

Briefing: Oil-by-Rail Cargo Movement in Multnomah County



Photo by SounderBruce

PURPOSE

The purpose of this study is to:

- 1) Assess the potential negative impact of an accident involving train car(s) carrying crude oil traveling through populated areas in Multnomah County, and
- 2) Estimate whether the potential negative impact of an accident involving train car(s) carrying crude oil would be disproportionately experienced by environmental justice communities.

BASIS FOR ASSESSMENT

Oil-by-rail poses risks to the public because of the following factors:

- Transport by rail of hazardous materials such as crude oil and natural gas have increased 340 percent since 2012.¹
- Most oil is currently carried in outdated tank cars prone to puncture, spills, and fires in train accidents.²
- Bakken crude is more volatile and flammable than most other crude oil.³
- Nine significant train derailments have occurred in North America since July 2013, one of which resulted in multiple fatalities and injuries.
- Impact from a major incident involving an oil train will extend beyond the immediately impacted area due to a toxic smoke plume, and stress and trauma to the population.
- The rapid increase of oil by rail has eclipsed the response capabilities of the local emergency responders and funding for those capabilities has not kept pace.⁴



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BACKGROUND

With the rapid development of the Bakken oil fields in North Dakota and Canada, and ongoing development of Canadian oil sands, shipments of crude oil-by-rail (OBR) have increased dramatically in the Northwest since 2012.⁵ Due to this oil boom Oregon has become a throughway for crude oil traveling by rail destined for transfer terminals or refineries in Oregon, California, and Washington States. The total volume of OBR shipments transiting through the County is unknown. An emergency order issued by the U.S. Department of Transportation, however, requires that the carriers with a train containing more than 1,000,000 gallons of Bakken crude report to the State Emergency Response Commission. Currently, BNSF Railway and Portland and Western Railways both meet the criteria for Multnomah County. BNSF has 0 - 9 trains per week meeting the threshold while Portland and Western has 0 - 3 trains per week meeting the threshold.

Expansion of oil transfer and distribution terminals, if approved, will increase OBR shipments through Multnomah County. Currently, Port Westward, near Clatskanie, Oregon, is receiving 120,000 barrels of crude each day for reloading onto ocean going vessels. The proposed Vancouver Energy oil terminal at the Port of Vancouver, WA would ship up to 360,000 barrels of crude oil each day. If all of the 13 proposed or expanded oil facilities are built in Oregon and Washington, over one million barrels of oil will be shipped daily over Northwest rails lines.⁶

The dramatic increase in OBR shipments present safety concerns. Although overall incidents of rail cargo accidents is low, since 2010 there have been 11 fires, 6 explosions, and 9 evacuations in North America due to incidents involving OBR (Table 1 details several high profile OBR accidents). The number of reported OBR related incidents in the United States rose to 144 in 2014 from just one in 2009.⁷ Several high profile derailments, spills, and explosions have raised widespread concern about the risks of moving crude by rail. An accident in Lac-Mégantic, a small town in Quebec, killed 47 people in the summer of 2013.⁸ New federal rules, which take full effect in 2018, will require enhanced safety for rail cars carrying crude oil, including replacement or retrofit of outdated tanker cars, but those rules will not be fully implemented until May 1, 2025⁹ and would not fully obviate the low probability but high impact potential of an accident.

| DATE & LOCATION | DESCRIPTION |
|---|--|
| 7/5/13 Lac-Mégantic, Quebec, Canada | An unattended freight train transporting petroleum crude oil rolled down a descending grade and subsequently 63 cars derailed. The subsequent fires, along with other effects of the accident, resulted in the confirmed deaths of 47 individuals. Extensive damage to the town center and the evacuation of approximately 2,000 people. |
| 10/19/13 Gainford, Alberta, Canada | 9 tank cars of propane and 4 tank cars of crude oil derailed. About 100 residents were evacuated. 3 propane cars burned, but the oil cars pushed away and did not burn. |
| 11/7/13 Aliceville, Alabama | 26 cars derailed, resulting in 11 cars impinged by a crude oil pool fire. An undetermined amount of petroleum crude oil escaped from derailed cars and found its way into wetlands area nearby the derailment site. |
| 12/30/13 Castleton, North Dakota | A separation derailment resulted in the derailment of 21 cars of petroleum crude oil. 18 cars ruptured, and an estimated 400,000 gallons of petroleum crude oil was released. The ruptured tank cars ignited, causing a significant fire. Approximately 1,400 people were evacuated. |
| 1/7/14 Plaster Rock, New Brunswick, Canada | 17 cars of a mixed train hauling crude oil, propane, and other goods derailed. 5 cars carrying crude oil caught fire and exploded. 45 homes were evacuated but no injuries were reported. |
| 4/30/14 Lynchburg, VA | 105 tank cars loaded with petroleum crude oil derailed. Seventeen cars derailed, and one breached. A fire ensued. 350 evacuated from immediate area. Three cars came to rest in James River, spilling up to 30,000 gallons of oil into river. |

Table 1: Recent oil train incidents in the United States and Canada¹⁰

Risks posed to Multnomah County residents from OBR include the potential for oil train explosions or spills as a result of derailment or rupture; increased particulate emissions from locomotive exhaust; congestion and collision along roadways and rail lines; and associated health impacts including injury and death.

Fires involving crude oil and/or fuel oil have several challenging aspects worth noting. Oil fires must be suppressed using specialized foam, and also release a noxious plume of toxic smoke. Only 10% of fire agencies in the State of Oregon are trained and equipped to respond with foam for an oil fire and 81% do not have the proper equipment to respond to a crude oil incident.¹¹ In addition, and depending on wind speed and direction, the plume from an oil train fire can greatly increase the area impacted by such an incident. For example, the Casselton, ND explosion and ensuing toxic cloud led to a five mile evacuation zone to the south and east of the incident.¹²

Concern about safety is also heightened because of population proximity to rail lines. A Multnomah County Health Department analysis (The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon, February 2013) found that a large portion of the County's population lives near rail lines. The demographics of this study also suggested that people of color make up a larger portion of the population in areas near rail lines than they do in the County as a whole, raising environmental justice concerns with OBR transport.

Because of the novelty and rapid increase of OBR shipments in Multnomah County, combined with the proximity of rail lines to population centers and the risk to public safety, the Multnomah County Office of Sustainability undertook this assessment. The Multnomah County Office of Emergency Management and Multnomah County Health Department also provided important data and review. In addition, Oregon Physicians for Social Responsibility raised concerns to Multnomah County on the potential risk posed by oil trains to the public.

FINDINGS

Accidents involving rail cargo are relatively rare given the total volume of cargo shipped by rail. Accidents do occur, however. During the last decade, overall rail accidents have declined, along with accidents involving the transport of hazardous materials. According to the Federal Railroad Administration, the number of derailments on long-haul tracks in the United States has declined by around 21 percent since 2009 (to 2014). Of that decline in overall derailments, however, the number of accidents related to fire or violent rupture nearly doubled from 20 in 2009 to 38 in 2014.¹³

Since 2012 there have been 27 rail accidents in Multnomah County representing 34% of all rail accidents statewide during the same period. Statewide, derailments account for 85% of total accidents, while side collisions and fire/violent-rupture account for 5% of total accidents (see appendix A for more details).¹⁴ The severity of an incident involving OBR depends on a complex mix of factors. These factors include the type of accident (derailment, spill, fire and/or explosion), the number of rail cars involved, the location of the incident, and the time of day and weather conditions when the incident occurs. The likelihood of a major accident from an oil train derailment, fire, and/or explosion is small, but the impact from such an incident would be high.

Additive factors combine to raise the overall level of concern for OBR shipments through Multnomah County. These factors include the especially volatile nature of the crude being transported, lagging federal safety rules for rail cars, the insufficient local emergency response capability, and the proximity of OBR shipments to heavily populated areas.

The Oregon Office of the State Fire Marshall recommends that in the event of a large oil train incident/spill, initial downwind evacuation should be at least 1,000 feet (300 meters). Further, if the tank or car is involved in a fire, officials should isolate and consider evacuation for 0.5-mile (800 meters) in all directions.¹⁵ The impacts of the incident are likely to be felt over a much wider area, however, with toxic smoke from the plume impacting downwind communities.

An analysis of 2010 Census data showed that 26% of residents in Multnomah County live within a half-mile of rail lines that carries OBR. The same analysis revealed that 108 schools are also located within a half-mile of OBR rail lines, as well as 100 child care facilities within the evacuation zone.

Not only does OBR pose a threat to public health and safety generally, increased transport of crude is an environmental justice issue in Multnomah County. A demographic analysis of the 0.5-mile evacuation zone shows that Black/

African Americans in Multnomah County are 1.8 times more likely to live in the evacuation zone as compared to Whites. Pacific Islanders in Multnomah County are 1.48 times more likely to live in the evacuation zone as compared to Whites. In addition, there is a significantly higher proportion of Multnomah County's Pacific Islander population located in

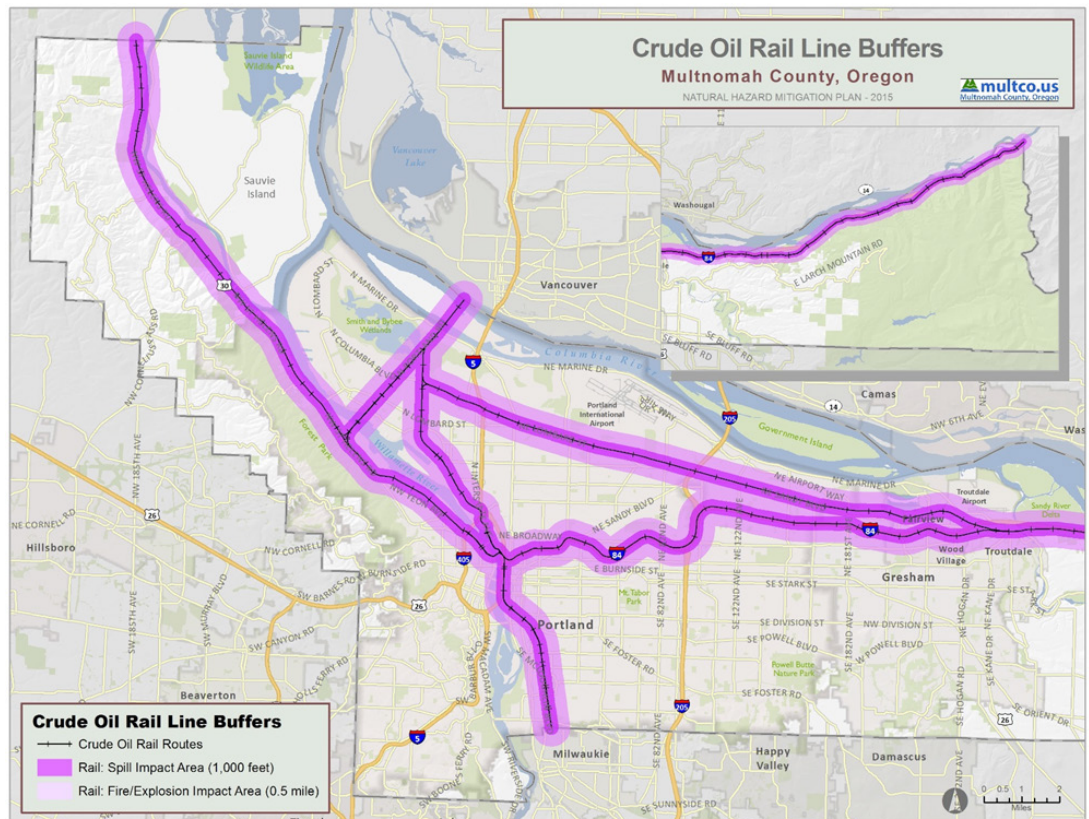


Figure 1: Oil-By-Rail Line Impact Buffers in Multnomah County

the evacuation zone as compared to Whites. Conversely, Asians are significantly underrepresented in the evacuation zones, and no meaningful difference between Latinos and Whites. Overall, people of color represent a greater percentage people in the evacuation zone (26.2%) versus general population (23.5%).

In addition to the human health impacts of OBR incidents, significant physical assets are also located with the evacuation zone. An analysis conducted by the Multnomah County Office of Emergency Management found that over \$25 billion dollars in infrastructure is located within a half-mile of OBR tracks.

Table 2 on the following page shows the approximate number of parcels/buildings and improved value.

SUMMARY OF FINDINGS

- Up to 12 trains a week carry 1,000,000 gallons of crude oil through Multnomah County.
- Smaller shipments of crude oil are not reported on, but do pass through Multnomah County regularly.
- More than a quarter of the Multnomah County population lives within the half-mile “evacuation zone” around the oil transport route.
- 108 schools and a 100 child care facilities are within the evacuation zone.
- People of color are more likely to live within a half-mile of a rail line.
- Over \$25 billion dollars of improved property is within a half-mile of rail lines in Multnomah County.
- The potential negative impacts of an oil train accident are heightened due to the volatility of the oil and the special equipment needed to extinguish it.
- Proposed new or expanded oil facilities in the NW will increase volumes of OBR transiting through Multnomah County.
- The lifting of the US oil export ban in 2015 is likely to increase pressure for new or expanded oil facilities in the Northwest.
- Emergency responders do not have adequate equipment to respond to a large scale OBR event.
- New safety requirements for rail cars carrying crude oil won’t be fully implemented until 2025.

This briefing is not intended as a comprehensive analysis of all potential risks posed by OBR. Nor does this briefing capture potential benefit from increased OBR activity, for example new jobs. Further study and analysis is needed to create a comprehensive assessment. It is the finding of this briefing, however, that potential for serious and grave injury to life and property in Multnomah County warrants additional public scrutiny up to and including public policy that will protect public health and safety.

| LOCATION | 0.5-mile buffer | | |
|-------------------------------|----------------------|------------------------|--------------------------------------|
| | Approx. # of Parcels | Approx. # of Buildings | Approx. ¹⁶ Improved Value |
| Fairview | 2,118 | 2,360 | \$392,328,560 |
| Gresham | 630 | 1,088 | \$727,378,680 |
| Lake Oswego | 0 | 0 | \$0 |
| Maywood Park | 272 | 318 | \$45,656,950 |
| Portland | 65,068 | 62,035 | \$22,319,588,560 |
| Troutdale | 968 | 880 | \$264,319,340 |
| Wood Village | 605 | 2,622 | \$105,731,230 |
| Unincorporated Area | 1,607 | 811 | \$1,937,644,260 |
| MULTNOMAH COUNTY TOTAL | 71,268 | 70,114 | \$25,792,647,580 |

Table 2: Exposure of Improved Property to Crude Oil Rail Hazardous Materials Spill

APPENDIX A

Impact Buffer Selection

Oregon Department of Transportation (ODOT) maintains records on which rail lines are used to carry crude oil by rail throughout Oregon. This study used the data provided by ODOT to examine these rail lines in Multnomah County using ArcGIS. A buffer analysis was used to estimate which populations were most likely to be impacted in case of an accident involving rail cars that are carrying crude oil. A buffer of 0.5-miles was used to analyze the area most likely to be impacted in the event of an accident involving crude by rail.

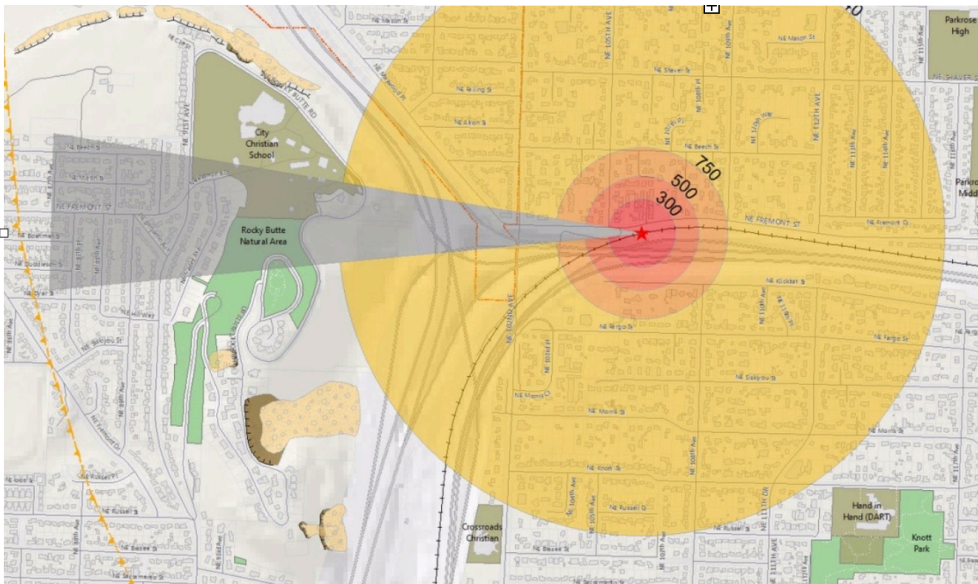


Figure 2: I-84 Crash Zone with plume (PBEM Desktop Exercise - OBR fire)

Various agencies including the federal Department of Transportation's Pipeline and Hazardous Materials Safety Administration have issued initial response guidelines codified in the Emergency Response Guidebook. For an incident involving a single oil tank car (whether truck or train), the primary set of responses is codified under response protocol 128 for petroleum crude oil, or UN hazmat code 1267. That guideline recommends initial evacuation range of 800 meters (approximately 0.5-miles) for a single burning car.¹⁷ The Oregon Office of the State Fire Marshall also recommends that in the event of a large oil train incident/spill, initial down-wind evacuation should be at least 1,000 feet (300 meters). Further, if the tank or car is involved in a fire, officials should isolate and consider evacuation for 0.5-mile (800 meters) in all directions.¹⁸ Therefore, the buffer area that was selected for this analysis is 0.5-mile (fire/explosion area) as the most likely area of impact in case of an emergency and is referred to in this report as the evacuation zone.

The 0.5-miles evacuation zone is a simplified version of what in practice is a highly complex set of potential responses by first responders and other safety personnel. Fire officials have the ability to model the plume based on the actual situation, similar to Figure 2. In practice, the evacuation zones may be much smaller (a single tipped car with no puncture in Seattle led to no evacuation) or much larger.

Appendix B

Rail Accident Data Multnomah County / State of Oregon

ACCIDENTS IN DESCENDING FREQUENCY BY TYPE

Selections: Railroad Group - ALL RAILROADS SELECTED, State - Oregon, County - MULTNOMAH All Regions
All Causes / All Types of Accidents / All Track Types
January through September 2015

| | Total | | Total Year Counts | | | YTD Counts Jan. - Sept. | | % Change Over Time | | |
|-----------------------|-------|--------------|-------------------|------|------|----------------------------|------|--------------------|-----------------|--------------------------|
| | ACCS | Pct of Total | 2012 | 2013 | 2014 | 2014 | 2015 | 2012 to 2014 | 2013 to 2014 | To Sept. 2014 2015 |
| GRAND TOTAL | 27 | 100.0 | 5 | 9 | 10 | 6 | 3 | 100 | 11.1 | -50 |
| 01 Derailments | 24 | 88.9 | 5 | 6 | 10 | 6 | 3 | 100 | 66.7 | -50 |
| 12 Other Impacts | 2 | 7.4 | . | 2 | . | . | . | . | . | . |
| 09 Obstruction Impact | 1 | 3.7 | . | 1 | . | . | . | . | . | . |

Selections: Railroad Group - ALL RAILROADS SELECTED, State - Oregon, County - All Counties, All Regions
All Causes / All Types of Accidents / All Track Types
January through September 2015

| | Total | | Total Year Counts | | | YTD Counts Jan. - Sept. | | % Change Over Time | | |
|-------------------------|-------|--------------|-------------------|------|------|----------------------------|------|--------------------|-----------------|--------------------------|
| | ACCS | Pct of Total | 2012 | 2013 | 2014 | 2014 | 2015 | 2012 to 2014 | 2013 to 2014 | To Sept. 2014 2015 |
| GRAND TOTAL | 79 | 100.0 | 16 | 24 | 24 | 16 | 15 | 50 | . | -6.3 |
| 01 Derailments | 67 | 84.8 | 10 | 20 | 23 | 15 | 14 | 130 | 15 | -6.7 |
| 12 Other Impacts | 4 | 5.1 | 2 | 2 | . | . | . | . | . | . |
| 09 Obstruction Impact | 3 | 3.8 | 1 | 1 | . | . | 1 | . | . | . |
| 04 Side Collision | 2 | 2.5 | 1 | 1 | . | . | . | . | . | . |
| 11 Fire/Violent Rupture | 2 | 2.5 | 1 | . | 1 | 1 | . | . | . | . |
| 13 Other Events | 1 | 1.3 | 1 | . | . | . | . | . | . | . |

Appendix C

Estimated Population Within Evacuation Zone of Rail Lines Transporting Crude Oil In Multnomah County and Environmental Justice Analysis

| Population Group | Multnomah County | % of Total Population | Evacuation Zone (0.5-mile from railway) | % of Total Population in Evacuation Zone |
|--------------------------------------|------------------|-----------------------|---|--|
| Total Population | 735,334 | 100% | 193,425 | 100% |
| Age | | | | |
| Under 18 years | 150,683 | 20.5% | 35,889 | 18.6% |
| 65 years and older | 77,423 | 10.5% | 20,860 | 10.8% |
| Race | | | | |
| White | 562,421 | 76.5% | 142,685 | 73.8% |
| African American/Black | 41,401 | 5.6% | 15,675 | 8.1% |
| American Indian and Alaskan Native | 7,825 | 1.1% | 2,500 | 1.3% |
| Asian | 47,950 | 6.5% | 11,014 | 5.7% |
| Native Hawaiian and Pacific Islander | 4,029 | 0.5% | 1,347 | 0.7% |
| Other Race | 37,865 | 5.1% | 10,646 | 5.5% |
| Two or More Races | 33,843 | 4.6% | 9,558 | 4.9% |
| Non-White | 172,913 | 23.5% | 50,740 | 26.2% |
| Ethnicity | | | | |
| Hispanic or Latino | 80,138 | 10.9% | 21,462 | 11.1% |

Source: 2010 U.S. Census

Analysis Note: Census blocks were selected that intersect a half-mile buffer around rail lines that are identified by Oregon Emergency Management as transporting crude oil. Some of the Census blocks selected have areas that extend further than a half-mile from the rail line so this analysis may over-estimate the number of persons within the evacuation zone.

Environmental Justice Analysis, Statistical Test for Significance

Method:

Statistical tests - 2 x 2 Chi-Square tests (White, including Latinos compared to each racial group)

| | White | Black/AA | Odds Ratio | Lower CI | Upper CI | Sig. Level |
|----------------|-------|----------|------------|----------|----------|------------|
| % in 0.5-miles | 25.4% | 37.86% | 1.79 | 1.76 | 1.83 | p<.0001 |

| | White | Asian | Odds Ratio | Lower CI | Upper CI | Sig. Level |
|----------------|-------|--------|------------|----------|----------|------------|
| % in 0.5-miles | 25.4% | 22.97% | 0.88 | 0.86 | 0.90 | p<.0001 |

| | White | Pacific Islander | Odds Ratio | Lower CI | Upper CI | Sig. Level |
|----------------|-------|------------------|------------|----------|----------|------------|
| % in 0.5-miles | 25.4% | 33.43% | 1.48 | 1.38 | 1.58 | p<.0001 |

| | White | AI / AN | Odds Ratio | Lower CI | Upper CI | Sig. Level |
|----------------|-------|---------|------------|----------|----------|------------|
| % in 0.5-miles | 25.4% | 31.95% | 1.38 | 1.32 | 1.48 | p<.0001 |

| | White | Latino | Odds Ratio | Lower CI | Upper CI | Sig. Level |
|----------------|-------|--------|------------|----------|----------|------------|
| % in 0.5-miles | 25.4% | 26.78% | 1.08 | 1.06 | 1.09 | p<.0001 |

Note: Though the test is statistically significant, Whites and Latinos are about equally likely to be located in the evacuation zone.

FOOTNOTES

- ¹ Borrud, Hillary. "ODOT Says Oil Train Shipments on the Rise." Portland Tribune 14 November 2015
- ² New York State. Transporting Crude Oil in New York State: A Review of Incident Prevention and Response Capacity. Albany New York, 30 April 2014.
- ³ New York State. Transporting Crude Oil in New York State: A Review of Incident Prevention and Response Capacity. Albany New York, 30 April 2014.
- ⁴ Oregon State Police, Office of State Fire Marshall. Survey Findings and Recommendations on Crude Oil. Salem Oregon, 5 March 2015.
- ⁵ Port of Portland. Port of Portland Statement Regarding Crude Oil by Rail. Portland, Oregon. 2014.
- ⁶ Place, Eric De. The Northwest's Pipeline on Rails. Sightline Institute. July 2015.
- ⁷ Mackrael, Kim. "Gaps in the System: Is Rail Safety on the Right Track?" The Globe and Mail 4 June 2015. Print.
- ⁸ Place, Eric De. The Northwest's Pipeline on Rails. Sightline Institute. July 2015.
- ⁹ United States. U.S. Department of Transportation. DOT Announces Final Rule to Strengthen Safe Transportation of Flammable Liquids by Rail. Washington, 1 May 2015.
- ¹⁰ Bakken Crude Oil Pamphlet distributed by the NW Area Committee, February 2015
- ¹¹ Oregon State Police, Office of State Fire Marshall. Survey Findings and Recommendations on Crude Oil. Salem Oregon, 5 March 2015.
- ¹² Forest Ethics. Crude Injustice on Rails: Race and the Disparate Risk from Oil Trains in California. June 2015.
- ¹³ Russell Gold and Paul Vieira. Wrecks Hit Tougher Oil Railcars. The Wall Street Journal. March 9, 2015.
- ¹⁴ United States Department of Transportation. Federal Railroad Administration Office of Safety Analysis: <http://safetydata.fra.dot.gov/>. Washington, D.C., 2015.
- ¹⁵ Office of State Fire Marshall Survey Findings and Recommendations on Crude Oil, January 8, 2015
- ¹⁶ Improved value is estimated based on the building value associated with parcels that have been identified as being located in the 0.5-mile buffer, since building footprints were not associated with dollar value data.
- ¹⁷ Forest Ethics. Crude Injustice on Rails: Race and the Disparate Risk from Oil Trains in California. June 2015.
- ¹⁸ Office of State Fire Marshall Survey Findings and Recommendations on Crude Oil, January 8, 2015