CN MILTON LOGISTICS HUB

REVIEW OF RISK ANALYSIS INFORMATION IN EIS

March 9, 2017

By

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1. INTRODUCTION

1.1 Summary

I am a professional engineer and a specialist in risk analysis. I was retained by the Halton Municipalities (the Regional Municipality of Halton, the City of Burlington, the Town of Halton Hills, the Town of Milton, and the Town of Oakville) to review the CN Milton Logistics Hub Development EIS, and its associated relevant appendices. I considered the sufficiency of the information provided to consider the risk of potential accidents and malfunctions during project construction and operation, both on the project site and on the surrounding roads. I was asked to focus my review on "the technical validity of the information, the methods and analysis used, and the conclusions regarding the significance of any environmental effects, proposed mitigation measures, and related follow-up programs."

Overall, I concluded that the information provided by CN was insufficient in a number of aspects, as discussed in my report. I have set out information requests for supplemental information that I recommend should be made to CN.

1.2 Purpose of Work and Scope of Report

The general purpose of this work is to provide expert assistance for the Halton Municipalities' participation in a Federal Environmental Assessment Panel Review on the CN Milton Logistics Hub Development (the "CN Proposal") for assessing the risk of potential accidents or malfunctions during project construction and operation, on the project site and on the surrounding roads and public locations.

The list of documents [numbered 1-18] that I reviewed or referred to is attached to my report as Appendix A. Specifically, the work includes a review and evaluation of the adequacy of information and data, methodology, and any conclusions on acute risks to the public and recommendations on mitigating such risks, as set out in the "Milton Logistics Hub, Summary of the Environmental Impact Statement [Appendix A, documents 2, 4, 5]," and related appendices [Appendix A, document 3] and other relevant documents [Appendix A, documents 1, 6, 7, 8, 9, 10, 11]. This review is restricted to that of information on acute risks to the public (such as risks from fires, explosions, or toxic releases causing fatality or serious injury) and excludes environmental damage and chronic health risks.

Accordingly, following this introductory section, this document describes the data and information provided, standards relevant to assessing risk, specific information requests I recommend, the adequacy of any conclusions and recommendations for risk mitigation given, and my conclusions and recommendations.

1.3 Expert Qualifications

I have been principal engineer and president of Bercha Group since 1975. I provide professional services on transportation, oil and gas facility, urban planning, and industrial projects requiring technical specialization in risk and reliability analysis including availability and reliability, constructability, economic, operational, and public safety analysis for operations in a variety of environments and locations. I have successfully provided innovative solutions to complex engineering and risk problems and developed new methods for better assessment and management of risks associated industrial and transportation project risk and reliability interactions with public and asset safety.

I obtained my Bachelor's Degree from the University of British Columbia in 1963, became a registered Professional Engineer in Alberta in 1969, and obtained my PhD in Engineering at the University of Toronto in 1972, specializing in probabilistic engineering. I also hold a DSc in Architecture obtained in 2012, in the area of building safety.

I am a member of numerous professional societies including the American Society of Mechanical Engineers and the International Society of Risk Analysis. I have authored over 100 refereed and published papers on the subjects of risk analysis, industrial safety, and other applications of risk and reliability physics and engineering, as well as over 300 technical reports on risk and reliability analysis.

My background includes industrial and frontier regions engineering experience, project management, design, resident engineering, research, university and industrial course teaching and technology transfer. I have also been qualified as an expert in risk analysis and have provided expert testimony at provincial, national, and international tribunals such as the Alberta Energy and Utilities Board, the National Energy Board, California Public Utilities Commission. In 2010 I also published a comprehensive book on risk analysis entitled "Risk Analysis Methods and Applications" [16].

2. ASSESSMENT OF CN EIS AND APPENDICES FOR ADEQUACY OF INFORMATION FOR RISK ANALYSIS

2.1 The Guidelines for Preparing the EIS

I reviewed the "Guidelines for the Preparation of an Environmental Impact Statement, Milton Logistics Hub" dated July 2015 [1] which provided the following instructions in regard to preparation of the EIS. I have also placed emphasis on certain portions of the instructions which I will discuss following the quote.

> **6.6.1 Effects of potential accidents or malfunctions**
>
> The failure of certain works caused by human error or exceptional natural events (e.g. flooding, earthquake) could cause major effects. The proponent will therefore conduct an **analysis of the risks of accidents and malfunctions**, **determine their effects** and present **preliminary emergency measures.**
>
> Taking into account the **lifespan of different project components**, the proponent will identify the probability of potential accidents and malfunctions related to the project, including an explanation of how those events were identified, **potential consequences** (including the environmental effects as defined in section 5 of CEAA 2012), the **plausible worst case scenarios** and the effects of these scenarios.
>
> This assessment will include an identification of the **magnitude of an accident and/or malfunction**, including the quantity, mechanism, rate, form and characteristics of the **contaminants and other materials likely to be released into the environment during the accident and malfunction events** and would potentially result in an adverse environmental effect as defined in section 5 of CEAA 2012.
>
> The EIS will describe the **safeguards** that have been established to protect against such occurrences and the **contingency and emergency response procedures** in place if such events do occur.

In reviewing the above requirements of the EIS Guidelines, I noted that CN was directed to address the following issues:

- **Risk analyses:** Both <u>qualitative</u> and <u>quantitative</u>.
    - In terms of the <u>qualitative</u> aspects, CN was requested to identify events that may lead to accidents and malfunctions, considering what contaminants or other material may be released into the environment, the consequences of such events, and plausible worst case scenarios.
    - Regarding the <u>quantitative</u> aspects, CN was asked to provide an "analysis of the risk" of accidents and malfunctions, which is a numerical exercise. Additional factors mentioned above, such as lifespan of project components and the presence of safeguards, are relevant to the quantification of risk.

- **Mitigation:** CN was required to describe the safeguards established to protect against the risk of accidents or malfunctions.

- **Emergency Response procedures**: CN was also required to discuss what emergency response procedures and measures would be put into place on a preliminary (preventive) basis (also called "**strategic measures**"), as well as procedures that would be used upon accidents and malfunctions occurring ("**tactical measures**").

I note that the above guidelines also refer to adverse environmental effects with respect to *CEAA 2012*. My expertise is in acute risks to the public such as from accidents and toxic substances; I will therefore not comment on chronic risks from other environmental impacts.

2.2 Approaches to Risk Analysis

To analyze risk, one must (1) identify the hazard, (2) determine the probability of occurrence, and (3) assess the consequences should it occur. The individual specific risk from a given event occurring is a combined measure of the numerical probability of occurrence, and the magnitude of effect [16] to a specific individual at a specific location.

There are a number of standards and approaches to calculating risk in connection with a proposed project such as the CN Intermodal terminal. While it cannot be claimed that any specific risk thresholds have gained universal acceptability, a sufficient number of individual risk, risk matrix, and risk spectrum thresholds have been adopted by various jurisdictions to make it worthwhile to consider some of these in evaluating the risk level acceptability for the subject development. I have listed a number of works on standards of risk assessment giving risk acceptability criteria in Table 3.1 (references are listed in Appendix A).

Table 1: Public Risk Standards

13.	Major Industrial Accident Council of Canada (MIACC). "Hazardous Substances Risk Assessment – A Mini Guide for Municipalities and Industry". 1994.
14.	Canadian Society for Chemical Engineering MIACC CSChE, Risk Assessment – Recommended Practices for Municipalities and Industry, 2015.
15.	Bercha Engineering Limited, Cumulative Risk Assessment and Land Use Planning Project, Summary Final Report, City of Edmonton, 2011.
16.	Bercha, FG. Risk Analysis Methods and Applications, Chapter 4 and 7, Universal Publishers Inc., 2014.
17.	Health and Safety Executive (HSE). "Risk Criteria for Land Use Planning in the Vicinity of Major Industrial Hazards". HSE. London, UK. 1989.
18.	County of Santa Barbara, Environmental Thresholds and Guidelines Manual, Section 15 P119-126 Public Safety Thresholds Revised 2015 Santa Barbara 15P.

Of the above, the MIACC standard is the most commonly used in Canada. Regardless of the risk criteria to use, the information requested below in this report will provide the basis of an adequate quantitative risk analysis of public safety related to the proposed development.

2.3 Risk Thresholds

Risk thresholds are a term generally used to designate the levels of risk which are acceptable in certain situations, and given defined risk recipients (eg. residents, workers, etc.). Possible measures of risk include individual risk, risk expectations, and risk spectra [16, 17, 18].

Individual risk is the probability that a given individual (at a specific location considering their time spent and any sheltering effects, at the location) will become a casualty as a result of the project over a given period of exposure (usually one year). Collective risk expectation can be described by the use of a risk matrix which relates various discrete levels of likelihood of occurrence and severity of consequences. A "risk spectrum" involves a more rigorous assessment of collective risk, and gives a continuous relationship between the probability of occurrence and a quantitative measure of the severity of consequences, such as the number of people affected [16, 17, 18].

A more simple risk criterion is the use of an individual location risk criterion which simply gives the permitted land uses for the individual risk at a specific location, regardless of the amount of time and sheltering of people at that location. This is called the individual risk intensity (IRI) criterion and is detailed in the MIACC standards described in [13, 14].

For the present project it is recommended that individual risk thresholds similar to those described in [15] be considered, but if risks are high and many recipients are exposed, it is recommended that collective risk also be quantified as described in [17, 18].

2.4 Portions of the EIS Relevant to Risk

In reviewing the EIS for the necessary information, I reviewed the section which appeared to focus on information for a risk analysis, section 6.6. ACCIDENTS AND MALFUNCTIONS. This section contained the following subsections:

A "spill" was generally defined in Section 6.6.1, but the section only briefly refers to hazardous materials, and in my opinion did not define them adequately. In my report we shall use the Transport Canada definition of hazardous materials, normally called Dangerous Goods (DG) given as [12]:

> *A product, substance or organism included by its nature or by the regulations in any of the classes listed in the schedule* (See Appendix B to my report)

CN provides a discussion of Human Health Risk analysis (HHRA) in [3], but this fails to discuss acute risks such as those from explosions or toxic gas releases causing immediate fatalities or injuries. No other documents that I reviewed in the EIS discuss acute risks to the public.

2.5 Information Required to Assess Risk for this Facility

An intermodal facility will involve trains transporting goods that are in containers, including dangerous goods (DG), and then transferring the goods between trains and trucks, and transporting the DG by trucks to external locations. A variety of equipment may be used to perform the transfers, such as stackers and reachers. There is risk of accident of malfunction at various points in the process. In order to qualitatively and quantitatively understand the risk, several types of information must be considered.

a. Trains, Vehicles, Transfers, and DGs

First, qualitative and quantitative information on the expected DG train transport, transfer to trucks, and extent of truck travel is required for a public safety QRA. The principal risk source from operations is the release of DG as a result of a malfunction or accident involving train derailment, collision, DG transfer to trucks, truck accident, and other release events.

Specifically, the following information items for a typical scenario – or typical scenarios (ie, max, min, avg) – are needed:

- Number of trains entering and exiting daily, estimated speeds of ingress and egress, station time, movements, locations along the track for idling, unloading, and reloading.

- Types of trains employed, including numbers of cars in each train, train specifications, and certification levels.

- Quantities and types of DG carried by the trains, including their quantities, form (solid, liquid, or gas), and their release parameters. This information will already be tracked by CN as part of its operations and should therefore be readily available.

- A detailed description of the intermodal transfer operations is needed, in terms of exactly how transfers of containerized material occur between trains and trucks, where on the site it occurs, what equipment is used to accomplish the transfer, and the extent of automation and human judgment used in the process.

- Details of the daily expected DG transfer operations (type, quantity, number of transfers, transfer times).

- The lifespan of all equipment used in the intermodal transfer operations also needs to be known. The effective functional time for individual items of equipment and the schedule for refurbishment and replacement are factors that can numerically be factored into the risk analysis.

- DG Truck characteristics and specifications need to be known. The intermodal facility will only allow trucks meeting certain minimum standards into the facility. In general, the higher the standards met by the trucks, the lower the risk of accident or malfunction.

- Driver certifications for the trucks entering the facility need to be confirmed. Only drivers meeting minimum levels of training and licensing will typically be allowed to handle trucks carrying DG.

- Daily DG truck movements and routes (road types, speed limits, Average Annual Daily Traffic) within terminal and routes within 10 km (nominally) of terminal.

- Life cycle characteristics of the operation including annual variations in above and total life cycle. This information is needed both in terms of the variations in locomotive and truck traffic on an annual basis, and the variations in terms of types of DG carried. For instance, in the spring there tends to be more fertilizer being shipped, whereas in the winter the amount of fuel oil increases. These annual patterns are relevant to determining risk associated with the operations.

- Information on the projected lifespan of the facility, and projected changes in types of DG shipped through the facility is also needed for the risk analysis. If this intermodal facility is projected to operate for the next fifty years, there will be changes to the DG being shipped over that time, some of which can be anticipated now. For example, as hydrocarbons become more scarce, the volume of transported hydrocarbons may decrease significantly over the next fifty years.

- The extent of human exposure in the vicinity of the proposed intermodal facility also needs to be factored into the risk analysis. Therefore, information on local population distributions, both current and projected, is necessary.

- Risk during the construction phase as opposed to the operations phase should also be considered. This will require detailed information as to the construction plans and schedules, and the equipment that will be used on site, and the extent of increased heavy truck traffic due to the construction.

b. Mitigation and Emergency Response Measures

The emergency response measures and plans should be provided, so that they can be considered and factored into the risk analysis and mitigation. There are two types of such measures: **strategic** safeguards such as alarms and spill containment areas, and **tactical** measures, which focus on response times and procedures in the event an incident occurs.

Municipalities generally have emergency response planners on staff who can provide templates for risk analysis and containment. In typical practice, it will be necessary to provide these plans to the municipality before the development can be approved. In addition, the Transportation Safety Board has templates for risk analysis that would be applicable to this facility.

As well, an explanation of any other measures to mitigate risk of accidents and malfunctions should be provided, as such measures can quantitatively reduce risk and should therefore be considered.

c. Worst Case Scenarios

A qualitative description of plausible worst case scenarios in the event of accident or malfunction should also be factored into the risk analysis. Examples of such scenarios would be the 1979 Mississauga derailment of a train carrying DG, or a possible sequential ignition of train cars carrying propane. Consequences such as fatalities or severe injuries should also be considered.

2.2 Review of EIS and Information Requests

I reviewed the EIS as discussed above, and in my opinion, the information provided in the documents reviewed is inadequate for input into a qualitative and quantitative risk analysis (QRA). Insufficient information is provided in respect of each of the above three categories of needed information.

In particular, the information provided in the documents reviewed was conceptual only. Although general concepts and plans were expressed, what was missing was the qualitative and detailed quantitative information on all aspects of the operation related to DGs, which is required for the conduct of a public safety QRA as explained above. I have also provided examples of DG train information collected for other locations [15], which is shown in Appendix C.

No detailed information was given on mitigation of risks to the public, and such risks are not described. Regarding preliminary emergency measures, safeguards, and contingency and emergency response procedures, a list of existing CN Emergency response plans was referred to, but the actual plans do not appear to have been provided with the EIS.

Based on my assessment, there are a number of deficiencies in the EIS in terms of the information needed to consider risk. I have suggested the below information requests be made of CN so that the deficiencies can be addressed. After receiving and reviewing the requested information, some further information may also be required.

Table 2: Information Requests

Topic	Reference to CN EIS [2]	Requested Information	Rationale
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA1. Train Volume and Station Activities** Please provide the numbers of trains entering and exiting daily, estimated speeds of ingress and egress, time spent at station, movements, and track locations for loading, unloading, and idling.	This information is necessary for assessing risk by conduction a Quantitative Risk Assessment.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA2. Train Specifications** For each type of train that will be using the facility, please provide the relevant certification levels, technical specifications, and numbers of cars per train.	This information is necessary for assessing risk by conduction a Quantitative Risk Assessment.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA3. Transfer Operations** Please provide a full description of the intermodal transfer operations, including the site location where transfers occurred, and the equipment used to affect transfers of containers. An analysis of the daily expected DG transfer operations in terms of type, quantity, number of transfers, and transfer timing is also needed.	This information must be considered for the modeling of risk from daily DG operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA4. Intermodal Equipment Lifespan** Regarding the equipment used for transferring containers between trains and trucks, please list the equipment and provide information for each on its technical useful life span. As well, please advise of CN's intended refurbishment and replacement programs in respect of all equipment to be used at the site in the transfer operations.	This information is relevant for the modeling of risk from daily operations. This information is also required by the EIS Guidelines, which request that the proponent take "into account the lifespan of different project components".

Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA5. Truck Specifications** For trucks carrying DG that will be permitted entry to the facility, please provide full technical specifications and characteristics, including tonnage limitations and permitted types of cargo.	This information must be considered for the modeling of risk from daily operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA6. Truck Driver Certifications and Permits** For drivers of trucks carrying DG that will be permitted entry to the facility, please provide details of driver certifications and licenses, and permits required for each truck type.	This information is relevant to the modeling of risk from daily operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA7. Truck Routes** Please provide details and mapping showing daily expected DG truck movements and routes. Information is needed on road types they will travel on, speed limits, and Average Annual Daily Traffic projections, both within the terminal and within 10 km of the terminal.	This information is relevant to the modeling of risk from daily operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS App. E7	**RA8. Human Exposure** Please provide public population distributions within 10 km of the site, and associated land use types, both current and future. For example, if land is zoned for commercial, residential, industrial, or recreational use, it needs to be factored into the risk analysis.	The density of the human population in the vicinity of the site, and the approved uses of land in the vicinity, are both important factors to consider in assessing risk from the operations of the terminal. Public exposure numbers and locations as well as an understanding of indoor and outdoor exposure are particularly important for assessing individual specific and collective risk.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA9. Details of DG** Please provide detail on the types of DG anticipated to be pass through the intermodal terminal. Details should be provided on quantities, form (liquid, solid, gas), containment characteristics (pressure, temperature, container type), and potential release parameters.	This information must be considered for the modeling of risk from daily DG operations.

Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA10. DG Annual Variation** Please explain the annual variations in types of DGs shipped. For example, certain goods such as fertilizer will tend to be shipped in larger volumes in the spring.	The quantities and timing of movement of DG are relevant to the modeling of risk from operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA11. DG Projected Changes** Over the planned lifespan of the facility, please advise of any foreseeable changes in the quantities and types of DG that will be shipped through the facility over its lifespan.	The future quantities and timing of movement of DG must be considered for the modeling of risk from operations.
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA12. Emergency Response Plans** Please provide copies of any emergency response plans, with both strategic (preventive) and tactical (responsive) measures considered. As well, the plans should comply with any local municipal requirements so this should be confirmed.	The plans are relevant to considering operational risk from the facility, and the extent to which any risk has been mitigated. As well, the EIS Guidelines require that such plans be provided: "The EIS will describe the **safeguards** that have been established to protect against such occurrences and the **contingency and emergency response procedures** in place if such events do occur."
Railway Networks and Crossings (Risk) EIS Guidelines Part 2, section 6.6.1 Halton Brief, Table D.5, Transportation	EIS s. 6.6.2	**RA13. Worst Case Scenarios** Please provide a discussion of plausible worst case scenarios associated with operation of the terminal.	Details of the extent of possible impacts from an accident or malfunction are required as they need to be considered in the course of performing risk analysis. As well, the EIS Guidelines required this information: "the proponent will identify . . . the plausible worst case scenarios and the effects of these scenarios."

4. CONCLUSIONS

The CN Milton Logistics Hub Development EIS and associated appendices were reviewed to assess the adequacy of information to form a basis of a quantitative risk analysis (QRA) of public safety during the construction and operation of the proposed facility. The information provided in the documents reviewed is inadequate for input into a QRA. The most significant issue is that the information provided is only conceptual rather than qualitative and quantitative.

Qualitative and detailed quantitative information on all aspects of the operation related to DGs is required for the conduct of a public safety QRA. Such information is described and characterized herein in Information Requests (IR) and partially exemplified with examples from other studies.

In summary, it is concluded that insufficient information on the proposed development for the conduct of a quantitative risk analysis of public safety from acute risks is provided. Details of the information required are given in this document.

Signed this 9th day of March, 2017

Frank G. Bercha

APPENDIX A

CN/Stantec Documents

1. Canadian Environmental Assessment Agency, "Guidelines for the Preparation of an Environmental Impact Statement, Milton Logistics Hub", July 2015.

2. Stantec Consulting Ltd. "Milton Logistics Hub, Summary of the Environmental Impact Statement," Canadian National Railway Company, December 7, 2015.

3. Stantec Consulting Ltd. "Milton Logistics Hub, Summary of the Environmental Impact Statement," Appendix E.7, Technical Data Report, Human Health Risk Assessment, Drc., 201.

4. Stantec Consulting Ltd. "Milton Logistics Hub, Figures," undated.

5. Stantec Consulting Ltd. "Milton Logistics Hub, Renderings," undated.

6. Appendix A, Renderings, Milton Logistics Hub, undated.

7. Appendix A, Figures, Milton Logistics Hub, undated.

8. BA GROUP, "Review of Terminal Generated Truck Traffic," Memorandum, November 30, 2015.

9. Canadian Environmental Assessment Agency, "Requirements for Additional Information from CN for the Milton Logistics Hub EIA", March 15, 2016.

10. CN, Milton Logistics Hub EIS, Response to CEAA IR 1 of March 15, 2016, (all re environmental effects), Prepared by Stantec, May 18, 2016.

11. CN, ATMOSPHERIC ENVIRONMENT, (re: Greenhouse Gas Emissions), Milton Logistics Hub, Response to CEAA IR 10 of March 15, 2016, F. Moreau, June17, 2016.

Other Documentation

12. Transport Canada. *Transportation of Dangerous Goods Act, June, 2009* (portions, as referenced).

13. Major Industrial Accident Council of Canada (MIACC). "Hazardous Substances Risk Assessment – A Mini Guide for Municipalities and Industry". 1994.

14. Canadian Society for Chemical Engineering, MIACC CSChE, Risk Assessment – Recommended Practices for Municipalities and Industry, 2015.

15. Bercha Engineering Limited, Cumulative Risk Assessment and Land Use Planning Project, Summary Final Report, City of Edmonton, 2011.

16. Bercha, FG. Risk Analysis Methods and Applications, Chapter 4 and 7, Universal Publishers Inc., 2014.

17. Health and Safety Executive (HSE). "Risk Criteria for Land Use Planning in the Vicinity of Major Industrial Hazards". HSE. London, UK. 1989.

18. County of Santa Barbara, Environmental Thresholds and Guidelines Manual, Section 15 P119-126 Public Safety Thresholds Revised 2015 Santa Barbara 15P.

19. *Canadian Environmental Assessment Act, 2012,* section 5

APPENDIX B

SCHEDULE OF DG SUBSTANCES [12]

- Class 1 — Explosives, including explosives within the meaning of the *Explosives Act*
- Class 2 — Gases: compressed, deeply refrigerated, liquefied or dissolved under pressure
- Class 3 — Flammable and combustible liquids
- Class 4 — Flammable solids; substances liable to spontaneous combustion; substances that on contact with water emit flammable gases
- Class 5 — Oxidizing substances; organic peroxides
- Class 6 — Poisonous (toxic) and infectious substances
- Class 7 — Nuclear substances, within the meaning of the *Nuclear Safety and Control Act*, that are radioactive
- Class 8 — Corrosives
- Class 9 — Miscellaneous products, substances or organisms considered by the Governor in Council to be dangerous to life, health, property or the environment when handled, offered for transport or transported and prescribed to be included in this class

APPENDIX C

TRAIN DG INFORMATION EXAMPLE

From [15]

Table 2.5.1 (= Table D.2.5.1)
Daily Train Information Summary

Area	Code	DG Route	Number of Trains per day	Type of train/car											
				LPG		Ammonia		Gasoline		Chlorine		Hydrochloric Acid		Other	
				%	No	%	No	%	No	%	No	%	No	%	No
Cloverbar	CCP1	Hwy 16 @ Hwy 216 (Meridian St.) to 33 St. NE (RR232	8	20	1.600	40	3.200	30	2.400	0.10	0.008	3	0.240	6.90	0.552
	CCN1	Hwy 16 @ 17 St NW to 33 St. NE (RR232)	8	20	1.600	40	3.200	30	2.400	0.10	0.008	3	0.240	6.90	0.552
Southeast	SCP1	50 St. @ 82 Ave to 34 St. &94 Ave NW	12	20	2.400	40	4.800	30	3.600	0.10	0.012	3	0.360	6.90	0.828
	SCN1	Sherwood Pk Fwy @ 29 St NW to Whitemud Drive & 17 St. NW	8	20	1.600	40	3.200	30	2.400	0.10	0.008	3	0.240	6.90	0.552
Horsehills	HCN1	Manning Fwy near 17 St NW to 259 Ave (Hwy 37)	2	20	0.400	40	0.800	30	0.600	0.10	0.002	3	0.060	6.90	0.138

Table 2.5.2 (= Table D.2.5.2)
Annual Train Information Summary

Area	Code	DG Route	Number of Trains per Year					
			LPG	Ammonia	Gasoline	Chlorine	Hydrochloric Acid	Other
			LPG	AMM	GAS	CHL	HCA	OTH
Cloverbar	CCP1	Hwy 16 @Hwy 216 (Meridian St.) to 33 St. NE (RR232	584	1,168	876	2.9	88	201
	CCN1	Hwy 16 @ 17 St NW to 33St. NE (RR232)	584	1,168	876	2.9	88	201
Southeast	SCP1	50 St. @82 Ave to 34 St. &94 Ave NW	876	1,752	1,314	4.4	131	302
	SCN1	Sherwood Pk Fwy @29 St NW to Whitemud Drive & 17 St. NW	584	1,168	876	2.9	88	201
Horsehills	HCN1	Manning Fwy near 17 St NW to 259 Ave(Hwy 37)	146	292	219	0.7	22	50