BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of: Application No. 2013-01 TESORO SAVAGE, LLC VANCOUVER ENERGY DISTRIBUTION TERMINAL	CASE NO. 15-001 **PREFILED TESTIMONY OF ROBERT CHIPKEVICH FILED BY THE CITY OF VANCOUVER**

Q: Please state your name, place of employment and title, and address.

A: Robert Joseph Chipkevich
Chipkevich Safety Consulting Group, LLC
Principal
9608 Romano Way
Brentwood, Tennessee 37027

Q: Can you briefly describe your work at Chipkevich Safety Consulting Group, LLC and your experience with transportation safety issues?

A: I established Chipkevich Safety Consulting Group, LLC in 2010 to provide transportation safety consulting services, and have partnered with Hall and Associates in Washington, D.C. on numerous transportation safety projects. I have 42 years of experience in transportation safety including 25 years at the National Transportation Safety Board (NTSB).

I headed the NTSB's Hazardous Materials Accident Investigation Program for 20 years, the Pipeline Accident Investigation Program for 15 years, and the Railroad

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Accident Investigation Program for more than 9 years. As the director for accident investigations, I have assessed hundreds of accidents in the United States each year and launched accident investigation teams to the most serious incidents. I have testified before Congress more than a dozen times on transportation safety issues. I have extensive experience investigating tank car failures in railroad accidents, material failures during transit, and cargo transfer incidents.

Q: Have you investigated accidents?

A: Yes. I have led multiple on-scene investigations and was responsible for directing the investigation of many significant accidents including Superior WI, Graniteville SC, Minot ND, New Brighton PA, and Cherry Valley IL. I have worked to improve the crashworthiness and integrity of tank cars including design, material performance and damage tolerance testing. I have significant experience in freight and passenger railroad accident investigations as well as those involving rail transit systems. As director over all railroad accident investigations for a 9-year period, I addressed safety issues in train operations, crew qualifications, track inspection and maintenance, and equipment performance. I have worked to address human factor issues including fatigue management and train crew distractions, and the use of positive train control technology to prevent collisions and over-speed derailments. My work on pipeline safety has included hazardous liquid, natural gas transmission and distribution pipeline systems. I have experience in pipeline safety integrity management; inspection and test programs; material performance; leak detection; pipeline control systems; remote and automatic shut-off valves; and excavation damage prevention.

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Q: What committees have you served on?

A: I have served on numerous transportation safety committees including the Transportation Research Board's Hazardous Materials Committee within the National Academy of Sciences, the Railroad Safety Advisory Committee, the National Association of State Fire Marshals Pipeline Safety Committee, the Dangerous Goods Panel of Experts – VOLPE, and the Association of American Railroads Tank Car Committee. I have worked with leaders in Canada, Europe and Asia on transportation safety issues.

Q: What is your educational background?

A: I am a graduate of the University of Tennessee. I hold a Bachelor of Science degree from the College of Business, with a major in Transportation. I have taken multiple hazardous materials transportation and accident reconstruction courses at the Transportation Safety Institute in Oklahoma City, Oklahoma.

Q: Have you written on the topic of rail accidents?

A: I have provided written testimony and testified before Committees and Subcommittees of the U.S. Congress on rail safety, pipeline safety and hazardous materials safety issues numerous times. I have also provided written testimony before the California State Assembly, the Maryland House of Delegates and the New Mexico House of Representatives.

- Testimony before the Subcommittee on Highway and Transit, Committee on Transportation Infrastructure, U.S. House of Representatives, Hearing on Public Transit Safety: Examining the Federal Role, December 8, 2009.

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- Testimony before the Subcommittee on Highways and Transit, Committee on Transportation Infrastructure, U.S. House of Representatives, Hearing on Public Transit Safety: Examining the Federal Role, December 8, 2009.
- Testimony before the Subcommittee on Railroads, Pipelines and Hazardous Materials, Committee on Transportation and Infrastructure, U.S. House of Representatives, Reauthorization of the Department of Transportation's Hazardous Materials Safety Program, November 16, 2009.
- Testimony before the Subcommittee on Railroads, Pipelines and Hazardous Materials, Committee on Transportation and Infrastructure, U.S. House of Representatives, Human Factors in Rail Accidents, March 16, 2007.
- Testimony before the Subcommittee on Railroads, Committee on Transportation and Infrastructure, U.S. House of Representatives, Human Factors in Rail Safety, July 25, 2006.
- Testimony before the Subcommittee on Railroads, Committee on Transportation and Infrastructure, U.S. House of Representatives, Current Issues on Transportation of Hazardous Materials by Rail, June 13, 2006.
- Testimony before the Subcommittee on Energy and Air Quality, Committee on Energy and Commerce, U.S. House of Representatives, Pipeline Safety: A Progress Report Since the Enactment of The Pipeline Safety Improvement Act of 2002, April 27, 2006.

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- Testimony before the Subcommittee on Highways, Transit and Pipelines, Committee on Transportation and Infrastructure, U.S. House of Representatives, Regarding Pipeline Safety, March 16, 2006.
- Testimony before the Special Committee on Rail Safety, California State Assembly, Rail Safety, July 20, 2005.
- Testimony before the Subcommittee on Railroads, Committee on Transportation and Infrastructure, U.S. House of Representatives, Positive Train Control, April 28, 2005.
- Testimony before the Subcommittee on Highways and Transit, Committee on Transportation and Infrastructure, U.S. House of Representatives, Hearing on Pipeline Safety, June 16, 2004.
- Testimony before the Subcommittee on Energy and Air Quality, Committee on Energy and Commerce, U.S. House of Representatives, Pipeline Safety, March 19, 2002.
- Testimony before the Subcommittee on Highways and Transit, Committee on Transportation and Infrastructure, U.S. House of Representatives, Pipeline Safety, February 12, 2002.
- Testimony before the Committee on Environmental Matters, Maryland House of Delegates, NTSB Investigation of April 7, 2000 Oil Pipeline Spill near Chalk Point, Maryland, January 11, 2001.

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- Testimony before the Interim Committee on Radioactive and Hazardous Materials, New Mexico House of Representatives, NTSB Investigation of The Pipeline Accident near Carlsbad, New Mexico, September 25, 2000.
- Testimony before Committee on Commerce, Science and Transportation, United States Senate, NTSB Update on the Investigation of the Bellingham, Washington Pipeline Accident, March 13, 2000.

Q: What is your basic understanding of the nature of the proposal, in very summary form?

A: Well, it is my understanding that the proposal involves the transport and handling of 15 million gallons of Bakken crude oil per day or four HHFTs per day. "HHFT" stands for "High-Hazard Flammable Train" and is the term used by the federal government (USDOT-PHMSA) to describe freight trains carrying 20 or more tank cars of crude oil in a block.[1] This is a highly volatile compound which has been involved in a number of catastrophic accidents. The Port of Vancouver has entered into a lease agreement with the applicant to construct handling facilities on its property, located within the City of Vancouver.

Q: What about the proposal context? Have you visited the City?

A: Yes. On October 6 and 7, 2015, Michael Hildebrand, who is a hazardous material emergency planning and response expert, and I conducted site inspections of property along the BNSF rail line within the City of Vancouver. We reviewed overpasses, grade crossings, adjacent exposures and storm drainage. I participated with Mr. Hildebrand in

[1] 49 CFR § 171.8.

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interviews with city planners, engineers, police, fire and emergency management senior leadership.

Q: To assess risks from the proposal, what would you consider as being relevant?

A: Well for one, the "real world" accident experience with transporting large volumes of crude oil and ethanol in tank cars and the consequences from train derailments involving those movements have to be considered.

Q: So, if you are assessing crude oil transport risks with HHFTs, what is the appropriate time frame for assessing risks associated with crude oil transport?

A: The time period in which trains have been used to transport large volumes of crude oil. The use of HHFTs to transport crude oil is a new phenomenon that has only recently reached historic levels. The number of crude oil-containing rail tank cars has increased over 108 times in the last seven years. And, the volume of crude oil carried by rail increased 423% between 2011 and 2012.[2]

Q: Would you include data from the many years of non-HHFT freight train experience?

A: It is critical to focus on accident history and data that has accumulated for trains transporting large volumes of crude oil and ethanol oil in tank cars since 2006 to appropriately understand the risk presented by HHFTs. Looking at "real world" consequences has long been understood as an important factor to understand risk. For example, the NTSB in 1971 issued a Special Study on Risk Concepts in Dangerous Goods Transportation. NTSB noted that it was not until accident experience began to accumulate that the change in risk became evident. The study found:

[2] 80 FR 26644 (May 8, 2015).

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> [D]ealing with regulators on a case by case basis, shippers and carriers promoted new, larger containers which were incorporated into regulations by the ICC, largely on the basis of their technical feasibility as assessed by expert opinion. Again, there was no documented effort to determine the changes in risk levels, with the result that, though they occurred, they went unnoted. It was not until the accident experience began to accumulate, as in the accidents at Laurel, Mississippi, Crete, Nebraska, and Crescent City, Illinois, that these changes in the levels became evident.[3]

The study found:

> Regulatory changes made in response to the desire for economies of scale then allowed the liquefied petroleum gas tank car size to be increased three-fold, and permitted the external insulation to be eliminated. Allegedly, safety valve capacities were increased to compensate for removal of insulation. No operational requirements were adopted to limit the bunching of the jumbo cars into large shipments. Following the regulatory changes, jumbo cars were put into service in great numbers. These cars often moved in multiple-car shipments. The involvement of jumbo cars in accidents has produced accidents of much larger scope as fire, fed by the contents of one of the cars, rapidly heats the contents of the adjacent cars, resulting in pressure increases which the safety valve cannot relieve, and subsequent explosive ruptures and fires of far larger proportions. Losses in such events have greatly increased compared to losses involving the smaller cars, reflecting the increase in risk levels these decisions unknowingly allowed.[4]

A very similar situation has occurred here, with the rapid shift in the risk profile. Since 2006, there have been several train derailments that demonstrate a high failure rate of crude oil and ethanol tank cars in accidents. Below are examples:

- New Brighton, Pennsylvania, 20 of 23 tank cars failed (86.9%);
- Cherry Valley, Illinois, 15 of 19 tank cars failed (78.9%);
- Arcadia, Ohio, 31 of 31 tank cars failed (100%);
- Plevna, Montana, 12 of 17 tank cars failed (70.5%);

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[3] Special Study, Risk Concepts in Dangerous Goods Transportation Regulations, NTSB (1971), p. 7.
[4] *Id.*, pp. 7-8.

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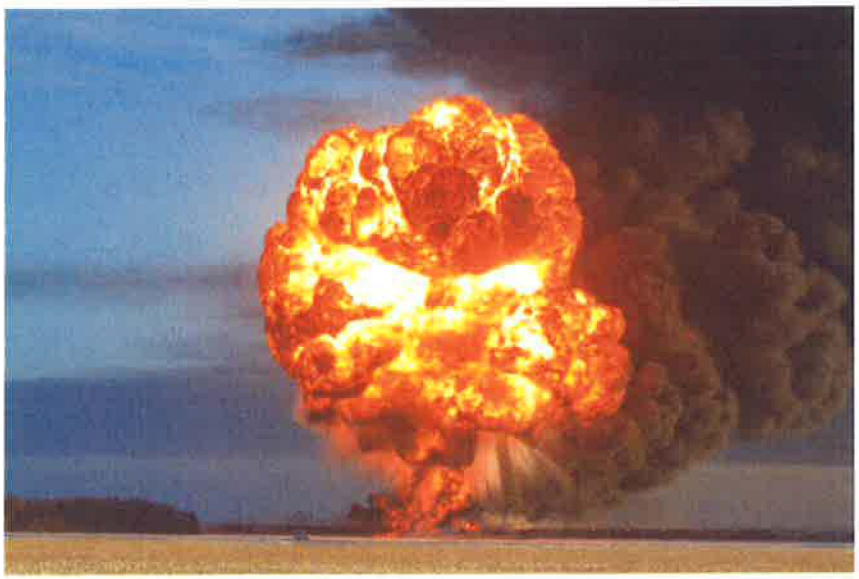
- Aliceville, Alabama, 25 of 26 tank cars failed (96.1%);
- In two separate accidents in Gogama, Ontario, 19 of 29 tank cars failed (65.5%) and 36 of 39 tank cars failed (92.3%);
- Mount Carbon, West Virginia, 20 of 27 tank cars failed (74%); and,
- Casselton, North Dakota, 18 of 20 tank cars failed (90%).

These are all accidents which the NTSB or FRA investigated. For example, the NTSB accident report includes the below photograph of the Casselton accident:



The accumulation of accident data since 2006 for trains transporting crude oil and ethanol is available in both the United States and Canada and this data provides factual information which is necessary to understand the performance of tank cars in multi-tank car train derailments and the consequences thereof. To focus on a longer time frame when these types of cars were not in use dilutes the risk profile and makes it virtually useless for understanding real world impacts.

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Q: Have any agencies responsible for considering these risks utilized such "real-world" data for risk analysis purposes?

A: Yes. The necessity of using current data is a general truism of course for all technical and scientific analysis, but is particularly important for this specific situation. In this situation, I agreed with the approach taken by The Pipeline and Hazardous Material Safety Administration or PHMSA. PHMSA is an agency within the USDOT that is responsible for establishing and enforcing requirements for the safe transport of hazardous materials by all modes of transportation. This includes the design of railroad tank cars carrying crude oil. In conducting its analysis of the risk of spills from HHFTs, PHMSA chose to focus on derailments from 2006 through 2013. Its rationale was that it is this period which "encompasses the beginning of the shipment of flammable liquids in HHFTs."[5] For the final regulatory impact analysis, PHMSA narrowed the focus to 2009 to 2013 to correspond to a time when a high volume of crude and ethanol was being shipped by rail.[6] To accurately identify the risks associated with HHFTs, this more recent time period beginning in 2006 needs to be utilized, not decades of old data with train make up different than the HHFTs in service today. To use 39 years of train experience, dating back to 1975 when large blocks of tank cars filled with crude oil were not grouped in trains in numbers and tank car size like they are today, and using all variety of freight trains to characterize the HHFT experience, creates a fundamentally flawed risk picture.

[5] USDOT-PHMSA Draft Regulatory Impact Analysis PHMSA-2012-0082, p. 25.
[6] USDOT-PHMSA Final Regulatory Impact Analysis PHMSA-2012-0082, p. 78.

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Q: I understand that PHMSA is using current data, but how is going back to 1975 or comparing all sorts of train loads problematic? In other words, why can't any other shipments of flammable liquids be a proxy for an oil train?

A: Well, the below is PHMSA and FRA's reasoning:

> In general, PHMSA and FRA found that several factors associated with oil trains have given rise to both higher expected damages and probability of a catastrophic event. First, the volumes of crude oil and ethanol carried by rail are relatively large when compared to rail shipments of other flammable liquids. In particular, the volume of crude oil shipped by rail has been increasing rapidly during the past several years. Second, the crude oil originating in the Bakken oil fields is volatile which increases the risks while it is in transportation. Finally, crude oil and ethanol are shipped in HHFTs, compounding the risk when an accident does occur.
>
> Due to these changes, PHMSA and FRA have concluded that the historical train accident record alone cannot determine the probability of a catastrophic event.[7]

Q: Do you agree with that rationale?

A: Yes. PHMSA further explained the reasons why all varieties of freight trains cannot be used as a "proxy" for HHFTs in calculating the risk of derailment and catastrophic events. PHMSA determined:

> There is reason to believe that derailments of HHFTs will continue to involve more cars than derailments of other types of trains. There are many unique features to the operation of unit trains to differentiate their risk. The trains are longer, heavier in total, more challenging to control, and can produce considerably higher buff and draft forces which affect train stability. In addition, these trains can be more challenging to slow down or stop, can be more prone to derailments when put in emergency braking, and the loaded tank cars are stiffer and do not react well to track warp which when combined with high buff/draft forces can increase the risk of derailments.[8]

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[7] USDOT-PHMSA Draft Regulatory Impact Analysis PHMSA-2012-0082, p. 20.
[8] USDOT-PHMSA Draft Regulatory Impact Analysis PHMSA-2012-0082, p. 24.

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Q: Do you agree with this assessment?

A: Yes.

Q: So, is the data there? Is there an accident history for crude oil train derailments?

A: Yes. I examined several train accidents that occurred over nine years between October 2006 and September 2015 in which multiple tank cars of crude oil or ethanol derailed and cargo was released. In 20 of the 24 derailments at least three tank cars released product, and in three of the 24 derailments at least 28 tank cars released cargo.

Q: Can you detail each incident?

A: Yes. The below table provides "real world" data on these accidents.

Table 1 - Crude Oil and Ethanol Train Derailments

	Location	Date	Railroad	tc derailed	tc release	Fire	Product	Speed	Released gallons
1	Bon Homme County, SD	9/19/2015	BNSF	7	3	Y	Ethanol	10	49,748
2	Heimdal, ND	5/6/2015	BNSF	6	5	Y	Crude oil	24	98,090
3	Gogama, Ontario	3/7/2015	CN	39	36	Y	Crude oil	43	500,000
4	Galena, IL	3/5/2015	BNSF	21	10	Y	Crude oil	23	110,543
5	Mount Carbon, WV	2/16/2015	CSX	27	20	Y	Crude oil	33	378,034
6	Gogama, Ontario	2/14/2015	CN	29	19	Y	Crude oil	38	264,172
7	LaSalle, CO	5/9/2014	UP	6	1	N	Crude oil	9	7,932
8	Lynchburg, VA	4/30/2014	CSX	17	1	Y	Crude oil	23	29,416
9	Vandergrift, PA	2/13/2014	NS	21	4	N	Crude oil	31	4,310
10	New Augusta, MS	1/31/2014	IC/CN	15	7	N	Crude oil	47	50,450
11	Plaster Rock, NB	1/7/2014	CN	6	2	Y	Crude/ethanol	47	60,759
12	Casselton, ND	12/30/2013	BNSF	20	18	Y	Crude oil	42	436,437
13	Aliceville, AL	11/8/2013	AGC	26	25	Y	Crude oil	39	630,000
14	Lac Megantic, Quebec	7/6/2013	MMA	63	59	Y	Crude oil	65	1,580,000
15	White River, Ontario	4/3/2013	CP	7	2	Y	Crude oil	35	26,600
16	Parkers Prairie, MN	3/27/2013	CP	14	3	N	Crude oil	40	30,000
17	Plevna, MT	8/5/2012	BNSF	17	12	Y	Ethanol	23	245,336
18	Columbus, OH	7/11/2012	NS	3	3	Y	Ethanol	25	54,748
19	Tiskilwa, IL	10/7/2011	IIRR	10	9	Y	Ethanol	37	162,000
20	Arcadia, OH	2/6/2011	NS	31	31	Y	Ethanol	46	834,840
21	Cherry Valley, IL	6/19/2011	CN	19	15	Y	Ethanol	36	323,963
22	Luther, OK	8/22/2008	BNSF	8	5	Y	Crude oil	19	80,746
23	Painesville, OH	10/10/2007	CSX	7	4	Y	Ethanol	48	55,200
24	New Brighton, PA	10/20/2006	NS	23	20	Y	Ethanol	37	485,278
	Totals			442	314				6,498,602

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Q: Where is this data pulled from?

A: I reviewed accident reports and records from the National Transportation Safety Board, the Transportation Safety Board of Canada, and the Federal Railroad Administration. I also reviewed hazardous materials incident reports from the Pipeline and Hazardous Materials Safety Administration.

Q: Can you tell me about the average number of tank cars which derail in these accidents?

A: Yes. Based on the 24 derailments that I reviewed, 442 tank cars derailed and 314 tank cars released cargo (71%). The average number of cars derailed in the 24 accidents is 18.4 and the average number of cars that breached is 13.

Q: What are the spill sizes, when averaged?

A: A total of 6,498,602 gallons of product were released in the 24 accidents. The average release per accident is 270,775 gallons, the equivalent of about 30 gasoline cargo tank trucks; 10 of the 24 accidents had releases of 245,336 gallons or greater, the equivalent of 27 gasoline cargo tank trucks.

Q: When trains derail, how many spill their cargo?

A: I have not attempted to do a statistical analysis on the probability of a train derailment or the frequency of a cargo release when a train does derail. I instead have looked at what has actually happened. I reviewed the consequences of several derailments that have in fact occurred, and those accidents demonstrate that the consequences of a derailment can and have been significant. A high percentage of tank cars that derailed have breached.

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Of the 442 tank cars that derailed in the accidents that I reviewed, 314 released cargo. In one accident 31 tank cars derailed and all 31 tank cars were breached.

Q: Can you describe some of the more significant spills?

A: Well, since 2011, the following significant spills have occurred:

- Lac-Megantic-59 tank cars breached and 1,580,000 gallons of crude oil were released;
- Arcadia-31 tank cars breached and 834,840 gallons of ethanol were released;
- Aliceville-25 tank cars breached and 630,000 gallons of crude oil were released;
- Gogama-36 tank cars breached and more than 500,000 gallons of crude oil were released; and,
- New Brighton-20 tank cars breached and 485,278 gallons of ethanol were released.

Q: How has PHMSA defined a "higher consequence event?"

A: PHMSA used a spill volume of 37,619 bbl/1,579,998 gals. as its "higher consequence event."[9] This is the equivalent of a Lac-Megantic style disaster.

Q: To put this in concrete terms, how many gasoline tank trucks is 1.6 million gallons equivalent to?

A: A full size gasoline cargo tank is approximately 9,000 gallons, so this would be the equivalent of about 178 gasoline cargo tank trucks.

Q: So, when we are talking about a "higher consequence" event, size-wise that is equivalent to 178 gasoline tank trucks breaching?

[9] USDOT-PHMSA Draft Regulatory Impact Analysis, PHMSA-20012-0082, p. 51.

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A: Yes, under PHMSA's explanation of the use of a spill volume for a "higher consequence event."

Q: What about total derailments and releases?

A: The PHMSA, for the time period between 2006 and 2013, identified 40 mainline derailments that resulted in the release of 3,344,081 gallons of crude oil and ethanol for an average of approximately 1,990 bbl/83,602 gals. released per mainline track derailment.

Q: Again, for 83,602 gallons, how many gasoline tank trucks would that be equivalent to?

A: That would be the equivalent of 9 gasoline cargo tank trucks released on average per mainline derailment.

Q: Is it possible that PHMSA's average release figures are low?

A: Yes. The PHMSA acknowledged that its own data may underreport spills.

> The PHMSA hazardous material incident report database often contains inaccuracies. The database presents information on releases of hazardous material in transportation and relies on the person in possession of the hazardous material at the time of the incident to report on the incident. Often the amount of product released from a particular tank car is unclear or reported differently in the description of events than in the appropriate incident report fields.
>
> Additionally, the PHMSA incident reports often do not reflect the full extent of damages including property damage, cleanup and remediation costs because it may be months before full damage figures can be reported. By regulation the filer has a maximum of thirty days from the time of the incident to file a report... When we compared the incident report information from the PHMSA hazardous material incident report database with data obtained through more thorough investigations, we discovered that the quantity of product lost and number of cars releasing product were misreported in a number of cases.[10]

[10] USDOT-PHMSA Draft Regulatory Impact Analysis PHMSA-2012-0082, p. 26.

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Q: Do you agree with this assessment?

A: Yes. These issues are ongoing for the industry.

Q: What about train speeds? Are they a factor in accidents?

A: The speed at which a train is operating is a significant factor in the consequences of a derailment. PHMSA, in its rulemaking to improve the crashworthiness of tank cars transporting crude oil, considered the relationship of train speed to tank car damage and mandated train speed restrictions and improved train braking requirements. PHMSA noted that the laws of physics predict that a faster moving train at the time of a collision or derailment would result in greater damage to tank cars, and mandated speed restrictions for crude oil trains transporting DOT-111 tank cars. However, many of the catastrophic crude oil and ethanol train accidents between 2006 and 2015 were operating at speeds below maximum speeds established by PHMSA in the recent rulemaking; in fact, 17 of 24 serious accidents that I reviewed happened at speeds of 40 mph or less and 8 of those accidents occurred at speeds of 25 mph or less.

Yet, PHMSA's final rule will allow crude oil trains to travel at 50 mph, with speed reduced to 40 mph in high-threat urban areas and the Federal Railroad Administration Emergency Order 30 restricts these trains to only 40 mph in certain highly populated areas.

The following accidents illustrate that train derailments at speeds below those limits established in the PHMSA final rule have resulted in significant tank car damage and significant cargo releases:

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- 46 mph derailment: Arcadia, OH – February 6, 2011 – 31 tank cars derailed and 31 tank cars failed - 834,840 gallons of ethanol were released (the equivalent of 93 gasoline cargo tank trucks);
- 43 mph derailment: Gogama, Ontario – March 7, 2015 - 39 tank cars derailed and 36 tank cars failed - more than 500,000 gallons of crude oil were released (the equivalent of 56 gasoline cargo tank trunks);
- 42 mph derailment: Casselton, ND – December 30, 2013 – 20 tank cars derailed and 18 tank cars failed - 436,437 gallons of crude oil were released (the equivalent of 48 gasoline cargo tank trucks);
- 39 mph derailment: Aliceville, AL – November 8, 2013 – 26 tank cars derailed and 25 tank cars failed - 630,000 gallons of crude oil were released (the equivalent of 70 gasoline cargo tank trucks);
- 37 mph derailment: New Brighton, PA – October 20, 2006 – 23 tank cars derailed and 20 tank cars failed - 485,278 gallons of ethanol were released (the equivalent of 54 gasoline cargo tank trucks);
- 36 mph derailment: Cherry Valley, IL – June 19, 2011 – 19 tank cars derailed and 15 tank cars failed - 323,963 gallons of ethanol were released (the equivalent of 36 gasoline cargo tank trucks);
- 33 mph derailment: Mount Carbon, WV – February 16, 2015 – 27 tank cars derailed and 20 tank cars failed - 378,034 gallons of crude oil were released (the equivalent of 42 gasoline cargo tank trucks);

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- 23 mph derailment: Plevna, MT – August 5, 2012 – 17 tank cars derailed and 12 tank cars failed - 245,336 gallons of ethanol released (the equivalent of 27 gasoline cargo tank trucks);
- 19 mph derailment: Luther, OK – August 22, 2008 – 8 tank cars derailed and 5 tank cars failed - 80,746 gallons of crude oil released (the equivalent of 9 gasoline cargo tank trucks); and
- 10 mph derailment: Bon Homme County, SD – September 19, 2015 - 7 tank cars derailed and 3 tank cars failed - 49,748 gallons of ethanol released (the equivalent of 6 gasoline cargo tank trucks).

Q: Tell me about the fires which have occurred in these "real world" accidents.

A: A fire occurred in 20 of the 24 train derailments that I reviewed for the period between October 2006 and September 2015, which is a rate of 83.3%. This is a particular concern given the nature of the product being handled with this proposal.

> The properties of Bakken shale oil are highly variable, even within the same oil field. In general, however, Bakken crude oil is much more volatile than other types of crude. Its higher volatility may have important safety implications.[11]

The highly flammable nature of the product emphasizes the need to honestly assess the likelihood of fire and explosion should an accident occur.

[11] U.S. Rail Transportation of Crude Oil: Background and Issues for Congress (December 4, 2014), p. 14.

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Q: What about track conditions? Are they also a factor in accidents?

A: Yes. Broken rails, irregular alignment (including buckled rails/sun kinks), wide gage (including missing or defective ties and fasteners, and missing or defective spikes), vertical split heads, broken joint bars, roadbed settled or soft, and worn or broken switch points are all track, roadbed and structure conditions that can cause a train derailment.

Q: What can you tell me about track conditions?

A: FRA data for Class 1 railroads (excluding AMTRAK) identifies 2,522 train derailments on main track for the period 2008 through 2015. This FRA data identifies 780 of those derailments as occurring on the BNSF. The FRA train derailment data identifies broken rails attributed to detail fractures (from shelling or head check), irregular track alignment (buckled/sun kink) and wide gage (including defective or missing cross ties, spikes or other fasteners) as some of the leading causes of derailments assigned to track, roadbed and structure related causes.

The failure to find defects in rail because of shelling or checks has been identified by the NTSB in several accidents. Poor rail surface condition can cause ultrasonic testing to miss internal detail fractures that can grow under train loads and fail once they reach critical size. As real world tank car accident experience provides factual information to help understand the safety performance of tank cars in accidents, the investigation of train derailments provides factual information to help understand the effectiveness of track inspection, testing and maintenance programs.

After a train derailment in Superior, Wisconsin in 1992 that resulted in the evacuation of 40,000 people as a result of a hazardous materials release from a damaged

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tank car, NTSB determined that the probable cause of the derailment was the failure of the rail from an undetected preexisting detail fracture that had initiated from shelling and had reached critical size. NTSB concluded that current ultrasonic and induction inspection methods used to detect internal defects are inadequate when rail has severe shelling or other surface conditions.

NTSB investigated the train accident in New Brighton, Pennsylvania in 2006 that resulted in the derailment of 23 tank cars, the failure of 20 tank cars and the release of 485,278 gallons of ethanol. NTSB had concluded that a detail fracture (fatigue crack) that originated from shelling on the rail head, reached critical size, and caused a piece of rail to break out under the train. NTSB concluded that rail surface conditions prevented the effective transmission of the ultrasonic signals, and the defect (fatigue crack) that led to the derailment may not have been large enough at the time to be reliably detected by the inspection vehicle.

NTSB investigated a train accident in Ellicott City, Maryland in 2012 that had derailed multiple coal cars killing two young women. Investigators reviewed the ultrasonic internal rail test data conducted on the rails for the three most recent tests. The last test before the derailment on August 20 was conducted on August 3. No defective rails were marked near the derailment area. The NTSB report states that the rail carrier was aware of the history of rail defects on the line and an increase in tonnage due to heavy coal traffic and that the railroad operator's consultants recommended that they test the track every 30 days; the railroad operator adopted the policy. NTSB found at the point of derailment, the rail fractured due to a detail fracture that initiated from head checks in

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the gage corner of the rail head and determined that the probable cause of the accident was a broken rail with evidence of rolling contact fatigue.

NTSB investigated the train accident in Lynchburg, Virginia on April 30, 2014 that had derailed 17 tank cars of crude oil. One car was breached and released 29,868 gallons of crude oil, which caught fire. The NTSB report illustrates the fire by photograph:

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The train was traveling 24 mph at the time of derailment. The NTSB report states that the derailment occurred at a sudden break of a rail originating from a reverse detail fracture on the gage corner of the rail head of the high rail in the curve. The report states that a railroad contractor performed ultrasonic testing in the area of the derailment the day before the accident. Investigators reviewed the ultrasonic test data for the failure location and the report states that the data confirm that the test equipment functioned properly and responded to known rail features that would normally be detected by ultrasonic test probes within the failed rail.

> The suspected rail defect that failed at the point of derailment was a 5 percent reverse detail fracture. Historically, regulations have not considered 5 percent reverse detail fractures to be a defect subject to complete failure prior to progressing to a larger size. These types of defects cause a stress concentration on the surface of the rail and may cause a complete rail failure at a much smaller size than typical detail fractures.[12]

NTSB determined that the probable cause of the accident was a broken rail caused by a reverse detail fracture with evidence of rolling contact fatigue.

Q: So, in lay terms, track conditions are a factor in accidents and even when inspections are occurring, defects are missed?

A: Correct.

Q: What are track conditions like within the City of Vancouver?

A: On October 6 and 7, 2015, Michael Hildebrand and I reviewed approximately 25 public and private overpasses and highway at-grade crossings, adjacent exposures and drainage along the BNSF Fallbridge Subdivision's main line track within the City of Vancouver.

[12] NTSB Railroad Accident Brief, Lynchburg, Virginia derailment, p. 9.

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Most of the grade crossings were identified as private crossings and had no active crossing protection devices. While the threat of a train and highway vehicle collision at a grade crossing increases the risk of a train derailment, the lack of active warning devices at the crossing enhances that risk. While conducting a review at one grade crossing location (X-ing 090074M), we observed from the crossing that some crossties in the track had splits and showed signs of deterioration that allowed spikes to lift upward from the ties, suggesting further review of the route is warranted.[13] Photographs we took that day documenting this deterioration are at Attachment 1.

Q: What do we know about the type of tank cars which will be used for the proposal?

A: First, some background. Given the recent history of tank car accidents, tank standards have been under ongoing revision. The DOT-111 is a specification non-pressurized rail tank car, which carries a wide range of hazardous and non-hazardous materials. The DOT-111 tank car has been manufactured for many decades and is continuing to be manufactured today. The CPC-1232 is a DOT-111 tank car that has enhanced features, including head shields constructed of ½ inch thick steel to protect the bottom half of tank heads during derailments and some are equipped with insulation and jackets. This tank car enhancement was initiated by industry in 2011 to help address crude oil and ethanol accident issues. (CPC stands for Casualty Prevention Circular, which was issued by the Association of American Railroads.)

On May 8, 2015, PHMSA issued a final rule, Hazardous Materials Enhanced Tank Car Standards and Operation Controls for HHFTs, which established standards for

[13] Federal Track Safety Standards for track structure, including crossties, are located in Title 49 Code of Federal Regulations Part 213.

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the construction of new tank cars built to transport crude oil and ethanol in HHFTs. The DOT-117 includes enhanced features such as thicker tank walls and heads (9/16 inches), full head shield protection minimum ½ inch thick steel, a thermal protection system including reclosing pressure relief valves, steel jackets, and improved protection for top fittings and bottom outlets. The final rule adopts a risk-based timeline for the retrofit of existing DOT-111 and CPC-1232 tank cars that will continue in HHFTs. Retrofitted tank cars will be designated DOT-117R, and those cars are not required to meet all of the new requirements for DOT-117 tank cars. The rule allows the DOT-117R tank car heads and walls to be 7/16 inch thick instead of 9/16 inch thick as required for new DOT-117 tank cars.

However, Public Law 114-94, Fixing America's Surface Transportation Act, or FAST, was enacted on December 4, 2015 with some modifications to the new requirements in PHMSA's May 8, 2015 final rule. Subtitle C of the Act – Safe Transportation of Flammable Liquids by Rail – requires that "Certain tank cars not meeting DOT-117, DOT-117P, or DOT-117R specifications on the date of enactment of this Act may be used, regardless of train composition, until the following end dates: (1) For transport of unrefined petroleum products in Class 3 flammable service, including crude oil – (A) January 1, 2018, for non-jacketed DOT-111 tank cars; (B) March 1, 2018, for jacketed DOT-111 tank cars; (C) April 1, 2020, for non-jacketed CPC-1232 tank cars; and (D) May 1, 2025 for jacketed CPC-1232 tank cars." The timeline for transport of ethanol is extended until 2023 and other flammable liquids to 2029. The Act allows the Secretary of Transportation to extend deadlines for ethanol and other flammable liquids if

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the Secretary determines that insufficient retrofitting shop capacity will prevent the phase-out of tank cars not meeting the DOT-117, DOT-117P, or DOT-117R specifications by the deadlines. The DOT-117P tank car will have to be constructed to meet performance based standards and approved, but has not been built to date.

Q: Are the newer tank cars available for those who wish to buy them?

A: The final USDOT rule identifying the DOT-117 as the standard for HHFTs was only recently adopted on May 8, 2015. There are some DOT-117 tank cars in service now. We do not know when a sufficient supply of these tank cars will be available to fulfill the requirement that only those cars be used to transport crude oil to the facility. According to manufacturer National Steel Car N.A. Inc., as of the second quarter 2015, application of the new DOT-117 standard could take longer than scheduled, as there was a backlog of 46,375 orders for new tank cars.

Q: Will that be a problem for timely implementation of the Rule?

A: That is a real possibility, yes.

Q: What can you tell us about the performance of tank cars used to transport crude oil by rail?

A: There is accident history available about the performance of DOT-111 tank cars and CPC-1232 tank cars in HHFT derailments. That history has shown that DOT-111 and CPC-1232 tank cars have poor crashworthiness records. Tank car breaches have resulted from head and sidewall punctures and tears, damaged valves and fittings, and thermal rupture tears after being exposed to large fires. The CPC-1232 tank car has failed on multiple occasions in 2015 - in Gogama, Ontario, in Galena, Montana, and in Mount

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Carbon, West Virginia. In the Mount Carbon, West Virginia accident on February 16, 2015, 27 CPC-1232 tank cars derailed, 20 of those tank cars failed and released 378,034 gallons of crude oil (the equivalent of 42 gasoline cargo tank trucks).

Below is an accident photo from the NTSB Tank Car Performance Factual Report for the Mount Carbon accident.

In a New Brighton, Pennsylvania train derailment on October 20, 2006, 20 of 23 DOT-111 tank cars failed and released 485,278 gallons of ethanol (the equivalent of 54 gasoline cargo tank trucks).

Q: What about DOT-117 cars? If only those are used, how does this impact the risk assessment?

A: The PHMSA estimates that the DOT-117 will only provide a 21% risk reduction over the unjacketed CPC-1232 and only a 10% risk reduction over the jacketed CPC-1232.[14] So,

[14] 47 Draft Regulatory Impact Analysis PHMSA-2012-0082, p. 120.

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there is an improvement, but risks remain present, even if the new requirements can be fully implemented.

Q: The applicant appears to believe - based on the 2016 "Barkan Report,"[15] that the risk of a 92,000 gallon (ten cargo tank trucks) spill in a non-jacketed DOT-111 is once every 13 years, once every 33 years in a jacketed DOT-111, once every 25 years in a non-jacketed CPC-1232, once every 57 years in a jacketed CPC-1232, and once every 110 years in a jacketed DOT-117. They also believe a "worst case discharge" of 840,000 gallons (93 cargo tank trucks) would occur just once in 20,176 years. Is this statistical analysis consistent with what is going on in the real world?

A: No. My review of data found 13 accidents involving DOT-111 and CPC-1232 tank cars releasing more than 92,000 gallons of cargo in the 9 year period of October 20, 2006 to September 19, 2015. Cargo release in these 13 accidents totaled 5,950,603 gallons of cargo, an average of 457,738 gallons per accident. If the Lac Megantic accident is not considered, the remaining 12 accidents had a total release of 4,370,603 gallons of cargo, an average of 364,216 gallons of product per accident. Four of these accidents involved CPC-1232 tank cars: two accidents in Gogama, Ontario and one accident each in Mount Carbon, West Virginia and Galena, Illinois.

Q: Ok. So, significant events are happening, regardless of the tank car.

A: Yes.

Q: What do these events look like on the ground?

[15] Petroleum Crude Oil Unit Train Transportation Risk Analysis: Vancouver Energy Project, by Christopher P.L. Barkan, M. Rapik Saat, and Manuel Martin Ramos (January 21, 2016).

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A: The NTSB accident reports document these accidents by photograph. Excerpts have been incorporated into this testimony above. Based on my own review of accident scenarios, those are reasonable depictions of those types of accidents.

Q: The applicant has stated that these risks are really no different than driving a car or flying in an airplane, and the public generally accepts those risks. Is that a true statement?

A: Well, how much risk the public wishes to tolerate is not my decision. However, what I can say is that I assessed risk associated with HHFTs based on their actual accident history.

An HHFT is distinct from automobiles or planes. An HHFT, unlike a plane or car, is not truly a single unit. It is composed of many linked units, each containing volatile cargo. That linkage changes the risk profile.

Consider the following. A single rail tank car used to transport crude can hold 30,000 gallons. A single HHFT, with its 20 car minimum, would thus carry at least 600,000 gallons, or the equivalent of 67 gasoline cargo tank trucks. That's a minimum, not a maximum. Crude oil trains may transport 100 or more tank cars filled with crude oil (more than 3,000,000 gallons per train) and it is proposed that four trains daily would travel through the City of Vancouver.

Derailments are occurring and tank cars are breaching. Of course, not every derailment is catastrophic, but given the consequences of significant events, risk management agencies should plan accordingly.

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I declare under penalty of perjury of the laws of the State of Washington that the foregoing is true and correct to the best of my knowledge.

DATED this 9th day of May, 2016 at Brentwood, Tennessee

Robert Joseph Chipkevich

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