For the Southwest line, we utilized population figures for the most significant urban areas in each of the transected counties (U.S. Census Bureau, "Annual Estimates of the Resident Population for Incorporated Places: 4/1/10—7/1/15.")

miles. Additionally, the south line passes through more counties, more urban areas, and some of the state's largest population centers, including Billings-Laurel, Bozeman-Belgrade, Helena, and Missoula. These factors, when considered independently of others, suggest that the level of hazard severity along the south line is greater than that along the north line.

However, the risk element that differs the most between lines is the volume of freight, particularly Bakken crude oil, carried on each line. In July 2015, the north line carried 10-18 trains per week carrying 1 million or more gallons of Bakken crude, while the south line carried 1 train per week of crude.[91] This north-south volume ratio—from 10:1 to 18:1—translates into a significantly greater hazard frequency on the north line. (The UP line in southwest Montana did not report any trains carrying more than 1 million gallons of crude oil in 2015.)

Because risk is the product of hazard frequency and hazard severity, the significantly greater value of the hazard frequency on the north line strongly suggests that most preventative attention from rail inspectors in Montana should occur on the north line. With the caveat that any of a number of additional factors not addressed by the risk methodology described herein might alter the balance of risk between Montana's major rail lines, it appears that a strong argument exists for the joint FRA-PSC rail inspection effort in Montana to dedicate the greater part of its time and resources to the state's northern line.

Although one of Montana's most severe hazmat rail accidents occurred on the south line involving chemicals other than crude oil (the Alberton chlorine spill), the volume of hazmat and frequency of accidents along the south line is much smaller than that on the north line (see the hazmat map on p. 19). The transport of chemicals by rail also has not increased in volumes as significantly as crude oil in the past decade, so for the purposes of this report staff chose to focus on the escalating potential risks of crude oil spills.

[91] Montana Department of Military Affairs, *Crude Oil Shipment Information*, http://montanadma.org/crude-oil-shipment-information (Sept. 6, 2016).

Section 8) Action Plan

Introduction

This section provides a recommended near-term action plan for the railroad safety program. In developing the recommended action plan, staff considered the results of the risk profile developed in Section 7. However, in addition to the risk assessment results, the recommended action plan reflects an introspective assessment of the structure and operation of the current program based on information and insights accrued during the process of preparing the risk assessment.

The Role of the Commission's Program in the Context of Federal Preemption

Staff could not locate records documenting the Commission's original decision to participate in the State Rail Safety Participation Program. State participation is not required and a number of states have decided not to participate. As explained in Section 2, the federal government has largely preempted the field of railroad regulation, including establishing and enforcing regulations intended to adequately mitigate risks of train incidents that expose people, property, and the environment to hazardous materials such as volatile crude oil products.

Given the degree of federal preemption, states should be able to expect the federal government to adequately mitigate state-specific risks through targeted compliance investigation and enforcement activities. In addition, states can use their congressional representation to affect the level of federal inspection resources and investigative and surveillance priorities. Thus, one might reasonably question whether states obtain incremental benefits from participation in the State Rail Safety Participation Program, given that the costs of participation fall largely on the states, while essential responsibility rests with the federal government.

The National Association of State Rail Safety Program Managers Handbook (Handbook) describes a number of benefits from state participation. According to the Handbook, benefits derive from the fact that state inspectors provide supplemental inspections that non-participating states do not receive because the FRA does not reduce its inspection efforts in response to state participation. The supplemental inspectors enhance regulatory scrutiny of railroads shipping hazardous commodities and provide health and safety benefits through public education, additional security at rail company facilities, monitoring and reporting drainage issues around roadbeds, addressing fencing issues, and informing state transportation planning efforts.

The Handbook recognizes that, though the federal government has the responsibility to fund a regulatory regime it has preempted from states, present workload exceeds the federal inspector workforce. However, it is not clear that the proper state response to an understaffed federal program is to add state inspectors. For example, compensating for a federal inspector shortfall with state inspectors might distort federal funding decisions by obscuring the real cost of achieving federal rail safety performance objectives and lead to a chronically underfunded federal inspection program. [92]

The best reason the Handbook provides for state participation is that the right of state participation was part of a "grand compromise" when the Federal Railroad Safety Act of 1970 was enacted to establish uniformity of railroad safety laws, regulations, and standards. Congress intended that there be some level of state participation and envisioned that state inspectors would act as the "eyes and ears" of state governments. In that role, state inspectors provide states a direct connection to railroad company operations within the state as well as the federal government's safety-related regulations and activities. Managed appropriately, state participation ensures that local objectives and concerns can influence the evolution of federal regulations and standards. In this way, according to the Handbook, the partnership between the states and the FRA is mutually beneficial and serves the public interest.

Because the Commission has an active railroad safety program, staff assumed that the Commission's primary reason for participating in the FRA's State Rail Safety Participation Program is to obtain insight and maintain a conduit for state input into federal inspection, surveillance, and enforcement activities. This allows the Commission to facilitate inspection and enforcement strategies that efficiently and effectively mitigate risks of railroad company operations on Montana's people and environment. However, the Commission may also have considered supplemental benefits of state inspection capability as reasons for participation. In any case, both of these possible reasons for participation strongly suggest that, in the long run, the Commission's railroad safety program action plans should reflect thorough knowledge of the FRA's risk assessments and associated inspection strategies and priorities.

In fact, the Commission's Federal Railroad Safety Program State Participation Agreement, which was executed in 1995, indicates that the Commission will use the

---

[92] *See, e.g. New York v. United States*, 505 U.S. 144, 169 (1992) ("But where the Federal Government directs the States to regulate, it may be state officials who will bear the brunt of public disapproval, while the federal officials who devised the regulatory program may remain insulated from the electoral ramifications of their decision. Accountability is thus diminished when, due to federal coercion, elected state officials cannot regulate in accordance with the views of the local electorate in matters not pre-empted by federal regulation").

FRA's National Inspection Plan (NIP) as a basis for planning inspection activities. Staff did not locate information regarding how the NIP may have been used in the past. Currently, the NIP is either not used, or it is used only indirectly as state inspectors informally coordinate their inspection activity with the FRA's inspection activities.

Should the Commission Concur in Audit Recommendation to Add Inspectors?

The performance audit of the Commission's railroad safety program concluded that the Commission was not actively engaged in railroad safety, had not undertaken a risk assessment for purposes of setting program goals and objectives, and was not actively participating in the National Association of State Rail Safety Program Managers. The Commission generally concurred in these findings.

However, staff does not agree with the performance audit recommendation that the Commission increase its inspection capability and coverage by hiring one Track Inspector, one Signals and Train Control Inspector, and an additional MP&E Inspector to focus on the Hi-Line. This recommendation was based primarily on a comparison to other states, an acknowledgement by the FRA that its inspection capability and coverage in Montana are suboptimal, and, perhaps, a misreading of federal regulations by the auditors.[93] To the extent overall inspection capability and coverage are not sufficient in Montana, the performance audit did not discuss potential alternatives to hiring additional state inspectors and the relative costs and benefits of those alternatives.

The results of staff's risk assessment, which identifies the BNSF rail line crossing northern Montana and its relatively high volume of crude-by-rail traffic as an important source of risk, is generally consistent with findings in the performance audit. However, staff concludes that it is premature at this time to expand inspection capability within its railroad safety program. Staff does not rule out the possibility that FTE additions might be appropriate in the future. However, the Commission's near-term railroad

[93] The performance audit observes that in the Commission's Federal Railroad Safety Program State Participation Agreement, the Commission "agrees to provide the capability necessary to assure coverage of facilities, equipment and operating practices through planned, routine compliance inspections within the state." The performance audit proceeds to discuss the various types of inspection tradecrafts, what tradecrafts the Commission employs and does not employ, and concludes that two state inspectors "covering the entire state is not sufficient…" To the extent the performance audit's recommendation assumes that the Commission has a responsibility to ensure coverage of facilities, equipment and operating practices by employing all types of tradecrafts, that assumption is not consistent with federal regulations which clearly allow the Commission to limit the scope of its participation to specific crafts. 49 CFR § 212.105.

safety program action plan should focus on making operational improvements in the existing program.

Due to staff retirements, the railroad safety program currently operates with one certified inspector and an inspector-in-training, and without a program manager; management functions have been assumed by the Regulatory Division Administrator. The previous program manager also supervised motor carrier regulation and enforcement. The railroad safety program management function within the Commission was functionally allocated 0.15 FTE. That contrasts with the Commission's pipeline safety program management function, which is allocated approximately 0.85 FTE. Staff finds that it could be beneficial for the railroad safety program manager to be a certified inspector in order to effectively manage the highly technical inspection and reporting activity performed by the work unit.

A technically proficient program manager could also develop the kind of data-driven state inspection plans described in the Handbook and the performance audit report. The program manager could monitor the development of the FRA's inspection plans, provide input during the planning process to reflect state goals and objectives, and integrate the FRA's inspection plans into the Commission's inspection plans. In short, the railroad safety program could operate more like the Commission's pipeline safety program. If these operational changes were implemented, the Commission would be in a much better position to assess whether additional state inspection resources are appropriate or whether other approaches should be considered to address any inspection shortfall in Montana.

It would be reasonable for the Commission to review and update its railroad safety program action plans on a regular basis, perhaps annually, to reflect the implementation of recommended operational changes. Updating the action plans could account for changing industry conditions, federal regulations, FRA inspection priorities, future Commission risk assessments, and the Commission's overall purpose for maintaining investigative and surveillance activities in a federally preempted area of regulation.

Recommended Action Plan

1. Return inspection capability to the prior baseline, i.e., 2 certified MP&E inspectors.
    a. Complete on-the-job training and certification for newly hired inspector.

2. Dedicate additional resources to program management function.

a. Allocate 0.3 – 0.5 FTE to program management, initially to be sourced from the two inspector positions and the Regulatory Division Administrator position. Work towards transitioning program management to one of the inspectors.
b. Revisit railroad safety program manager position description and revise as necessary.
c. Improve communication between field inspectors and program manager with respect to planning inspections and setting goals and objectives.
d. Improve communication between program staff and the Commission, for example by providing the Commission an annual review of inspection activities and results as is currently provided by pipeline safety program staff.

3. Integrate program management with the FRA's risk assessment and inspection planning and prioritization process.
    a. Regularly communicate with the FRA's Region 8 management.
    b. Participate in regional conference calls.
    c. Improve understanding of the FRA's process for developing Region 8 inspection work plans.
    d. Further explore, and implement if appropriate, the Focused Inspection Planning process framework outlined in the Handbook.
    e. Develop an annual inspection plan for Commission inspectors.

4. Continue participation in National Association of State Rail Safety Program Managers.

5. Continue participation in State Emergency Response Committee and Rail Safety Competition Council meetings.

6. Address "management memorandum" issued by Legislative Audit Division by exploring options for identification and safety markings and warning lights on inspectors' vehicles and apparel.

Section 9) Conclusion

The Legislative Audit Division's performance audit of the Commission's railroad safety program prompted the Commission to review the program in the context of the audit report's recommendation that the Commission add additional inspection capability. The Commission directed staff to undertake a risk assessment and develop an action plan. In the course of preparing the risk assessment and action plan staff examined how the program is currently structured and operated and whether improvements are possible. Staff's program examination indicated that a primary purpose for the Commission's participation in the State Rail Safety Participation Program is to provide Montana a direct connection, on a daily basis, to railroad company operations and FRA safety-related regulations and inspection, surveillance, and enforcement activities in the state. This participation should facilitate the consideration of state objectives and concerns in the deployment of federal preventative inspection resources in a way that serves the public interest.

Staff's program examination found room for improving program operating practices consistent with the program's purpose. Staff concluded that taking steps to improve program operating practices should be the focus of a near-term action plan because such improvements facilitate the Commission's ability to make better decisions about the merits of adding inspection resources compared to other alternatives for achieving the purposes of the railroad safety program. Staff identified a series of specific action items designed to improve program operating practices and recommended regularly revisiting and updating the program action plan.

Appendix A—Railroad Risk Elements

Montana North Line (BNSF)

County	Incident radius population[1]	Stream (RR miles)	Lake/Reservoir (RR miles)	Pass (elev.)	Protected area (RR miles)	Incident Intensity[2]
Roosevelt	6,560	Missouri R. (65 mi)				High
Valley	3,265	Milk R. (52 mi)				Medium
Phillips	2,111	Milk R. (22 mi)	L. Bowdoin (7 mi)		Bowdoin Wildlife Ref. (7 mi)	Medium
Blaine	1,918	Milk R. (54 mi)				Low
Hill	5,311	Milk R. (12 mi)				High
Liberty	940	N/A				Low
Toole	3,023	N/A				High
Glacier	3,518	Willow Cr. (3 mi) Summit Cr. (8 mi)		Marias Pass (5,280')	Glacier Natl. Park (8 mi)	Medium
Flathead	20,443	Flathead R. (46 mi)	Whitefish L. (6 mi)	Marias (5,280')	Glacier Natl. Park (50 mi) Great Bear Wild. (41 mi)	High
Lincoln	6,891	Tobacco R. (12 mi) Kootenai R. (43 mi) Fisher R. (10 mi)				Medium

[1] Matthew Jones, BNSF Railway, "BNSF_MT_CountyPopulation_HalfMileRadius," email, Oct. 12, 2016. BNSF provided a table listing total population by county within a ½ mile radius of its track, and whether or not crude oil is transported through the county. The decision to use a ½ mile radius is based on the DOT Emergency Response Guidebook.

[2] Federal Railroad Administration, "Train Accidents for Montana, Jan. 2006--Dec. 2015."

Montana South Line (BNSF/MRL)

County	Incident radius population[1]	Stream (RR miles)	Lake/Reservoir (RR miles)	Pass (elev.)	Protected area (RR miles)	Incident Intensity[2]
Richland	3,495	Y'stone R. (37 mi)				Medium
Dawson	6,691	Y'stone R. (38 mi)				High
Prairie	777	Y'stone R. (30 mi)				Low
Custer	6,122	Y'stone R. (35 mi)				Medium
Rosebud	3,547	Y'stone R. (36 mi)				Low
Treasure	402	Y'stone R. (26 mi)				Low
Yellowstone	24,152	Y'stone R. (81 mi)				High
Stillwater	3,627	Y'stone R. (46 mi)				Low
Sweetgrass	1,697	Y'stone R. (37 mi)				Low
Park	6,814	Y'stone R. (18 mi)				Medium
Gallatin	14,376	Gallatin R. (32 mi) Missouri R. (12 mi)		Bozeman Pass (5,760')		Medium
Broadwater	2,597	Missouri R. (15 mi)	C. Ferry Res. (5 mi)			Medium
Jefferson	2,397					Low
Lewis & Clark	18,627	Seven Mile Cr. (8 mi)		Mullan Pass (5,902')		High
Powell	2,544	Ltl. Blkft. R. (24 mi) Clark Fork R. (21 mi)				Medium
Granite	430	Clark Fork R. (30 mi)				Low
Missoula	39,909	Clark Fork R. (60 mi)				High
Mineral	2,855	Clark Fork R. (50 mi)				Medium
Sanders	5,312	Clark Fork R. (99 mi)	Noxon Res. (15 mi) Cab. Gorge (20 mi)			Medium

[1] Matthew Jones, BNSF Railway, "BNSF_MT_CountyPopulation_HalfMileRadius," email, Oct. 12, 2016. BNSF provided data listing population by county within a ½ mile radius of its track, and whether crude oil is transported through the county. The decision to use a ½ mile radius is based on the DOT Emergency Response Guidebook.

[2] Federal Railroad Administration, "Train Accidents for Montana, Jan. 2006--Dec. 2015."

Montana Diagonal Line (BNSF)

County	Incident radius population[1]	Stream (RR miles)	Lake/ Reservoir (RR miles)	Pass (elev.)	Protected area (RR miles)	Incident Intensity[2]
Yellowstone	24,152	Y'stone R. (20 mi)				High
Golden Valley	12	Musselshell R. (1 mi)				Low
Wheatland	136					Low
Judith Basin	1,015	Judith R. (1 mi)				Low
Cascade	31,125	Belt Cr. (1 mi) Missouri R. (3 mi) Sun River (12 mi)				High
Teton	2,915	Teton R. (1 mi)				Medium
Pondera	2,665					Low
Toole	3,023	Marias R. (1 mi)	Aloe L. (3 mi)			High

[1] Matthew Jones, BNSF Railway, "BNSF_MT_CountyPopulation_HalfMileRadius," email, Oct. 12, 2016. BNSF provided a table listing total population by county within a ½ mile radius of its track, and whether or not crude oil is transported through the county. The decision to use a ½ mile radius is based on the DOT Emergency Response Guidebook.

[2] Federal Railroad Administration, *State of Montana Rail Safety Overview*, "Train Accidents for Montana, Jan. 2006--Dec. 2015."

Montana Southwest Line (UP)

County	Community (population[1])	Stream (RR miles)	Lake/Reservoir (RR miles)	Pass (elev.)	Protected area (RR miles)	Incident Intensity[2]
Beaverhead	Dillon (4,300)	Red Rock R. (32 mi) Big Hole R. (13 mi) Beaverhead R. (24 mi)	Clark Canyon Res. (6 mi)	Monida (6,870')		Low
Silver Bow	Butte (33,700)	Big Hole R. (5 mi) Silver Bow Cr. (20 mi)		Divide (5,384')		Medium
Deer Lodge	Opportunity (100)	Silver Bow Cr. (8 mi) Clark Fork R. (6 mi)				Low
Powell	Deer Lodge (3,200) Garrison (100)	Clark Fork R. (22 mi)				Medium

[1] U.S. Census Bureau, "Annual Estimates of the Resident Population for Incorporated Places: 4/1/10--7/1/15."

[2] Federal Railroad Administration, "Train Accidents for Montana, Jan. 2006--Dec. 2015."

Appendix B—Railroad Risk Score

Montana North Line (BNSF)

County	Risk Level (population)	Risk Level (water miles)	Risk level (passes/ topography)	Risk level (protected areas)	Risk level (incident intensity)	Risk Level (freight volume)	Risk Level (aggregate)
(risk category)	high	medium	low	low	medium	high+	
(risk rating range)	10, 20, 30, 40, or 50[1]	5, 10, or 15[2]	0 or 5[3]	0 or 5[4]	5, 10, or 15[5]	20, 40, or 60[6]	(sum of columns B-G)
Roosevelt	20	15	0	0	15	60	110
Valley	10	15	0	0	10	60	95
Phillips	10	10	0	5	10	60	95
Blaine	10	15	0	0	5	60	90
Hill	20	15	0	0	15	60	110
Liberty	10	5	0	0	5	60	80
Toole	10	5	0	0	15	60	90
Glacier	10	10	5	5	10	60	100
Flathead	40	10	5	5	15	60	135
Lincoln	20	15	0	0	10	60	105

[1]Population rating: 0-5,000=10; 5,001-10,000=20; 10,001-20,000=30; 20,001-30,000=40; 30,001+=50

[2]Water miles rating; 0-10=5; 10-50=10; 50+=15

[3]Topography rating: no pass=0; pass(es)=5

[4]Protected area rating: no protected area=0; protected area(s)=5

[5]Incident intensity rating: low history=5; medium history=10; high history=15

[6]Freight volume rating: low volume=20; medium volume=40; high volume=60

Montana South Line (BNSF/MRL)

County	Risk Level (population)	Risk Level (water miles)	Risk level (passes/ topography)	Risk level (protected areas)	Risk level (incident intensity)	Risk Level (freight volume)	Risk Level (aggregate)
(risk category)	high	medium	low	low	medium	high+	
(risk rating range)	10, 20, 30, 40, or 50[1]	5, 10, or 15[2]	0 or 5[3]	0 or 5[4]	5, 10, or 15[5]	20, 40, or 60[6]	(sum of columns B-G)[7]
Richland	10	10	0	0	10	40	**70**
Dawson	20	10	0	0	15	40	**85**
Prairie	10	10	0	0	5	40	**65**
Custer	20	10	0	0	10	40	**80**
Rosebud	10	10	0	0	5	40	**65**
Treasure	10	10	0	0	5	40	**65**
Yellowstone	40	15	0	0	15	40	**110**
Stillwater	10	10	0	0	5	40	**65**
Sweetgrass	10	10	0	0	5	40	**65**
Park	20	10	0	0	10	40	**80**
Gallatin	30	10	5	0	10	40	**95**
Broadwater	10	10	0	0	10	40	**70**
Jefferson	10	5	0	0	5	40	**60**
Lewis & Clark	30	5	5	0	15	40	**95**
Powell	10	10	0	0	10	40	**70**
Granite	10	10	0	0	5	40	**65**
Missoula	50	15	0	0	15	40	**120**
Mineral	10	15	0	0	10	40	**75**
Sanders	20	15	0	0	10	40	**85**

[1]Population rating: 0-5,000=10; 5,001-10,000=20; 10,001-20,000=30; 20,001-30,000=40; 30,001+=50

[2]Water miles rating; 0-10=5; 10-50=10; 50+=15

[3]Topography rating: no pass=0; pass(es)=5

[4]Protected area rating: no protected area=0; protected area(s)=5

[5]Incident intensity rating: low history=5; medium history=10; high history=15

[6]Freight volume rating: low volume=20; medium volume=40; high volume=60

Montana Diagonal Line (BNSF)

County	Risk Level (population)	Risk Level (water miles)	Risk level (passes/ topography)	Risk level (protected areas)	Risk level (incident intensity)	Risk Level (freight volume)	Risk Level (aggregate)
(risk category)	high	medium	low	low	medium	high+	
(risk rating range)	10, 20, 30, 40, or 50[1]	5, 10, or 15[2]	0 or 5[3]	0 or 5[4]	5, 10, or 15[5]	20, 40, or 60[6]	(sum of columns B-G)
Yellowstone	40	5	0	0	15	20	80
Golden Valley	10	5	0	0	5	20	40
Wheatland	10	5	0	0	5	20	40
Judith Basin	10	5	0	0	5	20	40
Cascade	50	5	0	0	15	20	90
Teton	10	5	0	0	10	20	45
Pondera	10	5	0	0	5	20	40
Toole	10	5	0	0	15	20	50

[1]Population rating: 0-5,000=10; 5,001-10,000=20; 10,001-20,000=30; 20,001-30,000=40; 30,001+=50

[2]Water miles rating; 0-10=5; 10-50=10; 50+=15

[3]Topography rating: no pass=0; pass(es)=5

[4]Protected area rating: no protected area=0; protected area(s)=5

[5]Incident intensity rating: low history=5; medium history=10; high history=15

[6]Freight volume rating: low volume=20; medium volume=40; high volume=60

Montana Southwest Line (UP)

County	Risk Level (population)	Risk Level (water miles)	Risk level (passes/ topography)	Risk level (protected areas)	Risk level (incident intensity)	Risk Level (freight volume)	Risk Level (aggregate)
(risk category)	high	medium	low	low	medium	high+	
(risk rating range)	10, 20, 30, 40, or 50[1]	5, 10, or 15[2]	0 or 5[3]	0 or 5[4]	5, 10, or 15[5]	20, 40, or 60[6]	(sum of columns B-G)
Beaverhead	10	15	5	0	5	20	**55**
Silver Bow	50	10	5	0	10	20	**95**
Deer Lodge	10	10	0	0	5	20	**45**
Powell	10	10	0	0	10	20	**50**

[1]Population rating: 0-5,000=10; 5,001-10,000=20; 10,001-20,000=30; 20,001-30,000=40; 30,001+=50

[2]Water miles rating; 0-10=5; 10-50=10; 50+=15

[3]Topography rating: no pass=0; pass(es)=5

[4]Protected area rating: no protected area=0; protected area(s)=5

[5]Incident intensity rating: low history=5; medium history=10; high history=15

[6]Freight volume rating: low volume=20; medium volume=40; high volume=60