HALL & ASSOCIATES LLC

Suite 349
425 8th Street, NW
Washington, DC 20004
Tel: 202.312.0600
Fax: 202.312.0606

Statement of James E. Hall regarding crude oil train accident risk in relation to the proposed routing of crude oil trains through the Columbia River Basin

Accident experience has clearly demonstrated that the consequences of train derailments carrying large numbers of crude oil tank cars have been catastrophic. Even after industry attempts to improve the poor crashworthiness of DOT-111 tank cars by offering CPC-1232 tank cars with enhanced safety features, the failure of tank cars in accidents and the quantity of crude oil released is enormous.

To understand the scope of how serious a train derailment can be when carrying more than 3,000,000 gallons of crude oil in tank cars, it is paramount that we study and understand recent accident history, not rely upon normalized data that includes accidents from decades ago involving different equipment and operating conditions. The National Transportation Safety Board (NTSB) issued a special study on risk concepts in dangerous goods transportation regulation that identified an important concept that is applicable today: That it is not until accident experience begins to accumulate that the change in risk becomes evident.

Since 2006, there have been many accidents in the United States and Canada involving derailments of trains carrying large quantities of crude oil and ethanol that provide us a realistic picture of accident experience and consequences. In 24 of those accidents 442 tank cars derailed and 71% of them (314) were breached. About 6.5 million gallons of crude oil and ethanol were released, an average of 270,000 gallons per accident; the equivalent of 30 highway gasoline cargo tanks.

The poor crashworthiness of tank cars used to transport crude oil and ethanol is evident in these train derailments. For example:

- October 20, 2006 – New Brighton, Pennsylvania, 23 tank cars derailed and 20 tank cars breached (87%), 485,278 gallons of ethanol were released (the equivalent of 54 highway gasoline cargo tanks);

- June 19, 2011 – Cherry Valley, Illinois, 19 tank cars derailed and 15 tank cars breached (79%), 323,963 gallons of ethanol were released (the equivalent of 36 highway gasoline cargo tanks);

- February 6, 2011 – Arcadia, Ohio, all 31 tank cars derailed were breached, 834,840 gallons of ethanol were released (the equivalent of 93 highway gasoline cargo tanks);

- July 6, 2013 – Lac Megantic, Quebec, 63 tank cars derailed and 59 tank cars breached (93.6%), 1,580,000 gallons of crude oil were released (the equivalent of 175 highway gasoline cargo tanks);

- November 8, 2013 – Aliceville, Alabama, 26 tank cars derailed and 25 tank cars breached (96%), 630,000 gallons of crude oil were released (the equivalent of 70 highway gasoline cargo tanks);

- February 14, 2015 – Gogama, Ontario, 29 tank cars derailed and 19 tank cars breached (65.5%), 264,172 gallons of crude oil were released (the equivalent of 29 highway gasoline cargo tanks);

- February 16, 2015 – Mount Carbon, West Virginia, 27 tank cars derailed and 20 tank cars breached (74%), 378,034 gallons of crude oil were released (the equivalent of 42 highway gasoline cargo tanks); and

- March 7, 2015 – Gogama, Ontario, 39 tank cars derailed and 36 tank cars breached (92%), more than 500,000 gallons of crude oil were released (the equivalent of 83 highway cargo tanks).

The U.S. Department of Transportation's Federal Railroad Administration (FRA) and Pipeline and Hazardous Materials Safety Administration (PHMSA) issued speed restriction for high hazard flammable trains (including crude oil trains) to 50 mph and to 40 mph in high-threat urban areas. The agencies recognized that greater tank car damage can be expected at high speeds.

But accident data shows that the tank car failures are significant and consequences are substantial in train derailments at speeds below 50 mph and below 40 mph. In all of the 24 accidents reviewed all but one, accidents occurred at train speed below these restrictions:

- New Brighton, Pennsylvania – 37 mph,

- Cherry Valley, Illinois – 36 mph,

- Arcadia, Ohio – 46 mph,

- Aliceville, Alabama – 39 mph,

- Gogama, Ontario (February 14) – 38 mph,
- Mount Carbon, West Virginia – 33 mph, and
- Gogama, Ontario (March 7) – 43 mph.

Even at lower speeds (23 mph, 19 mph and 10 mph), tank car failures and consequences have been significant:

- August 5, 2012 – Pleva, Montana, train speed 23 mph, 17 tank cars derailed and 12 tank cars breached (74%), 245,336 gallons of ethanol were released (the equivalent of 27 highway gasoline cargo tanks),
- August 22, 2008 – Luther, Oklahoma, train speed 19 mph, 8 tank cars derailed and 5 tank cars breached (62.5%), 80,746 gallons of crude oil were released (the equivalent of 9 highway gasoline cargo tanks), and
- September 19, 2015 – Bon Homme County, South Dakota, train speed 10 mph, 7 tank cars derailed and 3 tank cars breached (43%), 49,748 gallons of crude oil were released (the equivalent of 5 and ½ highway cargo tanks).

Fire resulting from train derailments and tank car breaches has been significant. Of the 24 train derailments reviewed with tank car breaches 20 resulted in a fire. The volatility of crude oil has significant safety implications and when it has been released from tank cars during derailments fire threats were substantial.

The FRA accident data for Class 1 railroads (Excluding AMTRAK) show 2,522 train derailments on main line track for the period 2008 through 2015. The data identifies broken rails attributed to detail fractures including shelling and head checks, irregular track alignment including track that has buckled, and wide gage including defective or missing crossties, spikes or other fasteners as leading causes of derailments assigned to track, roadbed and structure related causes. Although investigations of some of the 24 crude oil and ethanol train accidents are ongoing, a significant number of these accidents have been attributed to track conditions like broken rails.

The accumulation of data from these accidents clearly illustrate that the consequences of high hazard flammable train derailments are significant. Crude oil tank cars have increased in size over the years and now are built for a gross weight of 286,000 pounds. NTSB has investigated serval accidents where rail head wear and rolling contact fatigue were attributed to rail failure. Following the New Brighton accident, NTSB recommended that the FRA require railroads to develop inspection and maintenance programs based on damage-tolerance principles that take

into account accumulated tonnage, track geometry, rail surface conditions, rail head wear and crack growth rates that can be affected by the frequency, size and weight of trains.

Although the U.S. Department of Transportation has mandated improvements for tank cars that carry crude oil – the new DOT-117 tank car – it is uncertain when enough of those tank cars will be available for all crude oil shipments. It will certainly be several years. Further, it is unknown how well they will perform in accidents until we accumulate accident history, like we have for DOT-111 and CPC-1232 tank cars. Tank cars are subject to strong forces during violent train derailments and subject to failure from punctures from broken rail and accident debris. Although the probability of any train derailment is portrayed by industry as low, we have seen many high hazard flammable train accidents since 2006 and the results have been high consequence and catastrophic.

Trains safely passed through the town of Lac Megantic, Quebec for years. But that was little comfort for the residents when one of them finally derailed on July 6, 2013. The resulting explosion and fire destroyed the downtown and killed 47 people. And consider the residents living near Gogama, Ontario, who suffered through a catastrophic derailment in February 2015. Despite industry claims about how rare such accidents are, the community was again visited by a similar disaster just three weeks later.

As tragic as industrial accidents can be (i.e., a refinery explosion), one can argue that a community has accepted certain risks for tangible benefits like employment and commerce. However, oil transportation industry statistics cannot be used to dismiss legitimate concerns of residents who bear all the risk of catastrophe with no tangible benefit simply because railroads have chosen their towns as convenient transit points.

It has been proposed that four crude oil trains a day, each carrying over 3,000,000 gallons of crude oil (the equivalent of 333 highway gasoline cargo tanks for each train), travel the Columbia River Basin. Because of the recent history of significant accidents with crude oil trains, the poor crashworthiness of tank cars and the significant number of those accidents that have resulted in fire, an extensive effort is essential to study the needs for the equipment, infrastructure and resources necessary to protect the people who live, fish and work along the Columbia River Basin.

Jim Hall
Principal
Hall & Associates LLC

May 10, 2016