Hatch Mott MacDonald

# North Toronto Subdivision Rail Corridor Risk Assessment and Management Study

## Final Report

| Issue and Revision Record | | | | | |
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# Key Findings and Recommendations

The key objective of this report is to provide the City of Toronto with credible and defensible information on which City staff can rely as they develop recommendations for the Dupont Street Regeneration Area Study.

The following definitions apply to the recommendations:

- "Sensitive land uses" means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects generated by an event or activity at a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities.
- "Principal buildings" includes any building where people live, work, shop, sleep, play, or are gathered for other reasons; in other words, a high occupancy building.
- "Ancillary buildings" includes parking structures, waste storage, or other storage facilities related to the principal use; in other words, a low occupancy building.

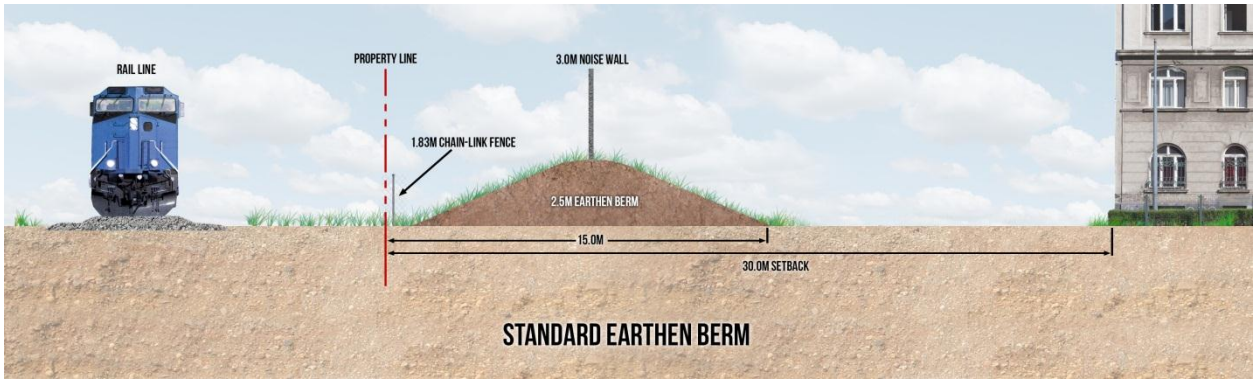
Railways are federally or provincially regulated and the City of Toronto has no jurisdiction over rail corridors and railway operations. The City is responsible to ensure land use compatibility along rail corridors, and manage future risks.

HMM has reviewed CPR's North Toronto Subdivision between Ossington Avenue and Kendal Avenue and focused on the most effective way to manage the risks to people and property along the rail corridor using best practices.

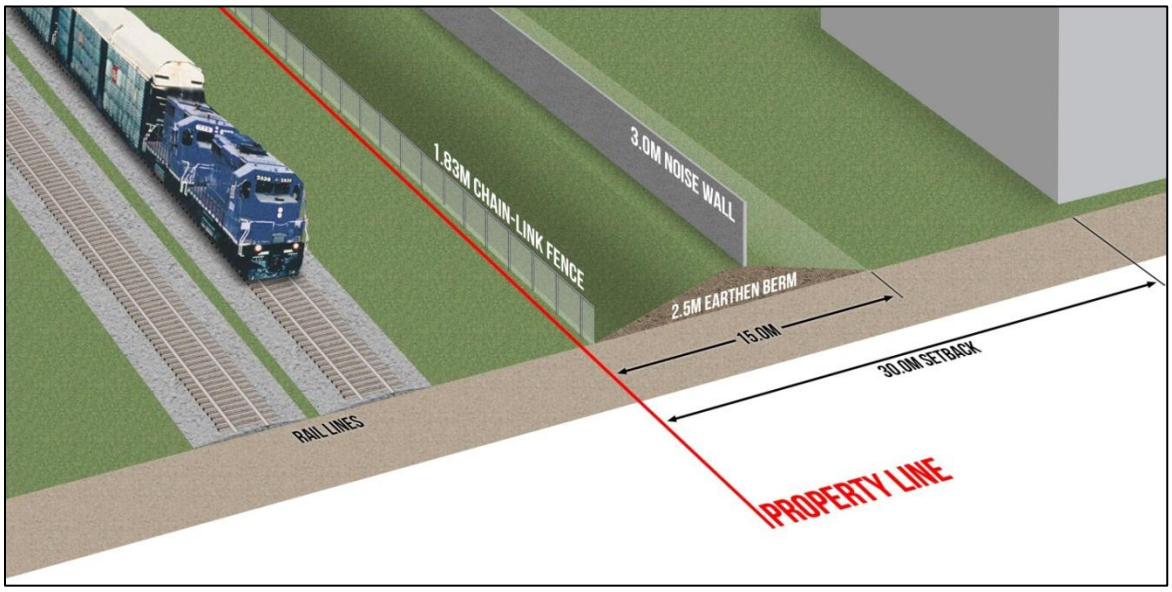
## For Principal Buildings

Where a building contains high-density or high-occupancy uses, including but not limited to: residential units, seniors housing, education or institutional uses, daycare, place of worship, hotels, entertainment or recreational facilities, retail or office space, the following mitigation measures are recommended, and illustrated below:

- Minimum setback of 30 m measured as a straight horizontal line, perpendicular to the rail property line to the building face, provided:
    i. A berm is constructed within the 30 m setback, on the proposed development land. The berm must be a minimum height of 2.5 m with side slopes not steeper than 2.5 to 1 (horizontal to vertical) on both sides. Berm height is to be measured from the existing elevation at the rail corridor property line.
    ii. An appropriate noise wall is constructed on top of the berm.
    iii. A fence is installed on development side of rail property line, minimum 1.83 m chain link, to be paid for and maintained by the development property owner.
    iv. The berm can be a simple earthen mound compacted to 95% modified Proctor, and must be constructed parallel to the rail corridor with returns at the ends.
    v. Mitigation measures are peer reviewed by CPR and City of Toronto.




**Recommended Mitigation Measures: Cross-Section**




**Recommended Mitigation Measures: Bird's Eye View**

## For Ancillary Buildings

Ancillary buildings, such as parking structures or temporary storage, may be provided within the 30m setback between the standard earthen berm (described in Section 8.1.1) and the principal buildings. Ancillary buildings are not to be used in lieu of a standard earthen berm. Ancillary buildings should be engineered as independent structures, with foundations and structural elements that are separate from the principal buildings. If an ancillary building is proposed beyond the berm but within the 30m setback, the design must include safety mitigation measures to limit damage to the principal building, on a case by case basis.

Surface parking, open space, natural areas, and storm water drainage facility uses may be included within the 30 m setback, if a standard earthen berm is provided.

# Executive Summary

City of Toronto retained Hatch Mott MacDonald (HMM), in association with McPhail Transportation Planning Services Ltd., to conduct the Risk Assessment and Management Study along the Canadian Pacific Railways North Toronto Subdivision. This study will inform and support the City Planning "Dupont Street Regeneration Area Study", in accordance with direction received from City Council through adoption of Official Plan Amendment No. 231 (OPA 231) and the policies of Section 4.7 of the Official Plan. This Risk Assessment and Management Study is focused on the risks to property and people adjacent to the CPR North Toronto Subdivision railway corridor, between Ossington Avenue and Kendal Avenue, north of Dupont Street.

The key objective of this report is to provide the City of Toronto with credible and defensible information on which City staff can rely as they develop recommendations regarding the Dupont Street Regeneration Area.

## Roles and Responsibilities

An overview of the regulations, roles and responsibilities around railways in Canada is provided in the report. It is important to note that Canadian Pacific Railways (CPR) is federally regulated. Each rail company has a responsibility towards public safety, and to ensure a safety management system (SMS) is implemented and functioning. Railways must ensure their infrastructure is routinely maintained to serviceable standards, decreasing the likelihood of accidents and derailments. Railway companies also have a responsibility to ensure that noise and vibration are at a reasonable level in consideration of the surrounding public.

Each municipality has a role to ensure suitable land use and planning in their respective jurisdictions. Municipalities must enforce the policies, regulations, and by-laws to accommodate appropriate land use and development. The Ontario Planning Act requires railways to be notified of land use changes within 300 m of a railway line. It is important to note that railways are not directly subject to municipal zoning controls, because they are federally regulated.

## Rail Transportation and Safety Trends

Recent events have raised public awareness of the movement of dangerous goods by rail. Since their inception, railways have transported a variety of goods, and the type and amount of commodities transported by rail is continually changing in Canada. The amount of each commodity shipped varies widely by market conditions. Railways in Canada are required by law to transport regulated dangerous goods in approved regulated containers. The movement of dangerous goods in Canada is controlled through the Transportation of Dangerous Goods Act and the Transportation of Dangerous Goods Regulations. Based on commodity information for 2012, refined petroleum products made up 7% of all commodities transported by rail in Canada, and dangerous goods comprised approximately 10% of the total rail carloads originated in Canada.

The Transportation Safety Board has records for 4159 mainline derailments in Canada from 1983 to 2013. Eighteen derailments occurred in Toronto during this 30-year time period, none resulting in fatalities or serious injuries. One of the 18 derailments involved dangerous goods cars, and occurred in a rail yard. Two of the 18 derailments occurred on the North Toronto Subdivision. It is important to note that mainline derailments can occur at any point in the rail corridor.

## North Toronto Subdivision

The North Toronto Subdivision was completed in 1884, providing an important link for CPR between Toronto and Montreal via Ottawa. Originally, the line carried both passenger and freight trains. In the 1970s, passenger service declined and the last CPR passenger service through West Toronto was in 1978. Today, the North Toronto Subdivision is used only by CPR for freight trains.

Current CPR freight operations within the corridor, based on 2013 averages provided by CPR, include about 35 to 40 trains per day. CPR indicated an average train has about 125 railcars plus two to four engines. Freight trains are generally limited to 45 mph, with trains carrying dangerous commodities limited to 25 or 35 mph, depending on the cargo.

Future operations on the North Toronto Subdivision are difficult to predict. The amount of future traffic will vary seasonally and depend on North American and even international economies. This is CPRs sole freight-only route through the City of Toronto connecting to Central Canada, western Canada, and the US. This means any regulated commodity transported in Canada (including dangerous goods) can be moved on this line at any time. It is reasonable to assume, given the location of the North Toronto Subdivision within CPR's network, that future freight rail traffic on this line will increase, including the movement of dangerous goods. However, there is insufficient information to predict future operations with any accuracy. At the time of writing, Metrolinx has no planned advancements on passenger train projects on the North Toronto Subdivision, and CPR has not indicated any plans to expand their infrastructure in this corridor.

## Development Near Railway Corridors

Industry guidelines for residential development adjacent to rail corridors have been in place across Canada since the early 1980s, following the Grange Commission after the Mississauga Derailment Disaster of 1979. As a safety measure for development along rail corridors, Canadian railways have promoted a 30 m setback and berm criteria since the early 1980s.

The Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) collaborated to produce a set of proximity guidelines and best practice for development near railways, and the most recent and comprehensive edition was published in May 2013.

The 30 m setback with berm was developed based on careful analysis of aerial photographs of derailments. It was determined through this analysis that 30 m, with a berm, was a minimum safe distance for derailments. The FCM/RAC Guidelines state that if best practices mitigation measures can be accommodated on the site, those measures should be included and the development may proceed with the subsequent appropriate studies. Best practice mitigation measures include a 30m building setback from the railway property line, with a 2.5 m high earthen berm.

A review of other Canadian municipalities was conducted in order to confirm the practices in use. The City of Edmonton's Zoning Bylaw 12800 Amendment was the most guidance reviewed, providing a detailed set of tables for setback and other mitigation measures for a range of land use types. It is important to note that this review confirmed the FCM/RAC recommendations are being implemented by municipalities across Canada.

## Changing Nature of Risk

The range of goods that can be moved by train is regulated by Transport Canada, and includes explosives, flammable and toxic gases, infectious substances, radioactive materials, and corrosives.

Based on a review of available data, there is a downward trend for main-track derailments across Canada and Ontario. There is also a downward trend for main-track derailments involving dangerous goods across Canada and Ontario. Rail companies are continuing to adopt and implement new technologies to supplement existing safety practices and continue to improve Safety Management Systems to enhance the safety of their operations.

The volume of trains, length of trains, and volume of goods moved by train is currently increasing across Canada. However, past trends show that it is not a constant increase over time, and it is impossible to quantitatively assess the future risk. On the North Toronto Subdivision, it is reasonable to assume that rail traffic may continue to increase over time but, given the complex relationship with economic forces, it is impossible to predict by how much or when these increases may occur.

In summary, while train volumes are generally increasing, the rate of derailments is generally decreasing.

Along the North Toronto Subdivision, there are two main types of train incident risks that could impact lands beyond the rail corridor: 1) Physical train derailment, 2) Release of material (e.g., a leak or spill of train cargo).

Research and analysis of past incidents shows that a physical train derailment can be caused by a wide range of factors. The severity of a derailment is directly related to the speed of the train. During a derailment, the kinetic energy of the train (a combination of its speed and mass) needs to be dissipated. Given the number of complex factors related to train derailment incidents, it is impossible to predict when or where a train incident or derailment may occur. In addition, the City of Toronto has no jurisdiction over the majority of factors that may cause a derailment or release of material.

Therefore, the responsible approach for the Dupont Street Regeneration Area Study is to apply a consistent risk management approach along the North Toronto Subdivision, focusing on managing the potential consequences should an incident occur in this area, and consideration of appropriate mitigation measures.

## Risk Assessment

As part of the Dupont Street Regeneration Area Study, the City is considering a range of potential land uses for the portion of lands designated Regeneration Areas by OPA 231. Two future land use scenarios were considered in this study: 1) Non-sensitive land uses (similar to existing employment and retail uses along the corridor), 2) Sensitive land uses within lands designated Regeneration Areas (this includes mixed use developments that contain sensitive uses such as residential along with employment and retail uses). Sensitive land uses are defined in the 2014 Provincial Policy Statement.

While the definition for sensitive land use focuses on residential and institutional land uses, it is important to consider the risk to people who may work adjacent to the rail corridor, and in particular the density of people who may work in the study area. For example, a temporary storage facility is likely to have far fewer people in the building at any given time when compared to a multi-storey office building or large retail store.

There are two key environmental risk factors which are within the City's jurisdiction:

- Building Setback: risk decreases with greater setback.
- Population Density: risk increases with higher density (higher occupancy) land uses.

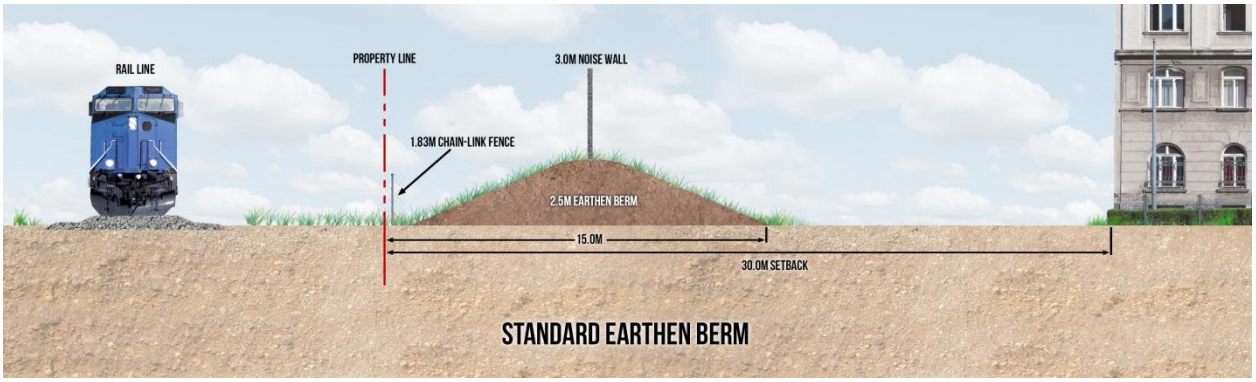
Based on the potential density of people in the future land use scenarios, HMM recommends that the City considers both sensitive and non-sensitive land uses for risk management, particularly where the land use may be high-density or high-occupancy.

## Risk Mitigation Recommendations

The standard earthen berm is the most effective mitigation measure for absorbing the energy of a derailing train, providing the greatest risk reduction for both impact to adjacent buildings, and subsequent release of materials. Absorbing as much energy as possible from the derailed train reduces the risk of train car damage and resulting leaks or spills, in turn reducing the risk for fire, explosion, or fumes.

Other mitigation measures are available, such as a deflection berm (crash berm) or deflection wall (crash wall). These measures are designed to deflect, or move, when impacted by a derailing train. These measures will also deflect some of the energy of the derailing train back to the train equipment. This increases both the time and distance of the derailment event as compared to the standard earthen berm. This also increases the potential damage to property, likelihood of equipment failure, exposure to people, and potential for a leak, spill or explosion.

Based on HMM's review of CPR's North Toronto Subdivision between Ossington Avenue and Kendal Avenue, best practices from across Canada, and focusing on the most effective way to mitigate risks to people and property along the rail corridor, HMM recommends a 30 m building setback plus standard 2.5 m high earthen berm, as illustrated below.




**Recommended Mitigation Measures**

# Project Report

May 15, 2014

## City of Toronto

## North Toronto Subdivision Rail Corridor Risk Assessment and Management Study

# Final Report

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Appendix B - Excerpts from Emergency Response Guidebook (CANUTEC)
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# 1. Introduction

The City of Toronto retained Hatch Mott MacDonald (HMM), in association with McPhail Transportation Planning Services Ltd., to conduct this Risk Assessment and Management Study along the Canadian Pacific Railway (CPR) North Toronto Subdivision. This study will inform and support the City Planning "Dupont Street Regeneration Area Study". The City's study area is shown in Figure 1. This Risk Assessment and Management Study is focused on risks to the property and people in this study area.

The key objective of this report is to provide the City of Toronto with credible and defensible information that City staff can rely on as they develop recommendations regarding the Dupont Street Regeneration Area.

This body of the report is organized into following sections:

- Section 2: Background and purpose of this study.
- Section 3: Background information on relevant regulations, roles and responsibilities of various stakeholders.
- Section 4: Rail transportation and safety trends across Canada and Ontario.
- Section 5: Profile of the North Toronto Subdivision (past, present and future).
- Section 6: Information from relevant agencies and other municipalities regarding proximity issues and guidelines.
- Section 7: Risk assessment and mitigation, including the changing nature of risk related to railway corridors, analysis of rail risks in the study area, and discussion of potential mitigation measures.
- Section 8: Recommendations for risk mitigation measures for different future land use scenarios, including information on their relative effectiveness.
- Section 9: References used in the development of this report
- Appendices: Data and statistics, and supporting information.

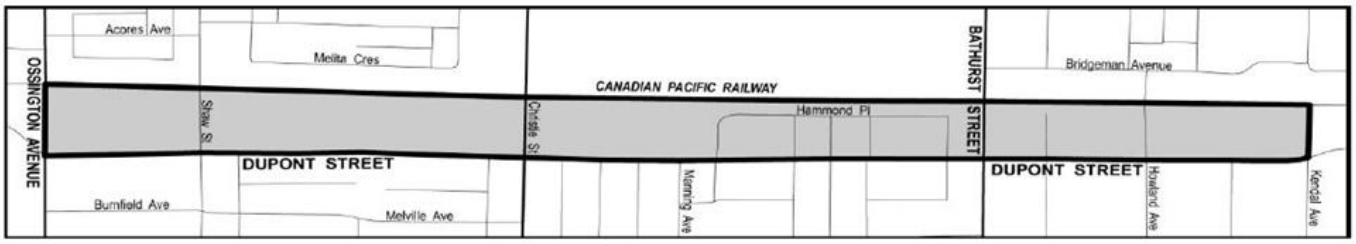



**Figure 1: Dupont Street Regeneration Area Study Limits**

# 2. Background

## 2.1 Municipal Comprehensive Review of the Toronto Official Plan

The Official Plan is a municipality's statutory document that sets out policies to manage physical change and the effects on the social, economic and natural environment in a city. A municipality in Ontario is required to review its Official Plan within five years of it coming into force. This statutory review includes an assessment of employment policies and designations. In 2011, the City of Toronto commenced with its first comprehensive review of its Official Plan resulting in amendments to the Plan, including Official Plan Amendment No.231 (OPA 231) which set out new policies and designations for the City's employment lands. Under Provincial legislation this comprehensive Official Plan review is the only time and process for the conversion of employment lands to non-employment, usually residential, uses.

Among the 146 requests received by the City to convert and re-designate employment lands for non-employment uses, there were 10 requests along the north side of Dupont Street to convert employment lands and change the Official Plan designation to permit residential uses. Eight of these requests were within the study area between Kendal and Ossington Avenues, occupying a majority of the lands within the study area. The specific conversion requests, including two applications, are as follows, and as shown in Appendix A:

1. 328-374 Dupont Street (Annex Centre) (application)
2. 840-860 Dupont Street (Sobeys & gas station) (application)
3. 404-408 Dupont Street and 275, 281, 283 Howland Avenue
4. 420 Dupont and 275 Albany Avenue (Mono Lino/Wing's)
5. 650 Dupont Street (Loblaws)
6. 672 Dupont Street (Faema)
7. 740 Dupont Street (Grand Touring Automobiles)
8. 915 Palmerston Avenue

In November 2012, Toronto City Council requested that the City Planning Division study the north side of Dupont Street from Davenport Road to Dovercourt Road as a potential Regeneration Area where a study could set out a redevelopment framework that could include sensitive uses such as residential units.

In December 2013, Council adopted OPA 231 (Ref 1) that left the lands as Employment Areas except for the area on the north side of Dupont Avenue between Kendal and Ossington Avenues. In this segment of Dupont Street the lots were sufficiently deep to retain an employment designation on the lands within 30 m of the rail corridor and re-designate the southerly portion of these lands as Regeneration Area.

An Area Specific Policy 212 was added to the Official Plan to guide the Regeneration Area Study to establish the framework for redevelopment, including the identification of necessary buffering

from the rail corridor. As part of the development exercise, this Rail Risk Assessment and Management Study was commissioned by the City.

The City has held community consultation meetings in February and April 2014 for the Dupont Street Regeneration Area Study. Information from these meetings was reviewed by the study team to gain an understanding of the community's opinions and concerns (Ref 2).

- Dupont Corridor Framework Study, completed in December 2012 by the "Ryerson Vision for the Dupont Corridor Working Group" (Ref 3).
- Bloor-Dupont Street Environmental Assessment Study is planned to start in 2014 with public consultation starting in 2015 (Ref 4).

## 2.2 Land Use, Official Plan and Zoning by Law Provision

During the early 20th Century the north side of Dupont Street in the study area was occupied by industries seeking to take advantage of the transportation and shipping opportunities afforded by the CPR North Toronto Subdivision, while the south side primarily evolved as a low-scale residential area. Today, the Wings food factory is the sole remaining manufacturer on the north side of Dupont Street, and it is scheduled to relocate operations to its Etobicoke plant. Retail, service and office employment uses are now predominant, while there are pockets of low-scale homes both fronting the north side of Dupont Street and on side streets, such as Palmerston Avenue, between Dupont Street and the tracks.

The existing in-force Official Plan designates all of the lands from Dupont Street north to the CPR rail line within the study area as an Employment Area, while the rail corridor itself is designated as a Utility Corridor. Within the in-force Employment Area designation economic activities such as offices, manufacturers, warehousing, utilities, media facilities, and small scale restaurants, services and stores that serve area businesses are permitted. Places of worship, recreation and entertainment facilities, business and trade schools, and branches of universities and colleges are also permitted. On the north side of Dupont Street, west of Bathurst Street, outside of the Official Plan boundaries of the downtown, 'big box' stores and 'power centres' are also provided by way of zoning by-law amendment where a number of criteria are met. On the north side of Dupont Street between Bathurst and Christie Streets residential development is permitted provided it is set back 30 m from the rail corridor and has a maximum density of three times the lot area.

OPA 231, adopted by Council and awaiting Provincial approval, would re-designate the lands between Kendal Avenue and Ossington Avenue that are more than 30 m south of the rail corridor as Regeneration Areas. The general policies for Regeneration Areas would provide for a mix of commercial, residential, light industrial, parks and open space, institutional and utility uses.

However, the precise framework for redevelopment in each Regeneration Area flows from a study that result in a Secondary Plan or Area Specific Policy. OPA 231 sets out the outline for such a study in the proposed Regeneration Area on the north side of Dupont Street.

The area of lands north of Dupont Street between Kendal and Ossington Avenues, but within 30 m of the CPR North Toronto corridor, are designated as a General Employment Area under OPA 231 to permit a wide array of employment uses as well as parking for residential uses to the south.

The in-force zoning for the entire study area, under Zoning By-law 438-86, is IC which permits retail, office , service and light industrial uses. The new harmonized citywide Zoning By-law 569-2013 does not apply to these lands.

# 3. Overview of Regulations, Roles and Responsibilities

The following sections summarize the roles of Transport Canada, the Transportation Safety Board of Canada (TSB), Railway Companies, and Municipalities in the context of railway regulations, operations, and safety.

It is important to note that railways in Canada fall into two categories when considering regulations. A railway can either be a federally regulated railway such as Canadian National Railway (CN) and Canadian Pacific Railways (CPR), or a provincially regulated railway such as Ontario Northland. Typically, federally regulated railways operate in two or more provinces, territories or combinations thereof.

Another key definition is the term "Class I railway". In Canada and the United States, railway class is defined based on operating revenue. Class I railways are the largest rail operators. Smaller railroads are classified as Class II and Class III, also called short-line or regional railways. The exact operating revenue thresholds for each class have varied through the years, and thresholds continue to be adjusted for inflation. In Canada, the two main Class I railways are Canadian National Railway (CN) and Canadian Pacific Railways (CPR).

## 3.1 Transport Canada

Transport Canada is the federal regulator implementing regulations, guidelines and safety management programs for all modes of transportation. Federally regulated railways primarily operate under the Canada Transportation Act (1996), which requires railways to obtain an approval for operations, and for certain new railway construction projects (Ref 5). For existing railway operations, the Canada Transportation Act requires that railway companies are only allowed to make a "reasonable amount" of noise and vibration. Complaints against the railway may be investigated by the Canadian Transportation Agency, who is responsible to resolve disputes relating to noise and vibration caused by railways companies.

In addition, all federally regulated railways are required to follow the Railway Safety Act (Ref 6). In 2006, an independent panel was appointed by the Minister of Transport, Infrastructure and Communities to conduct a review of the Railway Safety Act. This was due to the large increase in rail accidents and derailments between 2002 and 2005 (Ref 7).

A wide range of stakeholders were contacted, as well as 15 public consultation meetings, and numerous independent studies. The purpose was to review and evaluate the overall effectiveness of the Railway Safety Act with respect to various emerging concerns.

The review panel summarized their findings in a report named "Stronger Ties: A Shared Commitment to Railway Safety" (Ref 7), which includes the following general recommendations.

- Baseline safety requirements must be set prior to starting operations and indicated through a Rail Operating Certificate.
- Regulators require more power and tools for enforcement.
- A more in depth process needs to be established for rulemaking as well as consulting with interested parties.
- The Railway Safety Inspectors job specification needs to be updated in the Railway Safety Act, due to the change brought by the implementation of the safety management systems.

Of most relevance to this study, the review panel provided Recommendation 34: The Railway Safety Act should be amended to require the developer and municipalities to engage in a process of consultation with railway companies prior to any decision respecting land use that may affect railway safety" (Ref 8). The report also noted that proximity issues need to be resolved with coordination from various levels of government, affected residents, and railway companies. Railway companies have generally very limited or no control over land uses outside of their right-of-way.

The Government of Canada amended the Railway Safety Act on May 1, 2013 including the following (Ref 9):

- Each railway requires an executive legally responsible for safety with an emphasis on the importance of safety management systems.
- Whistleblower protection for those who raise safety concerns.
- Increased judicial and monetary penalties on rule breakers.

The review of the Railway Safety Act, as well as the Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) proximity initiative, is having an impact across Canada. As discussed later in Section 6, other municipalities across the country are adopting zoning by-laws to address development in proximity to rail corridors.

### 3.1.1 CANUTEC and Emergency Response Assistance

In Canada, the movement of dangerous goods is legislated and regulated by the Transportation of Dangerous Goods Act (1992) (Ref 10) and the Transportation of Dangerous Goods Regulations (Ref 11). Dangerous goods are divided into nine classes, as shown in Figure 2.

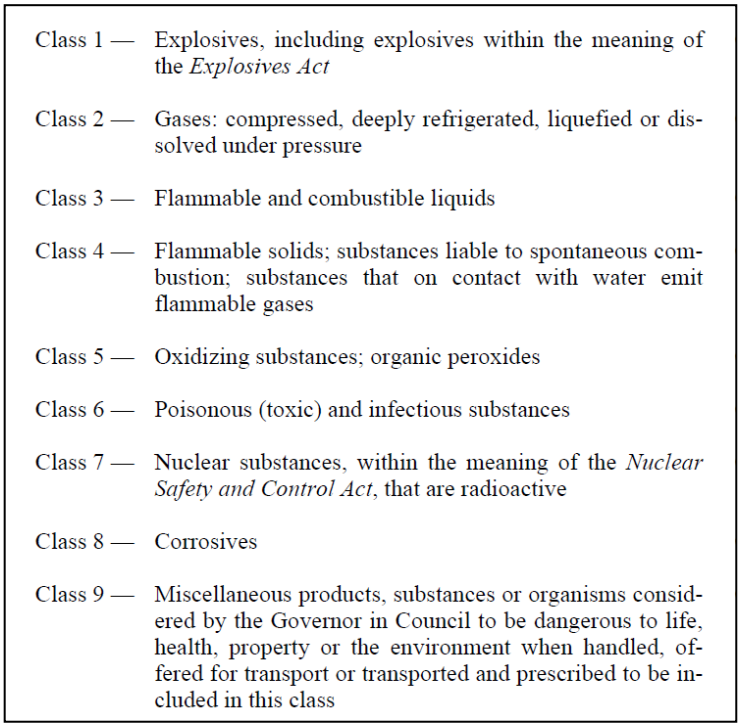
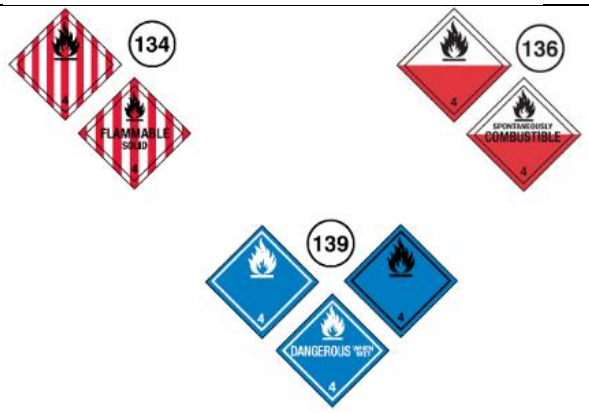



**Figure 2: Nine Classifications of Dangerous Goods (Ref 10)**

Emergency Response Assistance Plans (ERAP) are required under the Transportation of Dangerous Goods Regulations. They are plans that describe the special procedure needing to be done, in the event a transportation accident occurs with specific dangerous goods. CANUTEC (Canadian Transport Emergency Centre) is a national advisory service operated by Transport Canada, providing 24/7 emergency assistance in handling dangerous goods. In collaboration with other countries, Transport Canada developed Emergency Response Guidebook (2012) to help emergency responders to identify and respond appropriately at the scene of a transportation incident involving dangerous goods (Ref 12). CANUTEC classifies the full range of regulated dangerous goods, a sample of classifications with examples is shown in Table 1. Additional excerpts of the Emergency Response Guidebook are provided in Appendix B.

**Table 1: Sample of CANUTEC Hazard Classification and Placards**

| Class | Examples | Placards |
|---|---|---|
| 3 - Flammable liquids | Gasoline, ethanol, fuel oil (diesel) |   |
| 4 - Flammable solids; Spontaneously combustible materials; and dangerous when wet materials/water-reactive substances | (4.1) naphthalene, (4.2) sodium hydrosulphite, (4.3) sodium |   |

### 3.1.2 Protective Direction No. 32

On November 20, 2013, Transport Canada issued Protective Direction No. 32 (Ref 13) under the Transportation of Dangerous Goods Act (1992). The relevant points are listed below:

- Canadian Class I railway companies that transport dangerous goods are required to provide yearly aggregate information on the type and volume of dangerous goods to designated municipal Emergency Planning Officials by quarter.
- However, the information does not have to be provided, if the Emergency Planning Official:
  - Is not listed on the Emergency Planning Officials list maintained by Transport Canada.
  - Of a municipality requests in writing that it no longer requires this information.
  - Has not undertaken to keep the information confidential.
- Any Class I railway companies that transport dangerous goods must provide Transport Canada through CANUTEC, contact information of the person communicating with the municipalities' Emergency Planning Official.

This direction has been adopted by the railway companies. The direction was developed in partnership between the Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC), and the Canadian Association of Fire Chiefs.

### 3.1.3 Protective Direction No. 33

On April 23, 2014, Transport Canada issued Protective Direction No. 33 (Ref 14). Emergency Response Assistance Plans (ERAPs) are already required for the transportation of dangerous goods under the Transportation of Dangerous Goods Regulations. Protective Direction No. 33 requires an ERAP for certain Class 3 flammable liquids, including ethanol, diesel fuel, gasoline, petroleum crude oil, petroleum distillates and other liquids.

An ERAP is also required for any containers carrying dangerous goods filled to 10% or more of its capacity the ERAP must be submitted and approved by the Transport of Dangerous Goods Directorate. This direction takes into effect 150 days from the date of signing

### 3.1.4 Protective Direction No. 34

Protective Direction No. 34 was also issued on April 23, 2014 (Ref 15). This direction requires every tank car owner to identify each tank car that meets certain conditions, such as: DOT 111 cars of a stub sill design, shell is made of non-normalized steel plates, bottom of shell does not have exterior heater coils, and bottom of the shell is not continuously reinforced.

These identified tank cars must be marked with the words "Do not load with dangerous goods in Canada/Ne pas charger de marchandises dangereuses au Canada". Any such tank car currently transporting dangerous goods must arrive at their final destination and be unloaded within 30 days of this direction. The tank owner must also provide the reporting mark of each tank car within 30 days to the Director of Compliance and Response at Transport Canada.

### 3.1.5 Emergency Directive

The Minister of Transport issued an Emergency Directive on April 23, 2014 (Ref 16). The following terms are defined:

- "Key Train" means a train that includes:
  - One or more loaded tank cars containing dangerous goods that are classified toxic or dangerous; or
  - Twenty or more loaded tank cars or loaded intermodal portable tanks containing dangerous goods.
- "Key Route" means any track on which, over a period of one year, is carried 10,000 or more loaded tank cars or loaded intermodal portable tanks containing dangerous goods.

Using the above definitions, all companies are required to meet the following operating practices, related to speed, passing, vehicle condition and track maintenance:

- Not operate a Key Train at a speed exceeding 50 mph.
- At meeting or passing points, Key Train's must hold the main track unless the siding track meets Transport Canada Class 2 requirements. If it does not, it can use the siding at an operating speed not exceeding 15 mph, if holding the main track is operationally infeasible.
- Not operate a Key Train with any cars not equipped with roller bearings.

- Inspections and speed limitations for Key Trains that have been detected to have a defective bearing by a Wayside Defective Bearing Detector. If the inspection confirms a defect the train is limited to 15 mph until the bearing can be set off. If the defect is not confirmed, the speed is limited to 30 mph until the next Wayside Defective Bearing Detector.
- Key Route main tracks must be inspected by a heavy track geometry vehicle and rail flaw detector. If a heavy track vehicle detector is not available, a light track geometry vehicle must be used at least twice with no more than 100 days between inspections.
- Trains are limited to 4 mph when coupling loaded cars of dangerous goods.
- A risk assessment must be completed to determine the level of risk associated with each Key Route within six months of this emergency directive.

### *3.1.6 Ministerial Order Pursuant to Section 19 of the Railway Safety Act*

On April 23, 2014, the Minister of Transport ordered all railway companies to formulate rules regarding safety and operations of carrying certain dangerous goods and flammable liquids (Ref 17). Rules should be based on an assessment of safety and security risks, including the potential speed reduction of Key Trains to 40 mph, and completion of specific risk assessments and periodic updates for Key Routes. Key Train and Key Route are defined above in Section 3.1.5.

## 3.2 Transportation Safety Board

The Transportation Safety Board of Canada (TSB) is an independent agency founded and governed by the Canadian Transportation Accident Investigation and Safety Board Act (Ref 18). It was established in 1990 and consists of up to five board members. The TSB is responsible for collecting accident data and conducting independent investigations involving transportation accidents for rail, marine, pipeline, and air modes of transportation. The TSB publishes the entirety of its investigative results to the public. The TSB can neither enact laws or regulations, nor set fines or punishments. The role of its members is solely that of investigators who can make recommendations to the regulatory bodies having jurisdiction, typically, Transport Canada.

TSB investigations include (Ref 19):

- All factors and causes associated with an accident.
- Any safety deficiencies.
- Recommendations related to mitigating safety deficiencies.

TSB investigations are classified into five levels, based on the type of occurrence. There are numerous factors associated with classifying an incident such as: Degree of concern (general public, general public, services, or citizens abroad), TSB obligation/commitments (international agreements, other provinces etc.), and TSB experience.

The classifications for occurrences are (Ref 20):

- Class 1: Public inquiry for transportation occurrences including accidents/incidents, situations/conditions that could cause accidents.

- Class 2: Individual occurrence investigation with a high probability of advancing Canadian transportation safety.
- Class 3: Individual occurrence investigation which does not meet Class 2 criteria. Potential for better understanding underlying causes of safety issues. Public expectation for TSB to make an independent investigation.
- Class 4: Safety issue investigation.
- Class 5: Data collection.

### 3.2.1 Recent TSB Recommendations

As a result of the on-going investigation of Lac Mégantic, the TSB issued two safety advisories on the securement of trains (RSA 08/13 and 09/13). More relevant to this study, the TSB issued the following three safety recommendations on January 23, 2014 (Ref 21).

1. Enhanced protection standards for all Class 111 tank cars used to transport flammable liquids to reduce the risk of product loss when these cars are involved in incidents.
2. Route planning and analysis, periodic risk assessments, and operational criteria for trains carrying dangerous goods.
3. Requirements for emergency response assistance plans for the transportation of high volumes of liquid hydrocarbons.

The Class 111 (also known as DOT-111, CTC 111 or AAR 111) tank cars are of concern due to their vulnerability to head and shell damage; they are not jacketed; do not have top fitting protection, head shields, or thermal protection. This is not the first time the vulnerability of these cars has come into question. The Association of American Railways (AAR) proposed upgraded standards in 2011.These cars are mainly used to carry Class 3 (flammable liquids) and Class 8 (corrosives) products. The derailment at Lac Mégantic consisted of 63 derailed Class 111 cars, of which 60 released products due to tank car damage (Ref 21).

Transport Canada's response to these recommendations, current to April 23, 2014 is provided in Section 3.1.

## 3.3 Rail Companies

Federally regulated railways such as CPR, CN, and VIA are governed under the Canada Transportation Act (CTA) and adhere to the Railway Safety Act. Since these railways are federally regulated railways, provincial and municipal legislation has no authority over them.

Each rail company has a responsibility towards public safety, to ensure a safety management system (SMS) is implemented and functioning with regards to Transport Canada's Railway Safety Management System Regulations, (Section 37 - Subsection 47.1 (1) of the RSA) (Ref 22).

The Safety Management System should identify safety issues and concerns associated with railways operations. These issues should be evaluated and mitigated effectively.

Railway companies also have a responsibility to:

- Ensure their noise and vibrations are at a reasonable level in consideration of the surrounding public.
- Ensure their infrastructure is routinely maintained to serviceable standards, decreasing the likelihood of accidents and derailments.
- Emergency Response Assistance Plans (ERAP) are integrated in the SMS in the event of an accident, mitigating the affects to the surrounding public.

Both CN and CPR, as well as VIA Rail Canada, and several Canadian short line railways have developed guidelines for new development adjacent to their railway corridors (Ref 23, page 11). Railways also establish formal company environmental management policies, and are involved in voluntary initiatives such as Operation Lifesaver (Ref 24) (to reduce trespassing incidents), and TransCAER and Responsible Care ® programs (to improve emergency response to rail accidents) (Ref 23, page 11).

## 3.4 Municipalities

Each municipality has a role to ensure suitable land use and planning in their respective jurisdictions. Municipalities must enforce the policies, regulations, and by-laws to accommodate appropriate land use and development. In Toronto this includes Ontario's Provincial Policy Statement, Growth Plan, and Toronto's Official Plan.

The Ontario Planning Act requires railways to be notified of land use changes within 300 m of a railway line (Ref 25). Railways can provide input and raise concerns at the Ontario Municipal Board, if their recommendations are ignored.

Municipalities are also responsible for incorporating existing transportation rights-of-way into the planning process, including highway and rail corridors owned by other agencies, such as the MTO, Metrolinx, CNR or CPR.

It is important to note that railways are not directly subject to municipal zoning controls, and are federally or provincially regulated. In most Ontario municipalities, the application of zoning by-laws to rail lands has historically not been an important or well-addressed issue. In some municipalities, railway lines are not recognized by zoning by-laws, in others only rail uses are permitted (Ref 26).

# 4. Rail Transportation and Safety Trends

The following sections provide data and trends related to rail transportation and safety in Canada. This information is collected and reported primarily by Statistics Canada, Transport Canada and the Transportation Safety Board of Canada.

## 4.1 Rail Transportation Trends

The following sections present information on the amount and type of goods transported by rail in Canada and in Ontario, and some characteristics of train consists.

### *4.1.1 Across Canada*

Across Canada, a wide range of commodities are transported by rail. According to the Railway Association of Canada, "Canada relies on rail to move close to 70% of all non-local surface goods[1] valued at more than $250 billion per year" (Ref 27, page 2).

Rail traffic can be measured in different ways. The most common measure is revenue tonne-kilometres, combining the distance and weight of loaded railcars; this excludes the movement of empty railcars. As shown in Figure 3, economic conditions such as the downturn in 2008-2009 are clearly reflected in the amount of rail traffic in Canada. While there is generally an increasing trend in rail traffic, it is not a steady increase year after year. Detailed tables on rail transportation are provided in Appendix C.

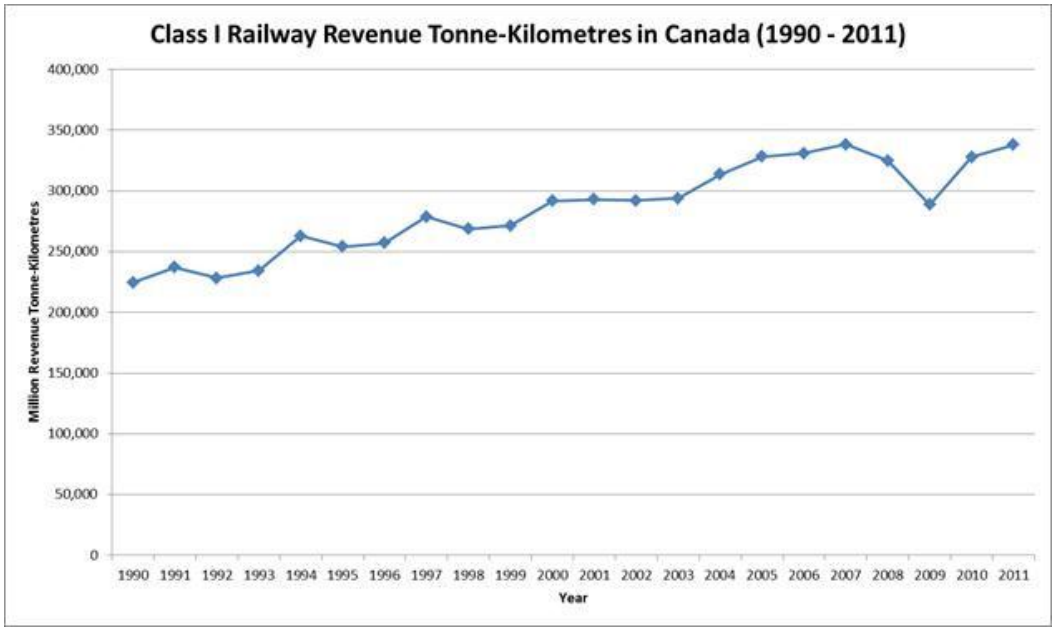



**Figure 3: Increasing Amount of Rail Traffic in Canada (1990 to 2011) (Ref 28 and 29)**

[1] "Non-local" excludes trucking activity on roads with speed limits of less than 80 km/hr. (Ref 23)

Since their inception, railways have transported a variety of goods, and the type and amount of commodities transported by rail is continually changing in Canada. The amount of each commodity shipped varies widely by market conditions. Figure 4 shows the wide range of commodities shipped by rail in Canada, and the changing nature of the amount of each commodity shipped over a 20-year period. Figure 4 includes the increase in petroleum products transported by rail from 1992 to 2012.

Railways in Canada are permitted by law to transport regulated dangerous goods. According to the Railway Association of Canada, "Year-over year, originated[2] dangerous goods carloads edged up by 0.8% to a record 428,660 carloads in 2012" (Ref 27, page 7). In comparison, total originated freight carloads in Canada increased by 1.7 % to 4.1 million carloads in 2012 (Ref 27, page 12).

In other words, in 2012, dangerous goods comprised approximately 10.5% of the total rail carloads originated in Canada.

Based on commodity information for 2012, refined petroleum products made up 7% of all commodities transported by rail in Canada (Figure 5). Data for 2013 was not available from Transport Canada at the time of writing this report.

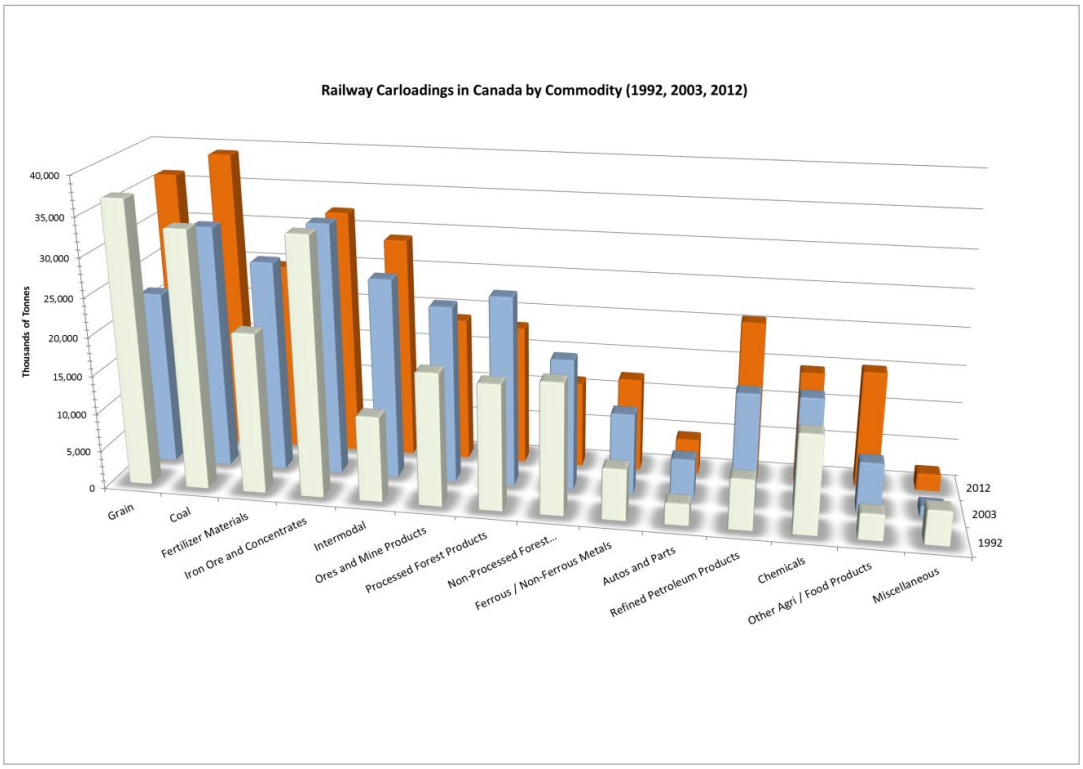



**Figure 4: Railway Carloadings in Canada by Commodity (1992, 2003, 2012) (Ref 28) and (Ref 29)**

[2] "Originated in Canada" means the carloads started their journey somewhere in Canada

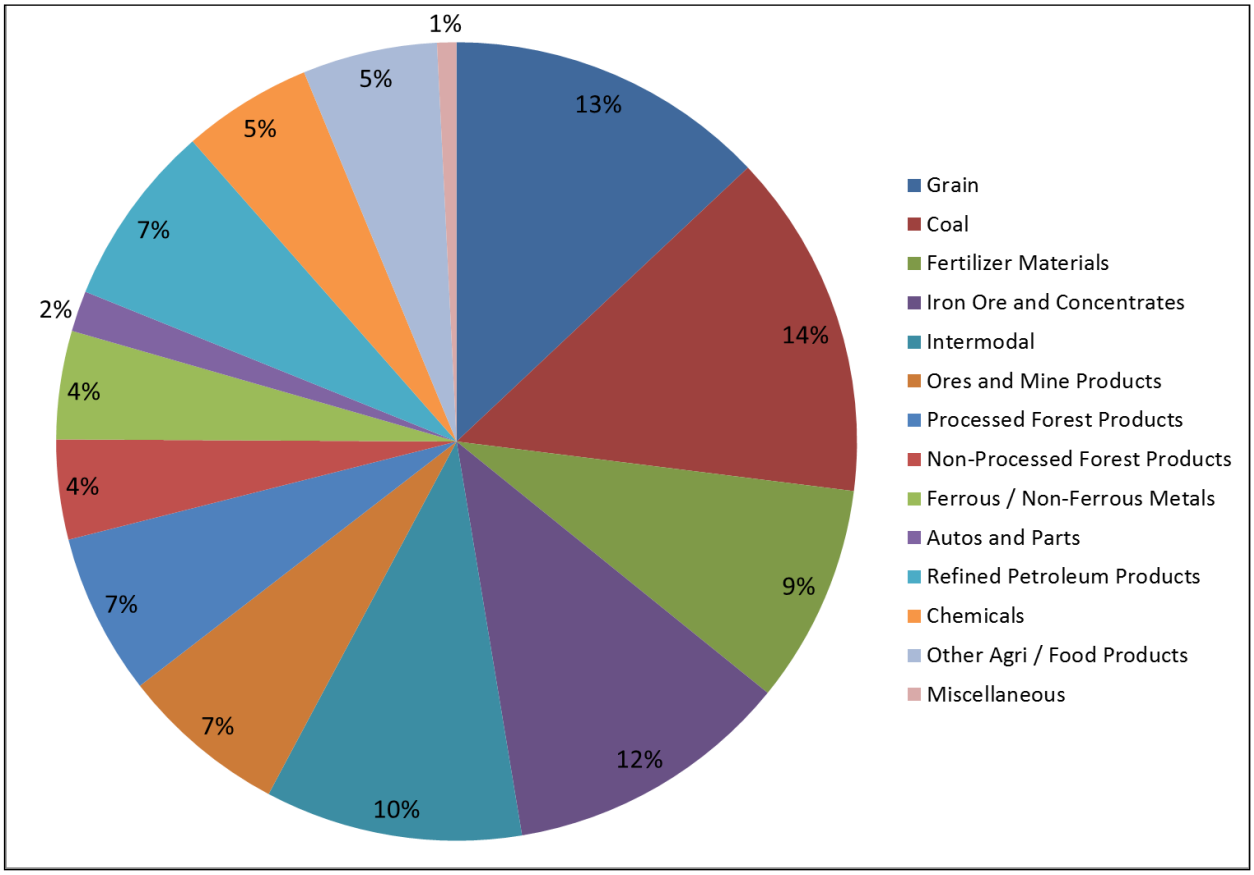



**Figure 5: Railway Carloadings in Canada (2012) by Commodity (Tonnes) (Ref 28)**

Specifically for CPR, based on their report of the 2014 first quarter operations across North America, compared to the first quarter of 2013 (Ref 30), the number of carloads of industrial and consumer products[3] is up slightly over last year, while the revenue-ton-miles has decreased (Table 2).

[3] Industrial and consumer products include chemicals, plastics, aggregates, steel, minerals, ethanol and other energy-related products, other than coal, shipped throughout North America.

**Table 2: Commodities Transported by CP Rail across North America (2014 Q1) (Ref 30)**

| | Millions of Revenue Ton-Miles (RTM) | | | Carloads (Thousands) | | |
|---|---|---|---|---|---|---|
| | First Quarter | | | First Quarter | | |
| **Commodity** | **2014** | **2013** | **Change** | **2014** | **2013** | **Change** |
| Grain | 8,385 | 8,430 | -45 | 101 | 108 | -7 |
| Coal | 5,441 | 5,640 | -199 | 78 | 81 | -3 |
| Fertilizers and sulphur | 4,367 | 4,952 | -585 | 43 | 49 | -6 |
| Industrial and consumer products | 9,277 | 9,536 | -259 | 125 | 127 | -2 |
| Automotive | 514 | 604 | -90 | 30 | 35 | -5 |
| Forest products | 920 | 1,223 | -303 | 14 | 18 | -4 |
| Intermodal | 5,471 | 5,778 | -307 | 227 | 241 | -14 |
| **TOTAL** | **34,375** | **36,163** | **-1,788** | **618** | **659** | **-41** |

In general, the length of train trips (length of haul) is increasing for transcontinental railway companies, as shown in Table 3. There is also a general trend in the rail industry to create longer train consists, with the average number of rail cars per freight train increasing from 74 in 2003 to 90 in 2012 (Ref 27).

**Table 3: Average Length of Haul/Cars per Train (Adapted From Ref 27)**

| Year | Average Length of Haul (km) by Transcontinental Railways (CN and CP) | Average Length Of Haul (km) by Regional/Short Line Railways | Average Cars Per Freight Train |
|---|---|---|---|
| 2003 | 1,278 | 243 | 74 |
| 2004 | 1,267 | 259 | 78 |
| 2005 | 1,270 | 240 | 79 |
| 2006 | 1,292 | 256 | 79 |
| 2007 | 1,299 | 243 | 81 |
| 2008 | 1,316 | 235 | 82 |
| 2009 | 1,336 | 256 | 87 |
| 2010 | 1,368 | 163 | 92 |
| 2011 | 1,366 | 274 | 81 |
| 2012 | 1,396 | 159 | 90 |

### *4.1.2 Across Ontario*

Statistics on the amount or type of rail transportation across Ontario or across Toronto was not found from the sources examined. However, Transport Canada provides information on the volume of major rail commodities imported and exported for the provinces of Ontario, Alberta, Quebec, and Saskatchewan. Detailed tables are included in Appendix C, and summarized in Table 4. These tables demonstrate the variable nature of rail transportation over time.
Table 4 shows the wide range of goods exported by Ontario by rail, and shows that the volume of

commodities exported by rail from Ontario has remained steady over the last three years. Table 5 shows the commodities imported by rail to Ontario (as province of clearance, not necessarily province of destination). The volume of goods imported to Ontario has increased over the last three years though the total tonnes imported has not returned to the level seen in 2008. Data from 2013 was not available at the time of writing this report.

**Table 4: Volume of Major Rail Commodities Exported by Province of Origin, 2008 to 2012 (Ref 28)**

| Province | Commodity | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| | | (Thousands of Tonnes) | | | | |
| Ontario | Forest Products | 2,753 | 1,491 | 1,573 | 1,959 | 1,853 |
| Ontario | Automotive Products | 2,005 | 1,327 | 1,982 | 2,124 | 2,474 |
| Ontario | Chemical Products | 2,583 | 1,567 | 1,953 | 1,914 | 2,153 |
| Ontario | Other Mine Products | 1,110 | 881 | 952 | 1,013 | 1,019 |
| Ontario | Other | 4,832 | 3,102 | 4,553 | 4,209 | 3,712 |
| **Ontario** | **Total** | **13,283** | **8,367** | **11,014** | **11,219** | **11,212** |
| **Alberta** | **Total** | **12,838** | **11,221** | **12,875** | **13,600** | **14,263** |
| **Saskatchewan** | **Total** | **14,601** | **8,756** | **13,488** | **15,256** | **16,206** |
| **Grand** | **Total** | **40,722** | **28,344** | **37,377** | **40,076** | **41,680** |

**Table 5: Volume of Major Rail Commodities Imported by Province of Clearance, 2008 to 2012 (Ref 28)**

| Province | Commodity | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| | | (Thousands of Tonnes) | | | | |
| Ontario | Chemicals | 2,405 | 1,869 | 2,161 | 2,184 | 2,171 |
| Ontario | Agriculture and Food | 1,130 | 779 | 830 | 765 | 762 |
| Ontario | Automotive Products | 656 | 451 | 581 | 582 | 523 |
| Ontario | Other Mine Products | 585 | 574 | 756 | 749 | 838 |
| Ontario | Other | 2,518 | 1,863 | 2,429 | 2,535 | 2,741 |
| **Ontario** | **Total** | **7,294** | **5,536** | **6,757** | **6,815** | **7,034** |
| **Alberta** | **Total** | **6,826** | **5,675** | **6,608** | **6,681** | **8,054** |
| **Quebec** | **Total** | **6,333** | **5,647** | **5,742** | **5,702** | **5,513** |
| **Grand** | **Total** | **20,453** | **16,857** | **19,107** | **19,197** | **20,601** |

## 4.2 Rail Safety Trends

The following sections present information on the number and type of rail accidents in Canada and in Ontario, including derailments and involving dangerous goods.

It is important to note that the TSB defines a reportable railway accident as (Ref 31):

1. Someone sustaining a serious injury or death due to:
    i. Being on board or getting off the rolling stock.
    ii. Coming into contact with any part of the rolling stock or its contents.
2. The rolling stock is:
    i. Involved in an at-grade collision.
    ii. Involved in a collision or derailment and is carrying passengers, or dangerous goods, or is known to have residue of dangerous goods (but has not been purged).
    iii. Sustains damage that affects its safe operations.
    iv. Causes or sustains a fire or explosion, or causes damage to the railway that poses a threat to the safety of any person, property or the environment.

### *4.2.1 Across Canada*

The Transportation Safety Board provided derailment data for all 4,159 mainline derailments in Canada from 1983 to 2013 (Ref 32). The annual number of mainline derailments, and the number of main-line derailments involving dangerous goods are shown in Figure 6. Overall, a downward trend is evident.

In the last 30 years in Canada, there were fourteen derailments that resulted in fatalities and/or serious injuries. Seven of these 14 derailments involved dangerous goods cars.

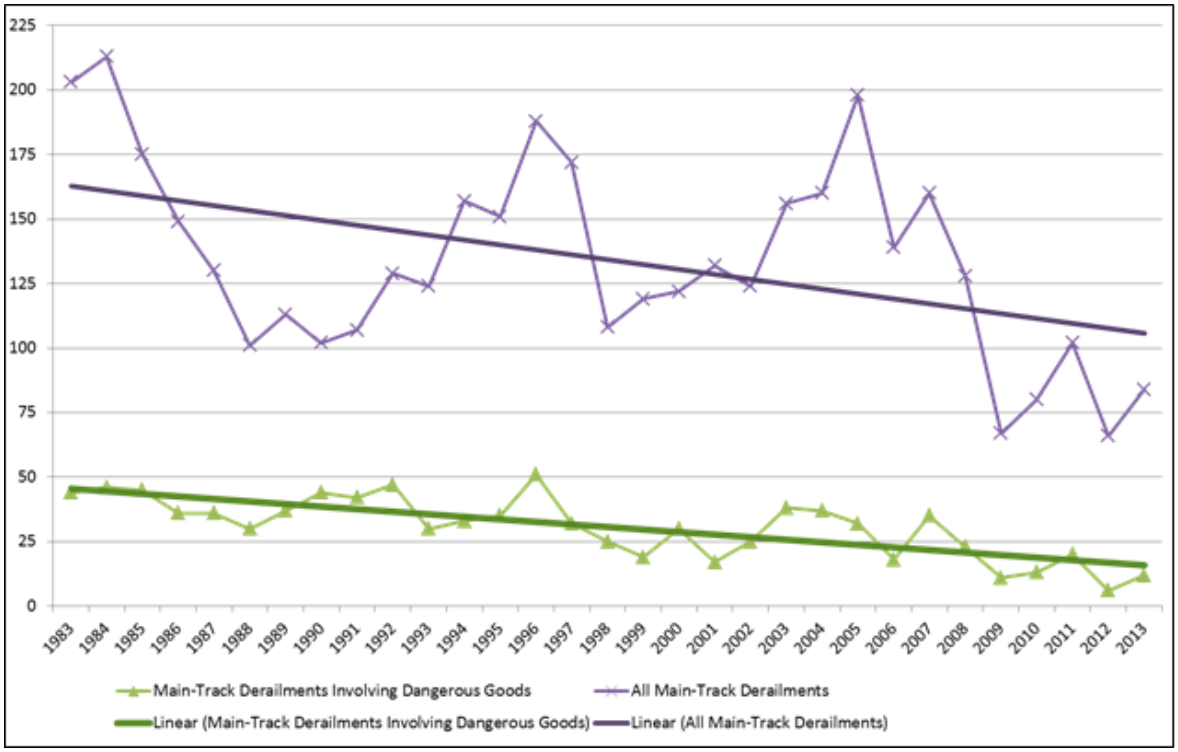



**Figure 6: Mainline Track Derailments in Canada (1983-2013) (Ref 32)**

The Railway Association of Canada notes that in 2012, "The number of accidents involving dangerous goods (125) edged down slightly from 2011, and dropped by 22.2% from the 2007-2011 average of 161[4] (Ref 27). Of the accidents in 2012, more than 90% occurred off the main track" (Ref 27, page 7). Figure 7 illustrates the increasing number of dangerous goods carloads in Canada, and the downward trend of accidents involving a release of dangerous goods.

[4] "On occasion, accidents involving dangerous goods can include road vehicles carrying or having recently carried dangerous goods. (Source: TSB)" (Ref 23)

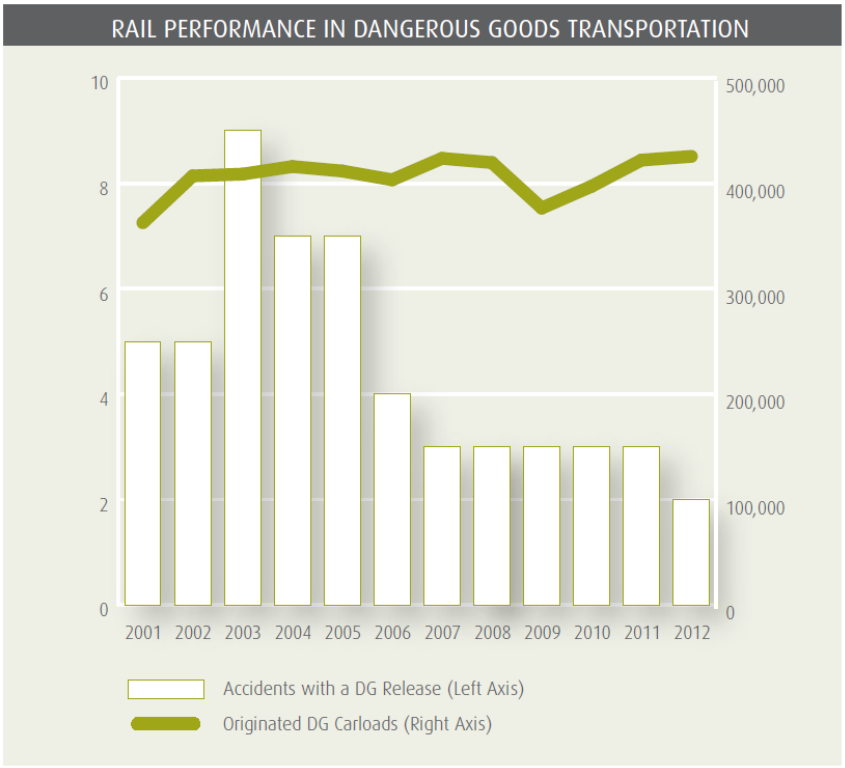



**Figure 7: Accident with a Dangerous Goods (DG) Release and Carloads in Canada (Reprinted from Ref 27)**

### *4.2.2 Across Ontario*

Examining the data provided by the TSB shows that there were 1,177 mainline derailments in Ontario over the last 30 years (Table 6), representing 28% of all mainline derailments in Canada over that period.

It is important to note that mainline derailments can occur at any point in the rail corridor. This is evident from the mapped derailment locations provided by the TSB, as shown in Figure 8 for southern Ontario.

**Table 6: Number of Mainline Track Derailments by Province (1983 to 2013) (Ref 32)**

| Province | Number of Mainline Track Derailments | Percent of Total |
|---|---|---|
| Alberta | 612 | 15% |
| British Columbia | 781 | 19% |
| Manitoba | 340 | 8% |
| New Brunswick | 103 | 2% |
| Newfoundland | 56 | 1% |
| Northwest Territories | 1 | 0% |
| Nova Scotia | 68 | 2% |
| **Ontario** | **1177** | **28%** |
| Prince Edward Island | 2 | 0% |
| Québec | 603 | 14% |
| Saskatchewan | 416 | 10% |
| **Grand Total** | **4159** | |

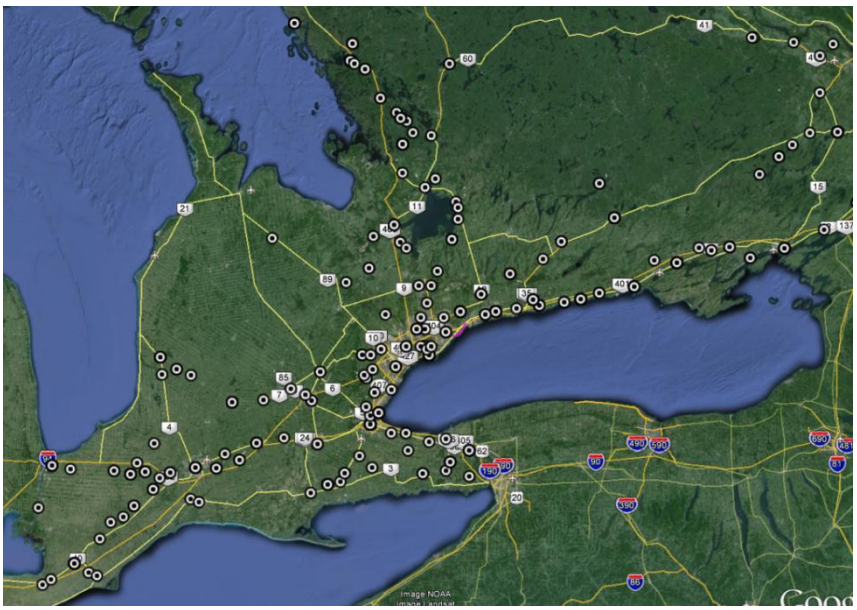


**Figure 8: Map of TSB Recorded Mainline Derailments in Southern Ontario (1983-2013) (Ref 32) (base map © Google)**

### *4.2.3 In Toronto*

Based on derailment data provided by the TSB (Ref 32), between 1983 and 2013:

- Eighteen derailments occurred in Toronto. None resulted in fatalities or serious injuries.
- One of the 18 derailments involved dangerous goods cars and occurred in a rail yard.

- Two of the 18 derailments occurred on the North Toronto Subdivision (1994, 2006), and did not involve dangerous goods cars.

Two other incidents not reported in the TSB derailment data occurred on the North Toronto Subdivision (1994, 1995). One incident was a main line derailment (Ref 33) and the other was due to a signalling conflict (Ref 34). More information on the North Toronto Subdivision is provided in Section 5.

# 5. North Toronto Subdivision

## 5.1 The Past

The Ontario & Quebec Railway Company (O & Q) constructed the principal mainline between Perth and Toronto, and construction was completed in 1884 (Ref 35). In January 1884, Canadian Pacific leased the Ontario & Quebec Railway for 999 years. This route was desirable for CPR as it provided direct access to its Lake Huron Port in Owen Sound, and gave CPR its own line between Toronto and Montreal via Ottawa. This location was 100 miles closer to Montreal, than the existing port at Algoma Mills. This also helped break the monopoly of the route owned by the Grand Trunk Railway owned between Montreal and Toronto (Ref 35).

From 1884 to 1892, all CPR passenger trains from any direction entered Toronto through the West Toronto Diamond (Ref 36).The West Toronto Diamond is located just west of the Dupont Street study area near Weston Road and Dundas Street West. Trains from Montreal and Ottawa travelled west along the North Toronto Subdivision, crossed the junction and then backed down to Union Station. When the line down the Don Valley opened in 1892, the North Toronto Subdivision did not have much use by passenger trains until 1912 when CPR introduced the "North Toronto Limited", an overnight passenger train from Montreal that entered Toronto by way of Leaside, North Toronto and West Toronto, completely bypassing Union Station and downtown Toronto (Ref 36). The early 1920s were the peak of passenger train service across North America, when up to 40 trains per day stopped at CPR's West Toronto station.

The village of West Toronto Junction was formed in 1887 and became a town in 1889. In 1890, the CPR built a 48-acre freight classification yard, roundhouse and shops west of Keele St. between West Toronto St. and Dundas St. West (Ref 36). CPR was the principal employer in West Toronto, employing more than two thousand men during the 1920s (Ref 36). The expanded rail facilities attracted industry, including the Heintzman Piano Factory, Wagner & Zeidler Showcases, Canada Wire Mattress Company, and the Union Stock Yards (Ref 36). By the 1950s the stockyards facility had expanded with a total of 26 tracks on the property.

As diesel-electric locomotives became more common during the 1950s, the CPR West Toronto station continued to be a busy place with as many as 25 daily passenger trains stopping there in 1955 (Ref 36). In the late 1950s, the freight business had changed substantially. With express parcel shipments being taken by trucks and planes, the numerous freight houses were no longer needed. CPR began to concentrate on what is now their core business: bulk freight such as grain, coal and timber, and intermodal transportation, where freight can be transferred between trucks and trains without unpacking the shipping container (Ref 36).

In the 1960s and 1970s, passenger service began to decline, due to a variety of factors, including the cancellation of mail contracts that had made lightly-used passenger trains a viable operation (Ref 36). The last CPR passenger service through West Toronto was in 1978. In 1981, GO Transit began commuter train service to Milton along the CPR Galt Subdivision, west of the West Toronto Diamond.

In the 1980s, railways stopped carrying livestock by rail, and the stock yards were closed in 1985. Previous studies of the North Toronto Subdivision provide some insight into the type of commodities transported during this period (Ref 37). For example, commodities shipped in 1985 were primarily non-dangerous (97% of the 343,000 carloads over a six-month period).

In the 1990s, the Lambton/West Toronto yard became an increasingly busy freight intermodal centre, and CPR undertook several modifications to the facilities (Ref 36). In 2000, a new intermodal yard was opened in Milton, transferring much of the activity away from Lambton/West Toronto. However, the yard continues to be well-used, and the ongoing construction of the rail-to-rail and rail-to-road grade separation at the West Toronto Diamond will run the GO Georgetown commuter line and UP airport trains underneath the CP freight lines, at the western limit of the North Toronto Subdivision.

## 5.2 The Present

### *5.2.1 Operations*

Currently, the North Toronto Subdivision is a CPR freight-only line through the City of Toronto. It is a 5.9 mile segment from the Leaside Yard in the east, near Millwood Road and Laird Drive, to the West Toronto Diamond, near Dupont Street and Dundas Avenue West. As described in the previous section, this corridor continues to be part of a major link between the Port of Montreal, Central Canada, Western Canada, and the U.S. This corridor is likely to remain a major element for CPRs growth strategy for rail traffic through the Port of Montreal.

Only CPR uses the North Toronto Subdivision. There are no GO or VIA trains on this line. Current CPR freight operations within the corridor, based on 2013 averages provided by CPR, includes approximately 35 to 40 trains per day. CPR indicated an average train has about 125 railcars plus two to four engines. Using an average railcar length of 55 ft. plus about 70 ft. for each of about three locomotives, means an average train length of about 7000 ft. (Ref 38). In HMM's opinion, the corridor is not operating at capacity.

Based on HMM observations from a site visit conducted in April 2014, the rolling stock on the corridor consists of a mix of freight, including intermodal containers and trailers, tank cars, bi-level and tri-level cars, and grains cars. Commodities are likely to include grain, chemicals (including various dangerous goods), agricultural and food products, automotive products, mine products and forest products.

Freight traffic is limited to 50 mph and 45 mph for expedited and non-expedited freight in the study area (Table 7). Any freight trains carrying dangerous goods or special dangerous goods (SDG) are limited to 35 mph and 25 mph along the entire length of the subdivision (Ref 39).

**Table 7: North Toronto Subdivision Permissible Speeds (Ref 39)**

| North Toronto Subdivision Mile | Speed Type | Permissible Speed (miles per hour) | | | |
|---|---|---|---|---|---|
| | | Expedited Freight Including Expressway | Non Expedited Freight | SDC (one or more car/container per train-load) | DC (Not residue cars) |
| 0.0 to 5.2 | Zone Speed | 50 | 45 | 25 | 35 |
| 5.2 to 5.9 | Zone Speed | 35 | 35 | 25 | 35 |

*SDC: Special Dangerous Commodity; DC: Dangerous Commodity

### 5.2.2 Infrastructure

The North Toronto Subdivision is a key link in CPRs network, as shown in Figure 9. From this map, it can be inferred that a large percentage of CPR trains pass through Toronto, which is connected to Western Canada, Michigan, New York, and the Port of Montreal.

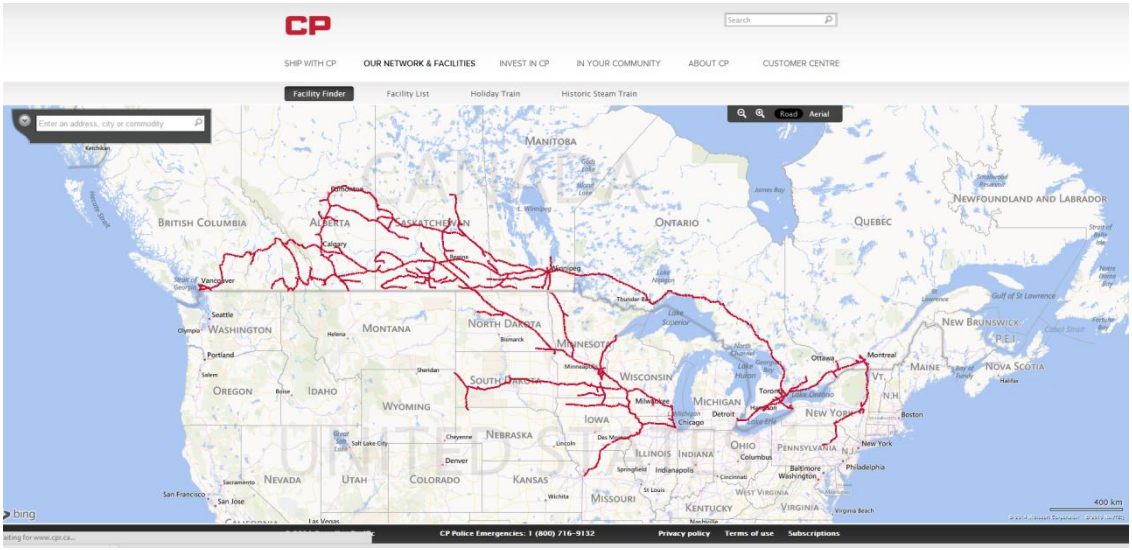



**Figure 9: CPR Network and Facilities Map (Ref 40) © Canadian Pacific**

The corridor consists of two main tracks, controlled remotely through the Control Centre in Montreal through a centralized traffic control (CTC) system. The corridor has two sidings: one located in the Dupont Street Study area between Davenport Road and Ossington Avenue, the other west of Dufferin Street. The existing rail corridor right-of-way is approximately 20 m (70 ft.) wide. Most of the road crossings are grade separated, with roads generally going under the railway corridor. There are three existing at-grade crossings on the North Toronto Subdivision: Bartlett Avenue, a private crossing, and Osler Street. Flashing lights, bells, and gates are currently provided at each at-grade crossing. Whistle signal and the ringing of the engine bell are prohibited at these grade crossings.

As described by previous studies, the maximum vertical grade along the tracks is about 1% with horizontal curvature up to 2° (Ref 39).

The railway is built on an elevated embankment. Based on topography information from the City of Toronto, the track is approximately 1 to 2 m above the elevation of the rail corridor property line within the study area (Ref 41). This difference in elevation varies throughout the study area.

### 5.2.3 Safety

TSB provided accident and incident data for all of Ontario from January 1, 1980 to December 31, 2013, with a total of 15,059 federally regulated railway occurrences. Of these, 63 occurred on the North Toronto Subdivision between Leaside and the West Toronto Diamond. Table 8 summarizes the characteristics of these occurrences related to dangerous goods cars, and injuries.

**Table 8: North Toronto Subdivision Accidents and Incidents**

| Accident/Incident Type | Total | Dangerous Goods Cars Involved | Fatalities | Injuries |
|---|---|---|---|---|
| Collision involving track unit | 1 | 0 | 0 | 0 |
| Crossing | 12 | 2 | 1 | 0 |
| DG leak | 1 | 1 | 0 | 0 |
| Fire | 3 | 0 | 0 | 0 |
| Main-track train collision | 1 | 0 | 0 | 0 |
| Main-track train derailment | 2 | 0 | 0 | 0 |
| Movement exceeds limits of authority | 10 | 1 | 0 | 0 |
| Non-main-track train derailment | 7 | 3 | 0 | 0 |
| Runaway rolling stock | 2 | 0 | 0 | 0 |
| Signal less restrictive than required | 1 | 0 | 0 | 0 |
| Trespasser | 22 | 2 | 13 | 0 |
| Unprotected overlap of authorities | 1 | 0 | 0 | 6 |
| **Grand Total** | **63** | **9** | **14** | **6** |

Within the Study Area, between Spadina Road and Ossington Avenue (Mile 3.09 to 4.23), nine accidents/incidents were reported between 1980 and 2013 (Table 9). The three trespassing incidents occurred between 2005 and 2009. None of these incidents involved dangerous goods cars, and none involved derailments.

**Table 9: Accidents/Incidents within Study Area (1983 to 2013)**

| Accident/Incident Type | Total | Dangerous Goods Cars Involved | Fatalities | Injuries |
|---|---|---|---|---|
| Main-track train derailment | 1 | 0 | **0** | **0** |
| Movement exceeds limits of authority | 2 | 0 | 0 | 0 |
| Non-main-track train derailment | 1 | 1 | 0 | 0 |
| Runaway rolling stock | 1 | 0 | 0 | 0 |
| Signal less restrictive than required | 1 | 0 | 0 | 0 |
| Trespasser | 3 | 0 | 1 | 1 |
| **Total** | **9** | **1** | **2** | **1** |

Examining the entire North Toronto Subdivision over time, there is a generally consistent number of reportable incidents occurring in the last 20 years, as shown in Figure 10.

Within the Study Area (Mile 3.09 to 4.23), there were nine reportable incidents between 1980 and 2013, and in most years there were no reportable incidents, as shown in Figure 11. Prior to 1994 there were no reported incidents between Ossington Ave. and Spadina Rd. (Mile 3.09 to 4.23).

While there has been an increase in frequency over the past decade, it should be noted that railways have taken the initiative to ensure every incident/accident is reported to the appropriate authorities (TC and TSB). The increase in frequency may also be related to the increased densification in this area over the past decade.

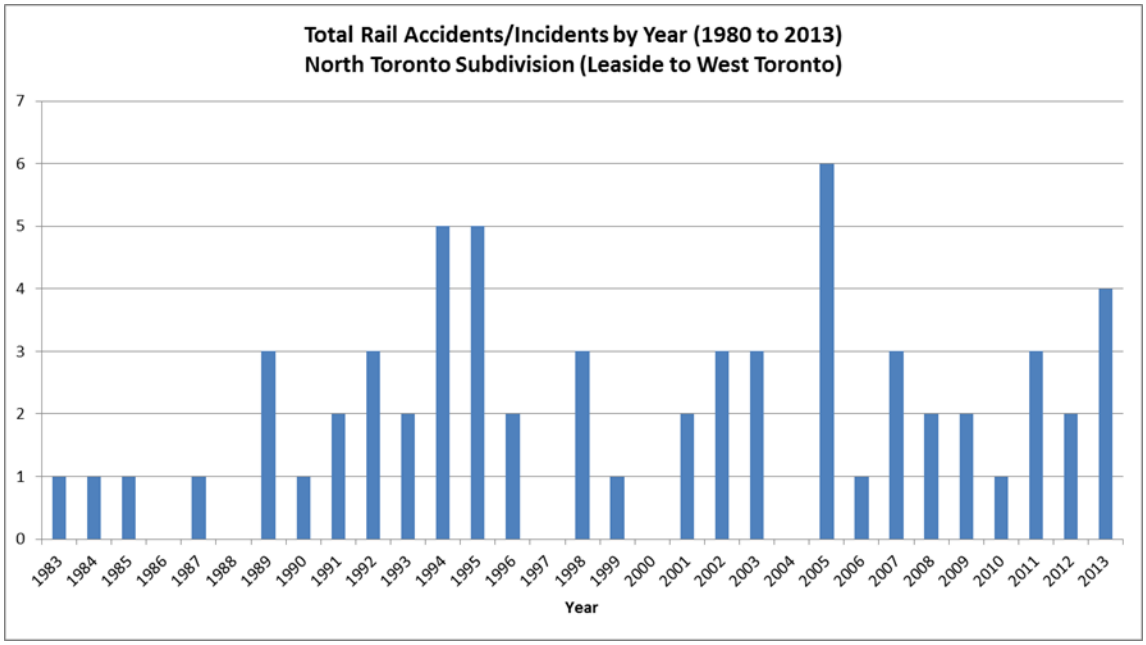



**Figure 10: Accidents/Incidents in the North Toronto Subdivision**

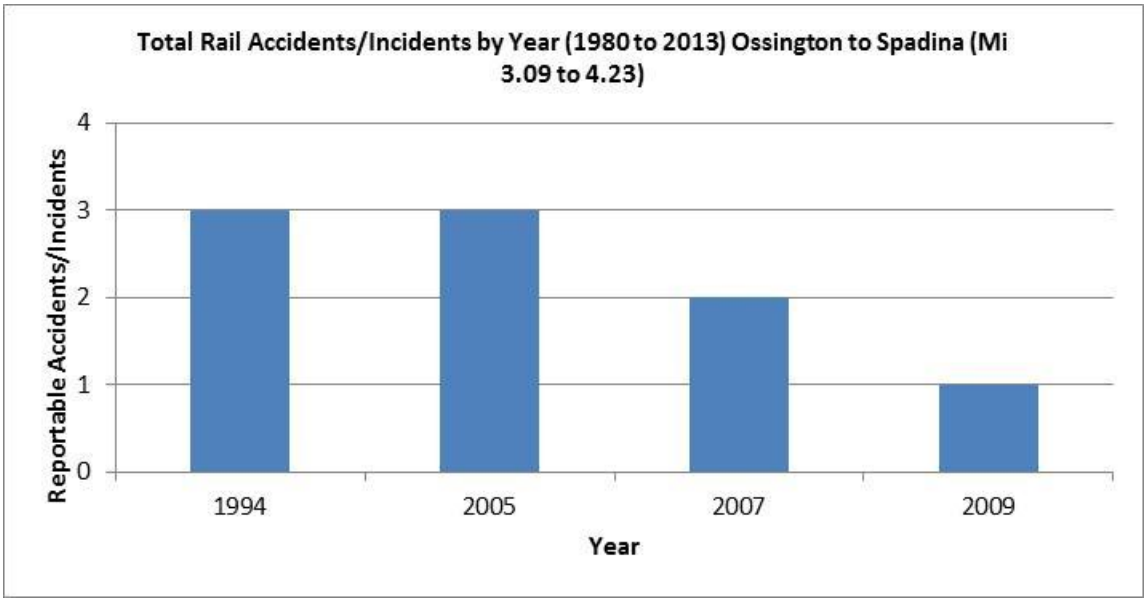



**Figure 11: Total Rail Accidents/Incidents by Year (1980-2013) North Toronto Subdivision**

## 5.3 The Future

### 5.3.1 Operations

Future operations on the North Toronto Subdivision are difficult to predict. The amount of future traffic will vary seasonally and depend on North American and even international economies. This is CPRs sole freight-only route through the City of Toronto connecting to Central Canada, Western Canada, and the US. This means any commodity legally transported in Canada (including dangerous goods), in an approved container, can be moved on this line at any time.

An article in the Financial Post confirms CPR has signed contracts to continue to transport petroleum products across North America, and that shipping crude oil by rail, is "emerging as a permanent fixture in the oil business as pipelines encounter stiff resistance from environmental groups" (Ref 42). It is reasonable to assume, given the location of the North Toronto Subdivision within CPR's network, that future freight rail traffic on this line will increase, including the movement of dangerous goods. However, there is insufficient information to predict future operations with any accuracy.

There are safety procedures, such as speed restrictions, currently in place for dangerous goods being moved along the corridor. Within North America, advancements in technology and infrastructure continue to improve the safety in railway operations. It may be reasonable to assume that the number of derailments will continue to decrease; however, we recommend taking the more prudent approach of assuming that a derailment may occur at any time, at any point along the rail corridor.

Studies have been conducted by Metrolinx and GO Transit to expand passenger operations onto this subdivision with a mid-Toronto relief commuter line such as the Metrolinx Peterborough Rail Study done in 2009/2010 as well as "The Big Move" Project #8 Crosstown: Dundas West to Summerhill Station. At the time of writing, Metrolinx has no planned advancements for introducing passenger trains on the North Toronto Subdivision; additional study and funding is required.

### 5.3.2 Infrastructure

The current configuration of two mainline tracks and a passing track between Ossington Ave. and Kendal Ave. has been in place since inception. CPR does not have any plans to expand the North Toronto Subdivision infrastructure at this time (Ref 43).

# 6. Guidelines for Development Near Railway Corridors

Industry guidelines for residential development adjacent to rail corridors have been in place across Canada since the early 1980s, following the Grange Commission Report on the Mississauga Derailment Disaster of 1979.

The intent of industry guidelines and best practices is to balance the safety of the public with the economic benefits of development and the reasonable operating practices of the railways. While there is no way to completely guarantee that an incident will not occur, there is a range of mitigation measures available to minimize the impact on adjacent properties.

On November 10, 1979, a 106-car CPR freight train derailed at Mavis Road north of Dundas Street in Cooksville (Mississauga). Twenty-three rail cars, of which 19 were carrying dangerous goods, went off the tracks. Fire spread through most of the derailed cars. Three tank cars which were loaded with propane exploded (Ref 44). One tank car contained chlorine, and the risk that chlorine gas might escape and spread over a heavily populated area caused the evacuation of almost 250,000 people. It took three days to extinguish the fires (Ref 45,Ref 46). The Mississauga Railway Accident Inquiry findings, generally referred to as the Grange Commission Report were published in December 1980, with several recommendations to enhance safety around the transportation of dangerous goods.

## 6.1 FCM/RAC Proximity Initiative

The Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) signed a memorandum of understanding in 2003 establishing the FCM/RAC Proximity Initiative. Their goals for this MOU were to build awareness, develop a set of guidelines for development adjacent to railways, and to provide dispute resolution assistance. This initiative is meant to promote better communication and understanding between the railways and stakeholders to resolve proximity issues in an effective manner.

The FCM and RAC collaborated to produce a set of proximity guidelines and best practices for development near railways, and the most recent and comprehensive edition was published in May 2013. These guidelines and best practices were developed with the input from a steering committee, which included the members from industry and municipalities, listed in Table 10 (Ref 23).

**Table 10: Members from the Federation of Canadian Municipalities and Railway Association of Canada**

| Members of the FCM/RAC Initiative | |
|---|---|
| CN Railways | Transport Canada |
| CP Railway | Railway Association of Canada (RAC) |
| GO Transit | Federation of Canadian Municipalities (FCM) |
| VIA Rail | Canadian Transportation Agency (CTA) |
| Agence Métropolitaine de Transport (AMT) | City of Toronto, Ontario |
| Southern Railway BC Ltd. | Cando Rail |
| Southwest Middlesex, Ontario | Prince George, British Columbia |
| Ville de Bromont, Quebec | City of Cambridge, Ontario |
| East Kootenay RD, British Columbia | |

The purpose of the FCM/RAC proximity initiative is to:

- Introduce a level of consistency for development near railways throughout Canada, by recommending guidelines and best practices for all municipalities.
- Anticipate and manage unnecessary proximity conflicts between railway companies and new development.
- Create awareness of the potential issues related to development along a railway corridor, such as: safety, noise, and vibration.

The following sections provide an overview of the key points from the FCM/RAC guidelines (Ref 23). In addition, clarifications of key points were provided by the FCM/RAC Proximity Initiative project manager in a letter received April 17, 2014 (Ref 47). This letter is included in Appendix E.

### 6.1.1 Common Issues and Constraints

The most common constraints associated with proximity to railways, as noted in the FCM/RAC guidelines, stem from a lack of communication amongst stakeholders. This leads to a lack of notification, consultation, and understanding of rail/municipal proximity issues. There is also an inconsistency and lack of detail across the nation in terms of regulations and policies dealing with these proximity issues.

Canadian railways are amongst the safest in North America with the greatest number of fatalities being associated with trespassers and at-grade-crossing collisions. As a safety measure for development along the corridor, Canadian railways have promoted a 30 m setback and berm criteria since the early 1980s. This has become a best practices guideline for any new residential development. The FCM/RAC further clarified the origin of the 30 m setback and berm.

“These measures have been developed based on a detailed analysis of past incidents and derailments by the railway industry for our first guidelines in 2004. The 30 m setback with berm was devised by a careful analysis of aerial photographs of derailments. It was determined through this analysis that 30 m, with a berm, was a minimum safe distance for derailments.

It must be mentioned, however, that a 30 m setback will not afford protection in the event of a catastrophic event involving hazardous materials. The 30 m set back also creates a minimum buffer zone from the noise and vibrations associated with railway operations." (Ref 47).

Noise and vibrations are additional areas of concern for people living in proximity to railway corridor. The airborne noise and ground vibrations from passing trains and rail yard activity can disrupt sleep patterns and potentially affect mental health. The FCM/RAC Guidelines provide details on a range of mitigation measures to deal with these issues, including:

- Building setbacks.
- Noise mitigation.
- Vibration mitigation.
- Safety barriers.
- Security fencing.
- Stormwater management and drainage, and
- Warning clauses and other legal agreements.

There are challenges associated with converting industrial/commercial land uses into residential. The existing infrastructure may not meet current building codes or accommodate the necessary mitigation measures. It becomes the responsibility of the municipality to consider the viability of sites for conversion, and require appropriate mitigation measures as part of the development.

### 6.1.2 Guidelines

When reviewing a development application, the FCM Proximity Guidelines (Ref 23) outlines a model review process for new residential development, infill and conversions in proximity to railway corridors (Figure 12). This model includes the appropriate steps developers should take in a proposed development application. Early consultation with the railway and appropriate municipal authorities will likely minimize the number of potential conflicts. The need to identify the appropriate studies that are required as well as the necessary mitigation measures is a critical step.

Of particular relevance to this study is that, if best practice or "standard mitigation measures" can be accommodated on the site, those measures should be included. The development should proceed to undertake the subsequent required studies, as shown in Figure 12. Standard mitigation measures for a Principal Main Line like the North Toronto Subdivision are a 30 m building setback from the railway property line, plus a 2.5 m high earthen berm.

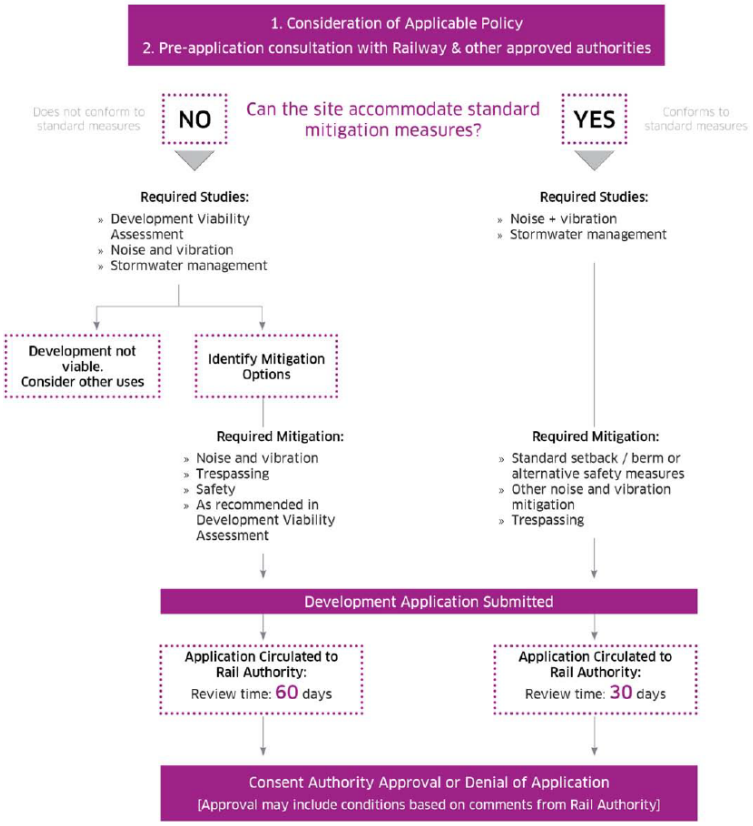



**Figure 12: Model Review Process (Figure 19 of FCM-RAC Proximity Guidelines)**

### *6.1.2.1 Best Practices Mitigation Measures*

The guidelines provide a range of setbacks and noise influence areas relative to the classification of railway operations. Rail yards have the greatest recommended setback and noise influence area due to the amount of rail traffic entering and leaving as well as the continuous activity within the yard. The recommended building setbacks (Ref 23, page 27) and noise influence areas for noise studies for new residential developments and railway corridors can be found in Table 11. The North Toronto Subdivision is considered a Principal Main Line.

**Table 11: Recommended Building Setbacks and Noise Influence Areas**

| Railway Operation | Setback (m) | Noise Influence Area (m) |
|---|---|---|
| Freight Rail Yard | 300 | 1000 |
| **Principal Main Line** | **30** | **300** |
| Secondary Main Line | 30 | 250 |
| Principal Branch Line | 15 | 150 |
| Secondary Branch Line | 15 | 75 |
| Spur Line | 15 | 75 |

The setback distance is measured horizontally from the mutual property line of the corridor and adjacent land. When the safety measures recommended by the guidelines are not viable due to reasons such as topography and existing infrastructure, alternative safety measures are suggested by the guidelines. A Development Viability Assessment (DVA) should be undertaken in such cases. The DVA will evaluate the site and specify any potential conflicts that may occur between the development and railway operations. This is a means of integrating railway companies in the early stages of planning. Railways can provide consultation and work with both the municipality and the developers effectively. The DVA has the potential to ensure a consistent set of guidelines is used across all jurisdictions.

The combination of a setback and berm is the most effective mitigation measure as the berm will absorb more of the derailment energy minimizing the impact to the corridor and surrounding land and structures. As noted in the FCM/RAC Guidelines, "Setback and berms should typically be provided together in order to afford a maximum level of mitigation" (Ref 23, page 36).

Recent support for the FCM/RAC guidelines comes from the Canadian Transportation Agency (CTA) Decision No. 69-R-2014 (February 27, 2014) (Ref 48). The CTA cites the FCM/RAC Proximity Guidelines in Section 56 of the decision. In addition, section 57 of the decision states: "A Municipality takes a risk when deciding to allow housing development in close proximity to a railway right of way and the Agency is of the opinion that Municipalities have a responsibility to assess compatibility issues before approving a housing development along a railway right of way, and if they approve a development, to ensure that the necessary mitigation measures are implemented. … there was no evidence presented to the Agency of any mitigation measures having been implemented.".

Earthen berm specifications can be found in Table 12 for various situations. The North Toronto Subdivision is considered a Principal Main Line.

These berms may be called a "safety berm" or a "deflection berm". The berm can be a simple earthen mound compacted to 95% modified Proctor (Ref 23, page 36), constructed parallel to the rail corridor with returns at the ends. The toe-of-slope of the rail-side of the berm is generally placed close to the mutual property line. The berm is constructed outside the rail right-of-way. Berm height is to be measured from the elevation at the mutual property line. The width at the base of a berm constructed to the specification for Principal Main Line in Table 12 will be about 15 m, depending on the topography of the site and the elevation of the rail corridor.

**Table 12: Standard Earthen Berm Specifications**

| Railway Operation | Berm Characteristics |
|---|---|
| **Principal Main Line** | **2.5 m (Side slope minimum 2.5:1)** |
| Secondary Main Line | 2.0 m (Side slope minimum 2.5:1) |
| Principal Branch Line | 2.0 m (Side slope minimum 2.5:1) |
| Secondary Branch Line | 2.0 m (Side slope minimum 2.5:1) |
| Spur Line | No requirement |

Note: Berm height is to be measured from the elevation at the mutual property line

#### *6.1.2.2 Other Mitigation Measures*

If the standard berm and setback are not feasible, another safety measure that may be proposed is a deflection wall (or crash wall) (Figure 13). "Where the standard berm and setback are not technically or practically feasible, due for example, to site conditions or constraints, then a Development Viability Assessment should be undertaken by the proponent to evaluate the conditions specific to the site, determine its suitability for development, and suggest alternative safety measures such as crash walls or crash berms." (Ref 23, page 38).

Deflection walls are generally made of concrete and are designed to move or deform upon impact, in order to absorb some of the energy of a derailing train. The amount that a deflection wall moves during an impact depends on the material, wall dimensions, and stiffness of the deflection wall (Ref 23, page 41).

After impacting the deflection wall, the derailing train will most likely continue moving, and can cause additional damage within the rail corridor or on adjacent lands depending on the speed and angle of impact.

Note that the terms "deflection wall", "containment wall", and "crash wall" are used interchangeably in this report and within the rail industry. HMM recommends the term "deflection wall" as it more accurately describes the function of the wall, to deflect the energy of the train.

Deflection walls do not have a standard design relative to residential development, and are not specified by the Ontario Building Code. Guidelines are provided for the development of deflection wall designs by a qualified engineer (Ref 23, page 40) on a case by case basis. The structure must be designed with appropriate foundations to account for site conditions. In addition, the construction of the wall must consider any potential encroachments onto the rail corridor, as this will require approval by the railway.

Deflection walls should be designed by a qualified engineer for different case loads, representing different types of derailing train and impact angle, as outlined in the Guidelines (Ref 23). The Guidelines recommend that the crash wall facing the track should be at least 2.13 m (7 ft.) above the top of rail elevation (Ref 23, page 41). The amount that the wall will move or deflect upon impact, to dissipate the derailing train energy, is determined on a case-by-case basis.

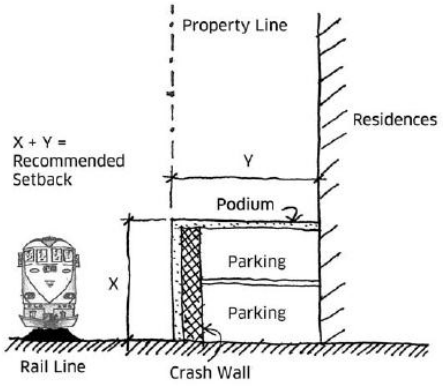



**Figure 13: Deflection Wall Application (NOTE: Deflection walls should be located on the side of the podium facing the railway corridor) (Ref 23 and 47)**

Additional clarification was provided by the FCM/RAC regarding Figure 13 and the concept of horizontal plus vertical setback:

"The Guidelines were written specifically to offer alternatives where it was not otherwise feasible to set a building back 30 m with a berm, or where there may be adaptive reuse of structures that are already abutting a railway corridor. The vertical and horizontal application of the 30 m buffering zone as illustrated on page 27 of the Guidelines, was never intended to be a "catch all" solution, it is offered as one of many possible solutions. The guidelines should be read and applied as a whole as every site is unique and must be comprehensively studied by qualified professionals, in consultation with the railway operators, to arrive at a solution where possible, that ensures safety, and sustainable living with regards to noise, vibration and emissions. As outlined in the guidelines - being closer to the noise/vibration source will require more mitigation measures. It, in fact, may not be possible to accommodate infill development in proximity to railway corridors under some circumstances." (Ref 47)

Another safety barrier described in the FCM/RAC guidelines is a crash berm, or deflection berm. Crash berms are basically a hybrid between a standard earthen berm and a deflection wall. The deflection wall is located on the rail side, and the earthen berm is behind the wall, on the development side. As noted in the FCM/RAC guidelines "They are generally preferable to crash walls, because they are more effective at absorbing the impact of a train derailment. This results from both the berm's mass and the nature of the material of which it is composed." (Ref 23, page 38).

## 6.2 Case Studies

As part of this assignment, HMM gathered information on setback requirements and other best practices for mitigation measures from other municipalities and documented when, where, and how the measures are implemented. Information from five Canadian municipalities was obtained through various public sources.

The information documented here also extends to one international example, Queensland Australia, which also focuses on zoning and by-laws related to residential development along a mainline railway corridor.

### 6.2.1 City of Edmonton

The City of Edmonton is a major hub for railway activity with VIA, CN, and CPR travelling throughout its limits. Currently, development adjacent to railway corridors and yards is reviewed on a case by case basis. However, the city officials are in the process of adopting a set of amendments concerning land use regulations for new development in proximity to railway corridors and yards, namely the City of Edmonton's Zoning Bylaw 12800 Amendment (Ref 49). These amendments consist of a detailed set of guidelines for setback and mitigation measures for various land use types. The proposed amendments include:

- Noise and Vibration impact assessments for developments within a certain distance of railways and rail yards.
- Berms and fences requirements along the property line between a development and rail corridor/yard.
- Minimum setback distance from a "Principal Building" of a new development to the railway corridor/yard.
- New definitions in the zoning bylaw for noise attenuation fencing.

The guidelines provide a minimum standard setback of 30 m from principal mainlines for residential, intermittently occupied institutions, high activity outdoor use, and commercial land uses. They also provide noise and vibration assessment areas as well as berm dimensions/locations as standard mitigation measures. The full set of guidelines is located in Appendix D. Currently this amendment is in the text amendment process phase, with no planned date for advancement to council.

Edmonton is a relevant comparison to Toronto, despite the geographic distance, as both CN and CPR corridors travel through Edmonton carrying a range of commodities, including trains to and from the tar sands, northern mining operations, and the Port of Prince Rupert.

A request was made to the City of Edmonton to obtain additional information on the development of the zoning bylaw amendment. However, HMM has not received any additional background information regarding their development.

### 6.2.2 City of Windsor

The City of Windsor has 55 km of rail lines, with approximately 11,200 dwellings within 300 m of the lines (12.7% of all dwellings) (Ref 50, page 4). Similar to the North Toronto Subdivision, these communities and neighbourhoods developed adjacent to the corridor after it was established in 1853 (Ref 51). The current City of Windsor Official Plan includes Section 7.2.8.8, allowing Council to evaluate a proposed development adjacent to the rail with respect to the following conditions:

- Any proposed development within 300 m of a rail corridor must complete a noise study with mitigation measures identified.
- Any proposed development within 75 m of a rail corridor must complete a vibration study with mitigation measures identified.
- Any proposed development in proximity to a railway corridor must consult the appropriate railway company prior to the completion of the noise and vibration studies. If the development requires rezoning, plan of subdivision, plan of condominium or site approval, the developers must incorporate the appropriate setbacks and mitigation measures for the approval of the municipality, incorporating consultation with the appropriate railway and public agency.

The Official Plan was also amended with respects to rail yards due to a ruling at the OMB (order 1485) Section: 5.22 Schedule C: Development Constraint Areas - Rail Yards (Ref 52).

- Rail Yards are development constrained features which preclude new residential development and new sensitive land uses within 300 m (section 7.2.6.8 of the plan) as well as requiring mitigation measures for proposed residential development within 300 m to 1000 m vicinity.
- Any planned development within 75 m of a designated Rail Yard must complete a vibration study.
- Any development adjacent to a rail yard requiring rezoning, plan of subdivision/ condominium, site approval must consult with the appropriate public agency and railway company.

More information is provided in Appendix D.

### 6.2.3 City of Ottawa

The City of Ottawa has a rural Zoning By-Law (Ref 53) for setbacks from Railway Rights-of Way (Sec. 68). This By-Law consists of the following main elements:

- No obstruction higher than one metre above grade including but not limited to buildings, structures, parking, storage or vegetation is permitted on any lot abutting an at-grade intersection of a street and a railway track within the triangle formed by connecting a point 45 m from the intersection of the centerline of the street and the centerline of the railway right-of-way. Agricultural crops, chainlink fences and other similar features that are transparent (see through) are not considered obstructions.
- No building that is used for residential use, day care or school can be within 30 m of a railway right-of-way.

More information is provided in Appendix D. There is currently no Zoning By-Law for setbacks in urban zones in Ottawa.

### 6.2.4 Town of Canmore

The Town of Canmore is located west of Calgary, and is surrounded by the Alberta Rockies. A CPR mainline runs through Canmore. The Town has By-Law 22-2010 which states (Ref 54):

- Section 4.16 (Ref 54, page 32): Residential buildings and visitor accommodations adjacent to railway corridors and highways (Trans-Canada Highway) must ensure noise levels do not exceed CMHC guidelines (55dBA or 24 hr. Leq interior). Development permits must include a professionally prepared acoustical report to confirm.
- Section 4.18: Setback and Screening from C.P.R Railway Line (Ref 54, page 6): Residential buildings and visitor accommodations (i.e. Hotels, motels etc.) adjacent to the railway corridor (C.P.R) shall be set back at a minimum of 27.5 m from the centre line of the railway ROW. They shall be screened from the railway by a fence, wall or berm to the approval of the Development Authority.

The surrounding topography, CPR mainline, and TransCanada Highway physically constrain the Town, which likely results in the reduction from the minimum setback of 30 m seen across other municipalities in Canada. The 27.5 m setback from the railway corridor has been in the Town's By-Law since 1989. This setback is not considered appropriate to the Dupont Street study area. More information is provided in Appendix D.

### 6.2.5 City of London

The City of London includes both CN and CPR rail corridors, VIA trains, plus two rail yards within its boundaries, the Quebec St. Yard (CPR) and the London Yard (CN). The City has Zoning By-Law No. Z-1 Section 4.34 (Ref 55) concerning development adjacent to railway corridors. This By-Law indicates minimum setbacks, mitigation measures, noise, and vibration requirements, summarized in Table 13.

**Table 13: City of London: Minimum Setback Required for Development Adjacent to Railways**

| Classification of Track | Setback Without Berm (m) | Setback With Berm (m) | Required Size of Berm (m) |
|---|---|---|---|
| Principal Main Line | 120 | 30 | 2.5 |
| Secondary Main Line | 120 | 30 | 2.0 |
| Principal Branch Line | 60 | 15 | 2.0 |

The noise and vibration requirements are:

- Evaluation of ground-borne vibration from rail traffic will be required within 75 m (246 ft.) of the railway line and shunting yards.
- Evaluation of noise from rail traffic through a Noise Impact Study will be required within 120 m (394 ft.) of the railway line and shunting yards in accordance with Ministry of the Environment (MOE) guidelines.

This By-Law applies to all main buildings in the residential, regional, community, neighbourhood facility, and open space zone variations. Special provisions are provided for zoning variations on a case by case basis. More information is provided in Appendix D.

It is interesting to note the increased building setback required if no berm is provided.

### *6.2.6 Queensland, Australia*

The Australian Department of Transport and Main Roads (TMR) in collaboration with stakeholders such as Queensland Rail (QR) and TransLink Transit Authority (TTA) created guidelines for developments adjacent to the "railway environment" (Ref 56). A railway environment is defined as the combination of the following:

- Railway corridor: within, above, and below.
- Twenty-five meters of adjacent land along both sides of corridor: within, above, and below.

Any proposed development within the railways environment must comply with Australian standards, QR/TMR technical requirements and standard drawings. These requirements involve vertical clearances to prevent conflicts with the overhead catenary system.

Collision Protection of Supporting Elements Adjacent to Railways (CIVIL-SR-012), a technical requirements standard, provides concise set of criteria for the design of protection measures for elements (including developments) adjacent railways relative to speed and zone of structure. More information is provided in Appendix D.

# 7. Risk Assessment and Mitigation

The following sections include a discussion on the changing nature of risk related to rail corridors in Canada, a risk assessment of the North Toronto Subdivision, the range of risk mitigation options available to land developers, and other risks and factors to consider for the Dupont Street Regeneration Area study.

## 7.1 Changing Nature of Risk

The TSB recommendations issued in January 2014 highlight the increase in crude oil shipments by rail in Canada, from about 500 car loads in 2009, to 160,000 car loads in 2013 (Ref 21). Crude oil production is expected to increase in North America, and the TSB notes concern that "infrastructure and operating conditions may not ensure a safe rail system now and in the future", and that "risks to the public and the environment along the train's route have increased significantly" (Ref 21).

The TSB goes on to acknowledge that there are on-going efforts to "reduce the risk of accidents involving trains carrying dangerous goods and to reduce the consequences to the public and the environment from derailments" (Ref 21).

TSB data related to train derailments and incidents (Section 4) shows that the number of derailments in Canada is going down. This can be attributed to many factors, including new technologies, improved rail car design, and operational measures. New technologies, increasingly

implemented over the last 30 years, include wayside detectors such as hot box and dragging equipment detectors, acoustic defect bearing detectors and wheel impact load detectors, among others. More details on advancements in technologies can be found on Transport Canada's website (Ref 57).

As documented in the previous sections, the amount of train traffic is increasing while the number of train derailments and incidents is decreasing. In summary, the trends of risk related to rail transportation in Canada are:

- There is a downward trend for mainline derailments across Canada and Ontario.
- There is a downward trend for mainline derailments involving dangerous goods across Canada and Ontario.
- Rail companies are continuing to adopt and implement new technologies to supplement visual inspections of train cars, and continue to improve Safety Management Systems to enhance the safety of their operations.
- The range of goods that can be moved by train is regulated by Transport Canada, and includes explosives, flammable and toxic gases, infectious substances, radioactive materials, and corrosives.
- Ninety-nine percent of goods that travel by rail reach their destination without incident or release (Ref 58).

The volume of trains, length of trains, and volume of goods moved by train is currently increasing across Canada. However, past trends show that it is not a constant increase over time, and it is impossible to quantitatively assess the future risk. On the North Toronto Subdivision, it is reasonable to assume that rail traffic may continue to increase over time, but it is impossible to predict how much or when these increases may occur, given the complex relationship with economic forces.

In summary, while train volumes are generally increasing, the rate of derailments is generally decreasing.

## 7.2 Train Incident Risk Assessment

Typically, a Risk Assessment identifies, analyses and ranks potential risks based on their probability and consequence. Given the focus of this study on the potential re-development of lands between the rail corridor and Dupont Street, the risk assessment is focused on the relative amount of potential risk to life and property of the study area lands.

There are two main types of train incident risks that could impact lands beyond the rail corridor:

1. Physical train derailment.
2. Release of material (e.g., a leak or spill of train cargo).

### 7.2.1 Factors Influencing Risk

Research and analysis of past incidents shows that a physical train derailment can be caused by a wide range of factors. Figure 14 summarizes analysis of the identified main cause of derailments in Canada in 2010, based on TSB investigations. Equipment (i.e. rolling stock) and track are the most frequently identified causes of main-track derailments.

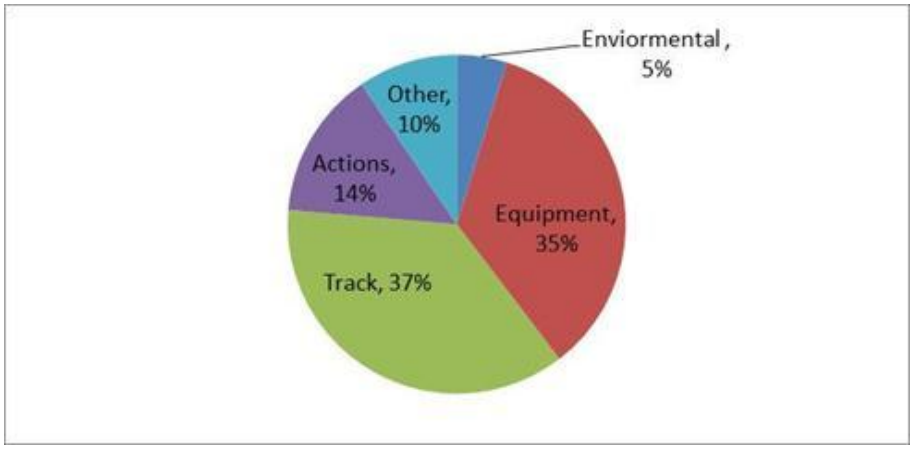



**Figure 14: Main-Track Train Derailments in 2010 by Assigned Factor (Canada) (Ref 59)**

The severity of a derailment is directly related to the speed of the train. During a derailment, the kinetic energy of the train (a combination of its speed and mass) needs to be dissipated (Ref 21). Based on an analysis by the U.S. Federal Railroad Administration of main-line freight derailments, the number of train cars derailed is highly correlated with train speed and with the release of dangerous goods (Ref 21). A statistical analysis of mainline freight derailments reported to the Federal Railroad Administration in the United States, from 1992 to 2001, found a strong linear relationship between derailment speed and the average number of cars derailed (Ref 60). The greater the speed of a derailing train, the greater the number of derailed railcars.

This same study analysed hazardous materials release probability and found a similar relationship; the greater the speed of a derailing train, the greater the average proportion of derailed cars that release hazardous materials (Ref 60).

Given the number of complex factors related to train derailment incidents, it is impossible to predict when or where a train incident or derailment may occur. In addition, the City of Toronto has no jurisdiction over the majority of factors that may cause a derailment or release of material.

Therefore, the responsible approach for the Dupont Street Regeneration Area Study is to apply a consistent risk management approach along the North Toronto Subdivision, focusing on managing the potential consequences should an incident occur in this area, and consideration of appropriate mitigation measures.

### 7.2.2 Defining Sensitive Land Use

In order to assess the risk to various land uses, it is important to select an appropriate definition for the land use scenarios. The 2014 Provincial Policy Statement (PPS) provides policy direction on matters of provincial interest related to land use planning and development. Under the Planning Act, the City is required to ensure that its planning decisions are consistent with the policies of the PPS. The Provincial Policy Statement, 2014 is effective April 30, 2014 (Ref 61).

The 2014 PPS defines "Sensitive Land Uses" as (Ref 61, page 48):

"Sensitive land uses: means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities."

The 2014 PPS defines a rail corridor as a "major facility", and the definition of adverse effects includes the injury or damage to property and the impairment of safety of any person. In the instance of rail corridors, it is not just contaminants or emissions which could negatively affect the gathering of persons in residential or institutional facilities, but also the potential negative effect the presence of the rail corridor may have on the safety of people.

The 2014 PPS also includes two policies relevant to this study:

- Policy 1.2.6.1 "Major facilities and sensitive land uses should be planned to ensure they are appropriately designed, buffered and/or separated from each other to prevent or mitigate adverse effects from odour, noise and other contaminants, minimize risk to public health and safety, and to ensure the long-term viability of major facilities." (Ref 61, page 13).
- Policy 1.6.8.3: "Planning authorities shall not permit development in planned corridors that could preclude or negatively affect the use of the corridor for the purpose(s) for which it was identified. "New development proposed on adjacent lands to existing or planned corridors and transportation facilities should be compatible with, and supportive of, the long-term purposes of the corridor and should be designed to avoid, mitigate or minimize negative impacts on and from the corridor and transportation facilities." (Ref 61, page 18).

Under the PPS, the City is required to ensure its land use planning decisions for the Dupont Regeneration Area are compatible with the continued presence and operations of the North Toronto Subdivision.

It is noted that the Ministry of the Environment Guideline D-6 also provides a definition for sensitive land use in the context of proximity to industrial land uses, such as rail corridors (Ref 62):

- "Recreational uses which are deemed by the municipality or provincial agency to be sensitive and/or;
- Any building or associated amenity area (i.e. may be indoor or outdoor space) which is not directly associated with the industrial use, where humans or the natural environment may be

adversely affected by emissions generated by the operation of a nearby industrial facility. For example, the building or amenity area may be associated with residences, senior citizen homes, schools, day care facilities, hospitals, churches, and other similar institutional uses, or campgrounds."

The FCM/RAC uses a similar but less detailed definition (Ref 23, page 105):

- "A land use where routine or normal activities occurring at reasonably expected times would experience adverse effects from the externalities, such as noise and vibration, generated from the operation of a railway. Sensitive land uses include, but are not limited to, residences or other facilities where people sleep, and institutional structures such as schools and daycares, etc.".

### 7.2.3 Future Land Use Scenarios

As part of the Dupont Street Regeneration Area study, the City is considering a range of potential land uses. If recommended, any development that includes Sensitive Land Uses, as defined above, will be restricted to the portion of lands designated Regeneration Areas by OPA 231. Non-sensitive uses such as employment uses may be considered within either the portion designated Regeneration Areas or General Employment Areas.

In either land use scenario, it is important to fully consider the risk associated and the appropriate level of mitigation. For this purpose HMM will consider two land use scenarios in the following section:

1. Future Scenario 1: Non-sensitive land uses (similar to existing employment and retail uses along the corridor).
2. Future Scenario 2: Sensitive land uses within lands designated Regeneration Areas (this includes mixed use developments that contain sensitive uses such as residential along with employment and retail uses).

While the definitions for sensitive land use focus on residential and institutional land uses, it is important to consider the risk to people who may work adjacent to the rail corridor, and in particular the density of people who may work in the retail and commercial land use types noted above.

For example, a temporary storage facility is likely to have far fewer people in the building at any given time compared to a multi-storey office building, large retail store, or a restaurant.

### 7.2.4 Risk Assessment

To consider the potential for increases in risk and the potential for new risks related to development in this study area, the risk factors related to future conditions need to be examined. There are two key environmental risk factors which are within the City's jurisdiction:

1. Building Setback: the horizontal distance between the rail corridor to the face of a building
2. Population Density: The numbers of people who may occupy a building, whether to live, work, shop, sleep, play, or are gathered for other reasons.

These two factors can influence the potential for a train incident to occur (i.e. risk probability), or the potential severity of an incident (i.e. risk consequence). Table 14 describes these risk factors in terms of risk probability and consequence.

**Table 14: Risk Factors for Dupont Street Regeneration Area**

| Risk Factor | Description of Risk Probability and Consequence |
|---|---|
| Building Setback | Reducing the distance or setback between a building and the rail corridor increases the probability that the building may be struck by a derailing train.<br><br>Reducing the setback increases the potential consequences if there is a leak, spill or explosion in the rail corridor; building occupants are more likely to be within the impact zone and may have less time to evacuate. |
| Population Density | Increasing the population density adjacent to the rail corridor increases the probability of trespassing or vandalism to the rail corridor, which may increase the probability of a train incident.<br><br>Increasing the population density adjacent to the rail corridor increases the potential consequences of a train incident. All incidence severity consequences are increased by increased population density. |

Table 15 summarizes the two identified risk factors and the qualitative risk assessment for each factor comparing existing and potential future land uses along this section of the North Toronto Subdivision. For each risk factor, the assessment is based on the information available for current operations along the North Toronto Subdivision, as there is insufficient information to predict future operations with any accuracy, as discussed in Section 5 of this report.

**Table 15: Risk Assessment for Future Land Use Scenarios**

| Risk Factors | Existing Land Use | Future Scenario 1: Non-sensitive land uses | Future Scenario 2: Sensitive land uses |
|---|---|---|---|
| Building setback | Existing building setback varies in the study area | Risk decreases with greater setback, or increases with reduced setback | Risk could be decreased with greater setback, or increased with reduced setback |
| Population density | Generally lower occupancy land uses | Risk increases with additional development along the corridor, or decreases with lower density land uses | Risk is increased with higher density land uses |

It is impossible predict where or when an incident may occur, whether a train derailment or release of materials. Railways are responsible for their own operations within their corridor, and the City is responsible for the compatibility of adjacent land uses and development.

Based on the potential density of people in the future land use scenarios, HMM recommends that the City consider both sensitive and non-sensitive land uses for risk management, where the land use may be high-density or high-occupancy.

## 7.3 Risk Mitigation Options

As described in Section 6, there is a range of risk mitigation measures available, including:

- Building setback.
- Standard earthen berm.
- Combination of earthen berm and deflection wall or "deflection berm".
- Deflection walls, also called "crash walls" or "containment walls".
- Crash ditch/valley.

These mitigation measures are described and illustrated in the following sections.

### 7.3.1 Building Setback

Based on detailed analysis of past incidents and derailments, railways have promoted risk mitigation through a 30m setback and earthen berm since the early 1980s (Ref 23, page 18). Building setback is measured in a horizontal line, perpendicular to the rail right-of-way line, from the rail corridor to the exterior building face. These mitigation measures are recommended for all types of new development in proximity to railway operations (Ref 23, page 18).

Building setbacks also provide space to dissipate noise and vibration (Ref 23), which are common issues for those who live or work near busy rail corridors.

Most municipalities in Canada have yet to establish formal requirements, through zoning by-laws or other methods, as shown in Section 6. As such, municipalities generally rely on the expertise of CN and CPR, and the long-standing 30 m building setback, in combination with an earthen berm.

This standard mitigation measure has been formalized through the FCM/RAC Proximity Guidelines, and updated recently in their May 2013 report (Ref 23).

The following types of buildings may be considered:

- "Principal buildings" includes any building where people live, work, shop, sleep, play, or are gathered for other reasons; in other words, a high-occupancy building.
- "Ancillary buildings" includes parking structures, waste storage, or other storage facilities related to the principal use; in other words, a low-occupancy building.

### 7.3.2 Standard Earthen Berm

Earthen berms partially absorb the energy of a derailing train as the trains kinetic energy is reduced by friction and gravity. The train will dig into the earth, slowing the train and limiting the distance that it can travel, eventually bringing the train to a stop (Ref 23, page 36). During the

impact the berm will deform and be pushed back. The amount of movement of the berm depends on the angle of impact, train speed and other factors.

A building setback is recommended in combination with the berm, since during the impact the berm will deform and be pushed back into the additional space. There is also allowance for secondary impacts which may go beyond the berm. The concept is illustrated in Figure 15.

While alternative mitigation measures such as deflection berms and deflection walls are effective at containing a derailed train, these measures are less effective than a standard earthen berm at absorbing the energy of a train derailment (Ref 23, page 38). Absorbing as much energy as possible from the derailed train reduces the risk of train car damage and resulting leaks or spills, in turn reducing the risk for fire, explosion, or fumes.

These characteristics make the standard earthen berm the most effective mitigation measure for a derailing train, providing the greatest risk reduction for both impact to adjacent buildings, and subsequent release of materials.

As with any structure, an earthen berm should be designed by a qualified engineer on a case by case basis.

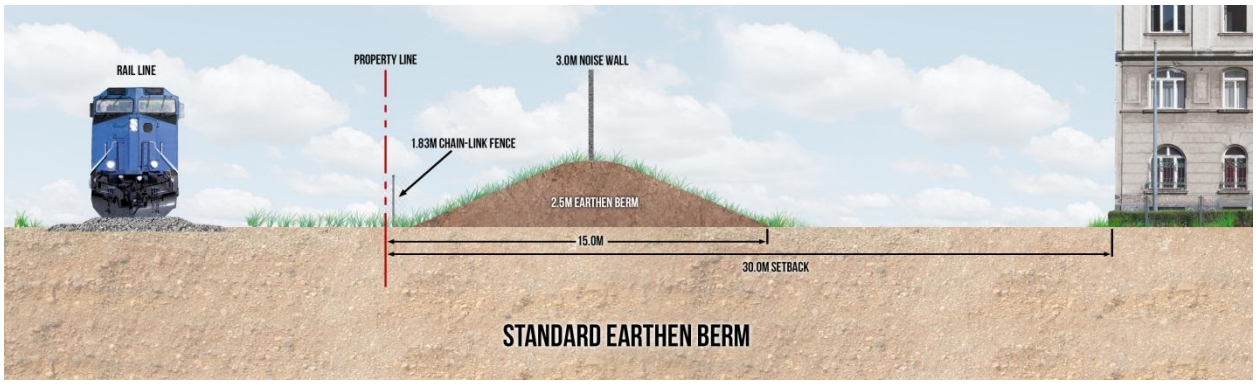



**Figure 15: Standard Earthen Berm Plus 30 m Building Setback**

### *7.3.3 Deflection Berm (or Crash Berm)*

Deflection berms (or crash berms) are hybrid structures, combining a deflection wall on the rail side, and an earthen berm behind the wall, on the development side. Deflection berms provide greater energy absorption or dissipation characteristics than a deflection wall, with the retained earth behind the wall (Ref 23, page 40). The concept is that a deflection berm is preferable to a deflection wall, because they are more effective at absorbing the energy from a derailing train (Ref 23, page 38). In addition, the impact with the deflection wall increases both the time and distance of the derailment event when compared to a standard earthen berm. This increases the potential damage to property, equipment failure, exposure to people, and potential for leak/spill or explosion.

The deflection berm concept is illustrated in Figure 16. As described in Section 6, a deflection wall requires specific design considerations, and this illustration is not an engineered design.

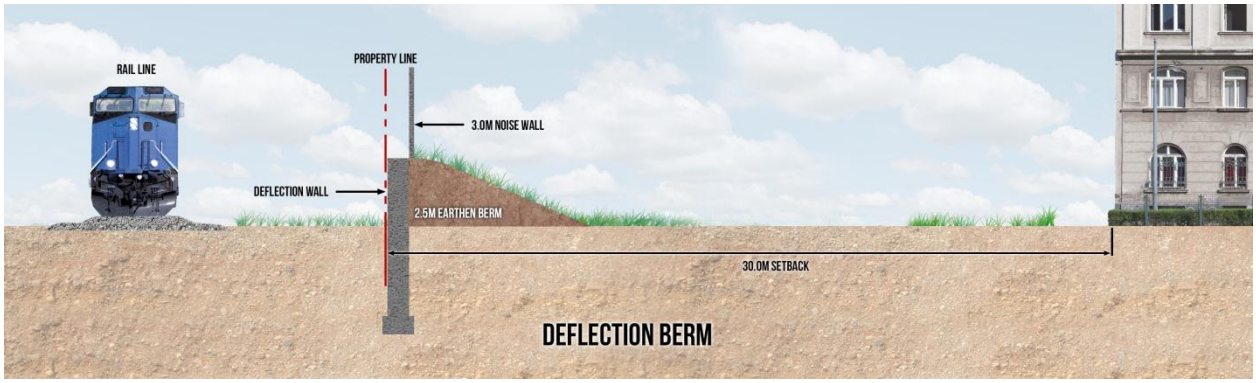



**Figure 16: Deflection Berm (or Crash Berm) Plus 30 m Building Setback**

### *7.3.4 Deflection Walls (or Crash Walls)*

Deflection walls (or crash walls) are concrete structures designed to provide resistance equal to that of a standard earthen berm, including energy absorptive characteristics (Ref 23, page 40). A deflection wall will redirect the derailing train back into the rail corridor and return some of the energy back to the train equipment. Redirection of the train increases both the time and distance of the derailment event when compared to a standard earthen berm, increasing the potential for damage to property and exposure to people. Returning energy to the train increases the potential for train equipment failure, potential for leak/ spill or explosion. The outcome is likely to result in a more expensive clean up and repair to the rail corridor and track structure compared to a standard earthen berm (Ref 23, page 38).

The deflection wall concept is illustrated in Figure 17. As described in Section 6, a deflection wall requires specific design considerations, and this illustration is not an engineered design.

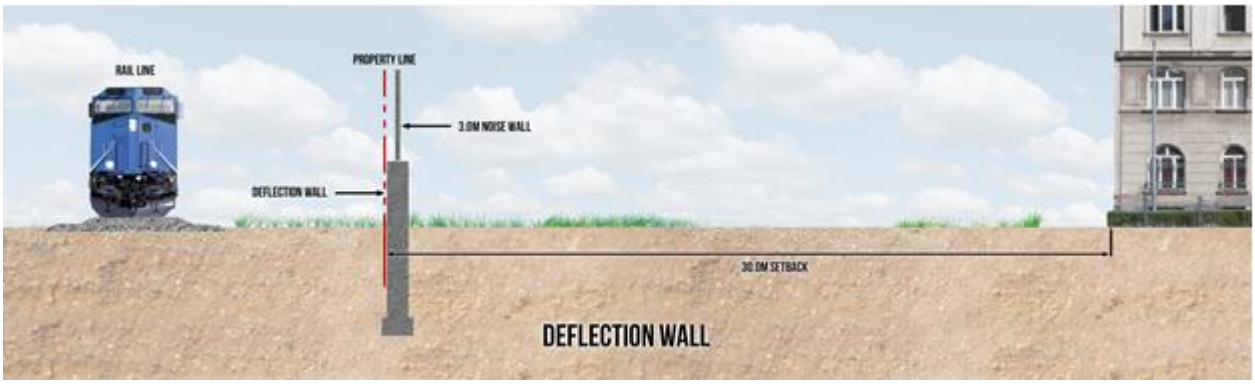



**Figure 17: Deflection Wall (or Crash Wall) Plus 30 m Building Setback**

Deflection walls are designed to deflect, or move, when impacted by a derailing train. Protection of bridge structures from damage due to train derailment is provided in the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering Commentary C-2.1. These provisions state that deflection walls "are not intended to create a structure that will resist the full impact of a direct collision by a loaded train. Rather, the intent is to reduce the damage caused by … derailed equipment. This is accomplished by: deflecting or redirecting the force from the [structure]; providing a smooth face; providing resisting mass; and distributing the collision force" (Ref 63). AREMA specifies some dimensions for crash walls designed for bridge pier protection. Crash walls for pier protection, which is not the same as a crash wall for protection of a building, are required to be a minimum of 760 mm (2.5 ft.) thick and at least 3.6 m (12 ft.) long, extending a minimum of 1.2 m (4 ft.) below grade.

Note that the terms "deflection wall", "containment wall", and "crash wall" are used interchangeably in this report and within the rail industry. HMM recommends the term "deflection wall" as it more accurately describes the function of the wall, to deflect the energy of the train.

For constrained sites where an earthen berm is not feasible, it is possible to integrate a deflection wall into an ancillary building such as a parking garage. The deflection wall must be placed on the exterior of the building, facing the railway corridor. The deflection wall is designed to move when impacted by a derailing train in order to absorb and redirect the train's energy. The design of the deflection wall is completed on a case-by-case basis, and the amount of wall movement will vary in each case. Regardless of the design used, derailment impact to the deflection wall will likely be transferred to any integrated ancillary or adjacent principal building, which may result in the building becoming compromised and unstable. Total collapse of both the deflection wall and ancillary building is also possible. Therefore, it is imperative that ancillary and principal buildings be structurally isolated from one another and that a mode of failure be designed into the ancillary building to minimise risk to the adjacent principal building. It is recommended that any deflection wall be designed by a qualified structural engineer, and peer reviewed prior to approval. It is also important to note that this type of integration is likely to have significant additional capital costs, with costly repairs or replacement of the building structure if impacted by a derailed train.

Regarding the combination of horizontal plus vertical elements to achieve the minimum building setback, as presented in the FCM/RAC Guidelines, and shown previously is this report as Figure 13, HMM recommends that the 30 m horizontal setback be applied wherever feasible. This is consistent with the FCM/RAC Guidelines review process as shown in Figure 12. It is not reasonable to assume that a reduced horizontal setback in combination with a vertical crash wall provides appropriate risk mitigation, given the physical impact of a derailing train could compromise the structural integrity of the deflection wall.

The most effective risk mitigation strategy remains a 30 m setback plus earthen berm. It is also noted that the horizontal setback provides other benefits such as noise and vibration mitigation.

### 7.3.5 Crash Ditch/Valley

The FCM/RAC Guidelines suggests that, if applicable to local site conditions, a "crash ditch or valley" could be implemented between the railway corridor and the new development (Ref 23, page 38). The Guidelines suggests the design would be generally equivalent or greater than the inverse of the berm (for example, a 2.5 m deep ditch approximately 15 m wide). The concept is illustrated in Figure 18.

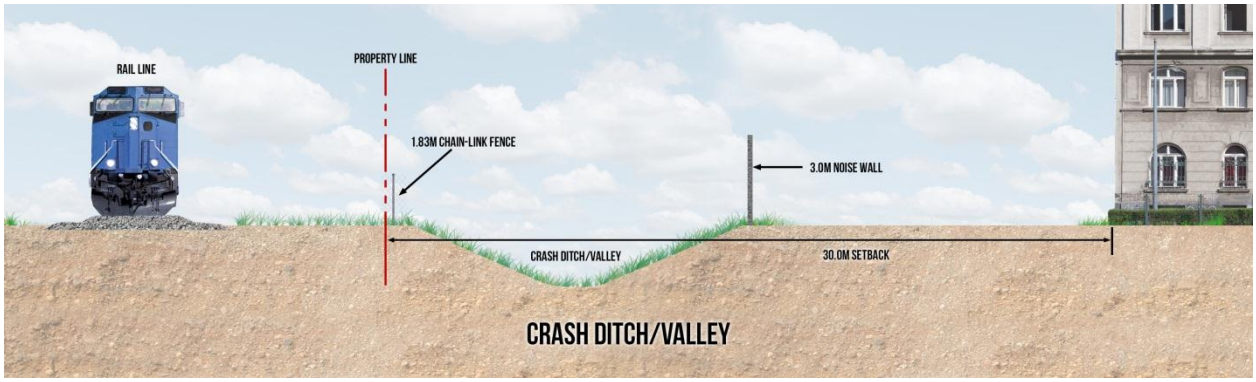



**Figure 18: Crash Ditch/Valley Plus 30 m Building Setback**

A crash ditch/valley is different from a crash pit. In HMM's experience, crash pits are designed for a specific, controlled derailment location, to keep derailed locomotives or cars more or less upright and in line with the track. For uncontrolled derailments, where cars can derail at varying angles up to 90° from the track, a crash ditch/valley is unlikely to provide appropriate mitigation. Rail cars can jump over the ditch or may not be fully contained within the ditch width. We do not recommend a crash ditch/valley as a mitigation measure for development along a rail corridor.

## 7.4 Other Risks and Factors to Consider

While the focus of this study is on the potential risk to adjacent land uses should a train derailment or other incident occur, there are other potential risks both to the public and to the rail operations. The City should consider appropriate studies and potential mitigation measures to address the following concerns.

### 7.4.1 Noise and Vibration

Noise and vibration issues are significant issues for new developments along a rail corridor, and in particular for residential development. People tend to be more sensitive to these issues in the context of their own homes, as compared to when at work or at play (Ref 23, page 20). In addition, these issues are generally related to disturbed sleep patterns. For development parcels that are small in size, such as those in the study area, it can be undesirable to accommodate the standard setback and berm (Ref 23, page 21). HMM recommends that the City retain the services of a noise and vibration specialist to assist in developing the policies for the Dupont Street area.

### 7.4.2 Air Quality

Air quality, including smells, is a potential concern for development adjacent to rail corridors. In particular for this study area, as CPR uses diesel locomotives to move freight trains. While the technology for locomotives is always improving, those adjacent to the rail corridor may have on-going concerns with the rail operations, and if not addressed through the development application by the developer, the City may have to continually respond to issues in this area into the future.

### 7.4.3 Drainage

Stormwater drainage can be an issue for any new development. Maintaining current drainage patterns for the rail corridor is important, to ensure the stability of the tracks. The City currently has a variety of tools in place to address drainage issues during the development process.

### 7.4.4 Trespassing

Trespassing is a concern along this section of rail corridor, as shown in Section 4. We recommend that any new development require security fencing along the rail right-of-way. Additional information on reducing trespassing can be found through Operation Lifesaver (Ref 24).

### 7.4.5 Emergency Response

Emergency Response Assistance Plans (ERAP) are required by the Transportation of Dangerous Goods Regulations (TDGR) and are approved by Transport Canada. These regulations specify the dangerous goods that require special expertise and response equipment to respond to an incident. ERAPs are intended to provide local emergency responders, such as Fire, Police and EMS, with the appropriate technical experts and appropriately equipped emergency response personnel at the scene should an incident occur. HMM was unable to obtain ERAP information from CPR, as this is confidential information shared only with the City's Emergency Planning Official.

# 8. Conclusions and Recommendations

The key objective of this report is to provide the City of Toronto with credible and defensible information that City staff can rely on as they develop recommendations for the Dupont Street Regeneration Area Study.

HMM reviewed and compiled a variety of information, including: the background leading up to the Dupont Street Regeneration Area Study, relevant regulations, the roles of various stakeholders, and rail transportation and safety trends. Information was gathered on the past, present and future of the North Toronto Subdivision. HMM also scanned, compiled and assessed available sources of information to identify current best practices in Canada for development near railway corridors.

The two most useful sources of best practice information are the FCM/RAC Proximity Guidelines, and the City of Edmonton's Zoning Bylaw 12800 Amendment. Edmonton is a relevant comparison to Toronto, despite the geographic distance, as both CN and CPR corridors travel through Edmonton carrying a range of commodities, including trains to and from the tar sands, northern mining operations, and the Port of Prince Rupert.

With this body of knowledge, HMM examined this particular study area, and the potential risks for the people and property on the south side of the rail corridor between Ossington Avenue and Kendal Avenue, and considered potential future land use scenarios.

The following definitions apply to the recommendations:

- "Sensitive land uses" means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities.
- "Principal buildings" includes any building where people live, work, shop, sleep, play, or are gathered for other reasons; in other words, a high-occupancy building.
- "Ancillary buildings" includes parking structures, waste storage, or other storage facilities related to the principal use; in other words, a low-occupancy building.

## 8.1 Risk Management Recommendations

Railways are federally or provincially regulated and the City of Toronto has no jurisdiction over rail corridors and railway operations. The City is responsible to ensure land use compatibility along rail corridors, and manage future risks. As noted in the FCM Guidelines (Ref 23, page 6):

"When it comes to rail safety, all parties must be aware that there are inherent safety implications associated with new developments in proximity to a railway line, and that these implications can often be mitigated, but typically not entirely eliminated."

Based on HMM's review of CPR's North Toronto Subdivision between Ossington Avenue and Kendal Avenue, the best practices in place across Canada, and focusing on the most effective way to manage risks to people and property along the rail corridor, HMM recommends best practices mitigation measures be applied to the Dupont Street Regeneration Area, as detailed in the following sections.

### *8.1.1 For Principal Buildings*

Where a building contains high-density or high-occupancy uses, including but not limited to: residential units, seniors housing, education or institutional uses, daycare, place of worship, hotels, entertainment or recreational facilities, retail or office space, the following mitigation measures are recommended, and illustrated in Figure 19.

1. Minimum setback of 30 m measured as a straight horizontal line, perpendicular to the rail property line to the building face, provided:

    i. A berm is constructed within the 30 m setback, on the proposed development land. The berm must be a minimum height of 2.5 m with side slopes not steeper than 2.5 to 1 (horizontal to vertical) on both sides (Ref 23, page 36). Berm height is to be measured from the existing elevation at the rail corridor property line.

    ii. An appropriate noise wall is constructed on top of the berm.

iii. A fence is installed on the development side of the rail property line, minimum 1.83 m chain link, to be paid for and maintained by the development property owner.

iv. The berm can be a simple earthen mound compacted to 95% modified Proctor (Ref 23, page 36), and must be constructed parallel to the rail corridor with returns at the ends.

v. Mitigation measures are peer reviewed by CPR and City of Toronto during the site plan approval process.

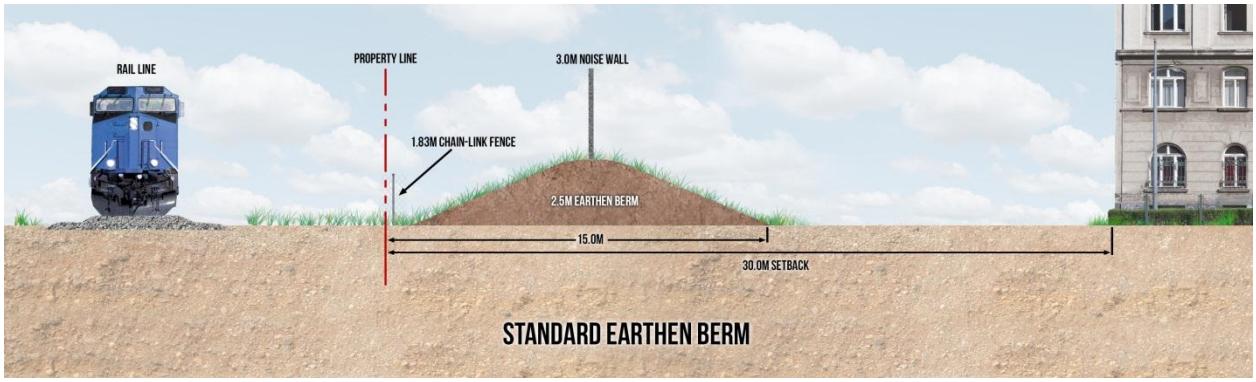



**Figure 19: Recommended Mitigation Measures**

Standard earthen berm design observations:

- Minimum width at the base of the 2.5 m high berm is 14.5 m, assuming the berm is located on relatively flat ground. This is based on two side slopes at 2.5:1 plus the provision of an approximate 2 m flat or rounded area at the top of the berm to accommodate an appropriate noise wall.
- It is noted that the slope on the development side may be more gradual (i.e., flatter than 2.5:1) depending on the finished grade of the development and provided drainage is appropriately accommodated. Also, the level on the development side of the berm may not return to the original ground level.
- The toe-of-slope of the rail-side of the berm should be close to the mutual property line, outside of the rail right-of-way, assuming drainage can be accommodated and in consultation with CPR. If construction of the berm requires access to the rail corridor, appropriate consultation and coordination with CPR is required.

### *8.1.2 For Ancillary Buildings*

Ancillary buildings, such as parking structures or temporary storage, may be provided within the 30m setback between the standard earthen berm (described in Section 8.1.1) and the principal buildings. Ancillary buildings are not to be used in lieu of a berm. Ancillary buildings should be engineered as independent structures, with foundations and structural elements that are separate from principal buildings. If an ancillary building is proposed beyond the berm but within the

30 m setback, the structure and foundation design must include safety mitigation measures to limit damage to principal building(s), on a case by case basis.

Surface parking, parks and open space, natural areas, and storm water drainage facility uses may be included within the 30 m setback, if a standard earthen berm is provided. Recreational facilities that encourage people to gather and spend time in a single place (e.g. playground) should be located beyond the 30 m setback. Recreational facilities that encourage people to move through the space (e.g. trails) may be located within the 30 m setback, beyond the berm.

### *8.1.3 Additional Clarification*

If a 30 m building setback is provided, but a standard earthen berm is not constructed, HMM recommends limiting land uses beyond the 30 m setback to low-occupancy uses such as surface parking lots or parking structures, temporary storage, open space, and stormwater drainage facilities.

## 8.2 Issues for Further Consideration

The City may wish to consider adoption of a zoning by-law amendment, perhaps including tables similar to the detailed tables assembled by the City of Edmonton. Based on the detailed tables developed by the City of Edmonton (included in Appendix D), HMM generally recommends:

- The same berm and setback requirements for the land uses outlined in Edmonton's Tables A through D.
- The land uses in Edmonton's Table E should still require a 30 m setback and 2.5 m high berm. However, there may be flexibility in accepting other mitigation measures designed appropriately and reviewed on a case-by-case basis. This would be at the City's discretion to allow greater use of the 30 m setback area for operations and non-sensitive low-occupancy ancillary uses. The site layout should consider the storage location of any dangerous goods related to the land use.
- The same berm and setback requirements for the land uses outlined in Edmonton's Table F, if applicable to Toronto.

The City may wish to retain a noise & vibration specialist to provide additional information to the Dupont Street Regeneration Area Study, and/or to provide information to future zoning by-law amendments.

# 9. References

1 City of Toronto Official Plan Amendment 231 - By-Law No. 1714-2013. http://www.toronto.ca/legdocs/bylaws/2013/law1714.pdf.

2 Dupont Street Study: Wards 19 and 20. City of Toronto Community Planning. http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=efa15886289e3410VgnVCM10000071d60f89RCRD&vgnextchannel=4b4452cc66061410VgnVCM10000071d60f89RCRD

3 Dupont Corridor Framework Study, Final Report. December 6, 2012. http://www1.toronto.ca/City%20Of%20Toronto/City%20Planning/Community%20Planning/Files/pdf/D/Dupont_Corridor_Framework_Study.pdf

4 "Proposed combined Bloor-Dupont EA Study Area", October 2013, Accessed April 17, 2014 http://www.toronto.ca/legdocs/mmis/2013/pw/bgrd/backgroundfile-62336.pdf

5 Canada Transportation Act (1996), Current to April 16, 2014. Last amended June 26, 2013. http://laws-lois.justice.gc.ca/PDF/C-10.4.pdf

6 Railway Safety Acts R.S.C., 1985, c. 32 (4th Supp.) http://www.canlii.org/en/ca/laws/stat/rsc-1985-c-32-4th-supp/latest/rsc-1985-c-32-4th-supp.html

7 "Stronger Ties: A Shared Commitment to Railway Safety – Review of the Railway Safety Act", November 2007

8 Railway Safety Act Review, Chapter 7 – Proximity Issues: http://www.tc.gc.ca/eng/tcss/RSA_review/chapter7-394.htm

9 Order Fixing May 1, 2013 as the Day on which Certain Provisions of the Safer Railways Act and the Railway Safety Act Come into Force: http://canadagazette.gc.ca/rp-pr/p2/2013/2013-05-08/html/si-tr50-eng.html

10 Transportation of Dangerous Goods Act, 1992. Last amended June 16, 2009. Current to April 16, 2014. http://laws-lois.justice.gc.ca/PDF/T-19.01.pdf

11 Transportation of Dangerous Goods Regulations. Current to April 16, 2014. http://laws-lois.justice.gc.ca/PDF/SOR-2001-286.pdf

12 Transport Canada -2012 Emergency Response Guidebook: https://www.tc.gc.ca/eng/canutec/guide-menu-227.htm

13 Protective Direction No. 32: http://news.gc.ca/web/article-en.do?nid=829079

14 Protective Direction No. 33: http://www.tc.gc.ca/eng/mediaroom/protective-direction-33-7494.html

15 Protective Direction No. 34: http://www.tc.gc.ca/eng/mediaroom/protective-direction-34-7493.html

16 Emergency Directive Pursuant to Section 33 of the Railway Safety Act: Rail Transportation of Dangerous Goods. http://www.tc.gc.ca/eng/mediaroom/emergency-directive-railway-7492.html

17 Minister of Transport Order Pursuant to Section 19 of the Railway Safety Act (MO 14-01). http://www.tc.gc.ca/eng/mediaroom/ministerial-order-railway-7491.html

18 Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c.3)

19 Railway Investigation R14M0002:http://www.tsb.gc.ca/eng/enquetes-investigations/rail/2014/r14m0002/r14m0002.asp

20 Occurrence Classification Policy:http://www.tsb.gc.ca/eng/lois-acts/evenements-occurrences.asp

21 TSB Recommendations R14-01, R14-02, R14-03: http://www.tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1401-r1403.asp

22 Railway Safety Management System Regulations: http://laws-lois.justice.gc.ca/eng/regulations/sor-2001-37/page-1.html

23 “Guidelines for New Development in Proximity to Railway Operations”, Federation of Canadian Municipalities and the Railway Association of Canada, May 2013, http://www.proximityissues.ca/.

24 Operation Lifesaver Website: http://www.operationlifesaver.ca/wp-content/uploads/2010/06/en_TrespGuide2003.pdf

25 Official Plans and Plan Amendments, O. Reg. 543/06, s. 3(9) 7, under the Planning Act (R.S.O. 1990, c. P.13): https://www.canlii.org/en/on/laws/regu/o-reg-543-06/latest/o-reg-543-06.html

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33 Railway Investigation Report R95t0152: http://www.tsb.gc.ca/eng/rapports-reports/rail/1995/r95t0152/r95t0152.asp

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39 Bolton Commuter Rail Feasibility Study (2010), Metrolinx.

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43 Conversation between David Grigg (Senior Associate, HMM) and Randy Marsh, CP Rail

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54 Town of Canmore "Land use By-Law Section 4: General Regulations" http://www.canmore.ca/index.php?option=com_docman&task=doc_download&gid=3105

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58 "Statistical Summary: Railway Occurrences 2010" Transportation Safety Board of Canada

59 "Statistical Summary: Railway Occurrences 2010" Transportation Safety Board of Canada

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61 Provincial Policy Statement, 2014. Ontario Ministry of Municipal Affairs and Housing. http://www.mah.gov.on.ca/Page10679.aspx.

62 Ministry of Environment, Guideline D-6 "Compatibility between Industrial Facilities and Sensitive Land Uses", July 1995

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# Appendix A
# Conversion Requests in the Study Area


Dovercourt Road
Lansdowne Avenue
Shaw Street
Ossington Avenue
Dufferin Street
Bathurst Street
Spadina Road
Davenport Road
Avenue Road
Albany Avenue
Howland Avenue
Palmerston Avenue
Clinton
Manning
Brunswick
Kendal
Walmer
Madison
Huron
St. George
Dupont Street
1
2
3
4
5
6
7

# Appendix B
# Excerpts from Emergency Response Guidebook (CANUTEC)

## HAZARD CLASSIFICATION SYSTEM

The hazard class of dangerous goods is indicated either by its class (or division) number or name. Placards are used to identify the class or division of a material. The hazard class or division number must be displayed in the lower corner of a placard and is required for both primary and subsidiary hazard classes and divisions, if applicable. For other than Class 7 or the OXYGEN placard, text indicating a hazard (for example, "CORROSIVE") is not required. Text is shown only in the U.S. The hazard class or division number and subsidiary hazard classes or division numbers placed in parentheses (when applicable), must appear on the shipping document after each proper shipping name.

**Class 1 - Explosives**

| | |
|---|---|
| Division 1.1 | Explosives with a mass explosion hazard |
| Division 1.2 | Explosives with a projection hazard |
| Division 1.3 | Explosives with predominantly a fire hazard |
| Division 1.4 | Explosives with no significant blast hazard |
| Division 1.5 | Very insensitive explosives with a mass explosion hazard |
| Division 1.6 | Extremely insensitive articles |

**Class 2 - Gases**

| | |
|---|---|
| Division 2.1 | Flammable gases |
| Division 2.2 | Non-flammable, non-toxic* gases |
| Division 2.3 | Toxic* gases |

**Class 3 - Flammable liquids (and Combustible liquids** [U.S.])

**Class 4 - Flammable solids; Spontaneously combustible materials; and Dangerous when wet materials/Water-reactive substances**

| | |
|---|---|
| Division 4.1 | Flammable solids |
| Division 4.2 | Spontaneously combustible materials |
| Division 4.3 | Water-reactive substances/Dangerous when wet materials |

**Class 5 - Oxidizing substances and Organic peroxides**

| | |
|---|---|
| Division 5.1 | Oxidizing substances |
| Division 5.2 | Organic peroxides |

**Class 6 - Toxic* substances and Infectious substances**

| | |
|---|---|
| Division 6.1 | Toxic*substances |
| Division 6.2 | Infectious substances |

**Class 7 - Radioactive materials**

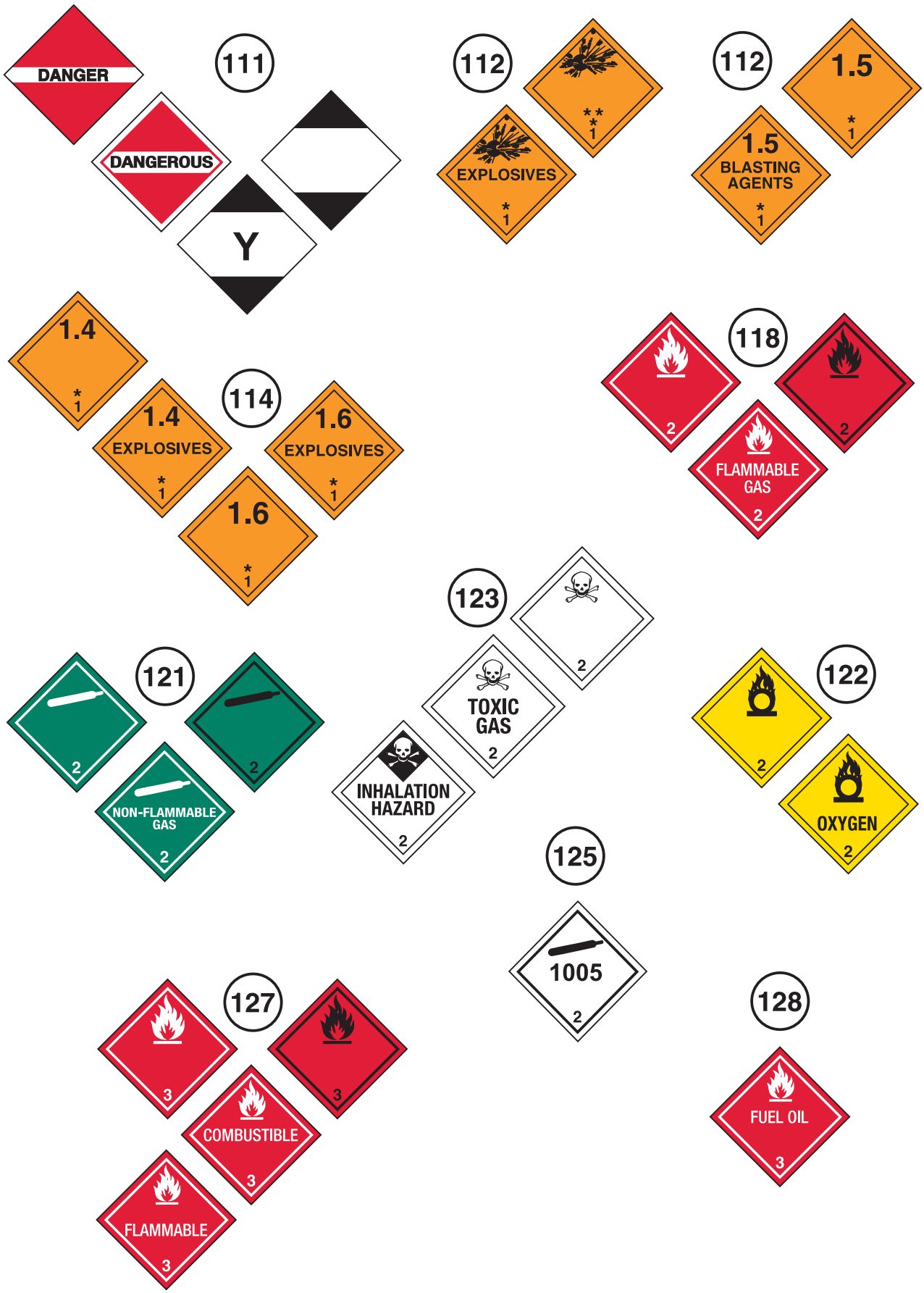
**Class 8 - Corrosive substances**

**Class 9 - Miscellaneous hazardous materials/Products, Substances or Organisms**

* The words "poison" or "poisonous" are synonymous with the word "toxic".

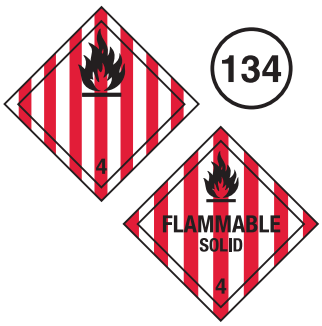
## TABLE OF PLACARDS AND INITIAL

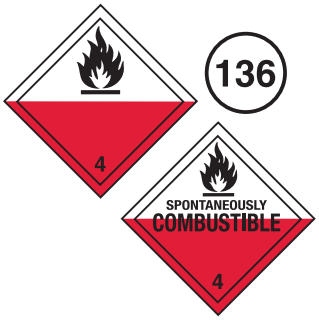
USE THIS TABLE ONLY IF MATERIALS CANNOT BE SPECIFICALLY IDENTIFIED BY



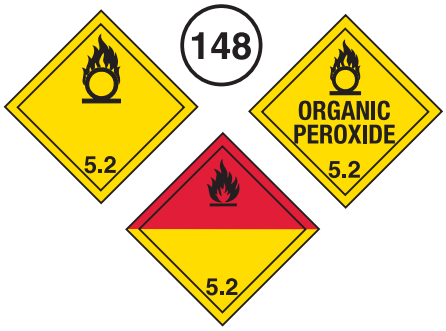
# RESPONSE GUIDE TO USE ON-SCENE

USING THE SHIPPING DOCUMENT, NUMBERED PLACARD, OR ORANGE PANEL NUMBER

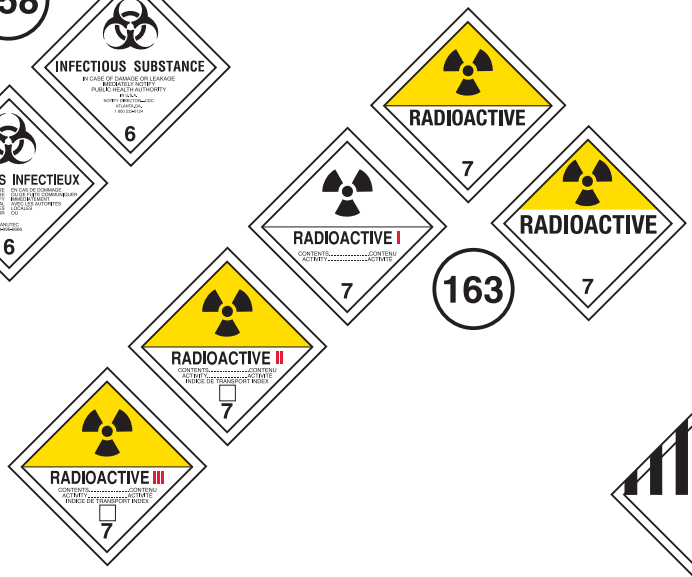


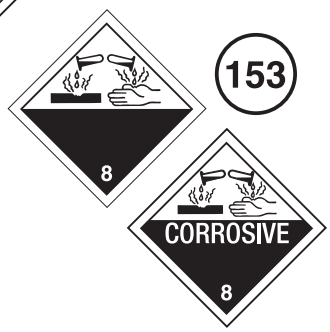





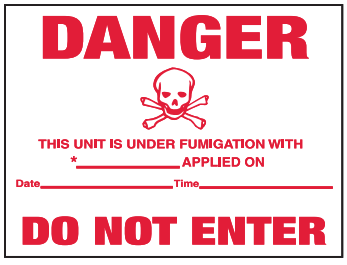



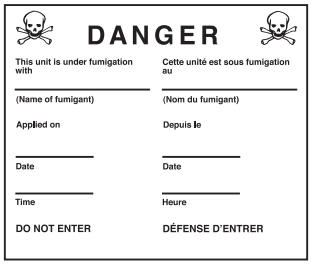








# Appendix C
# Transportation and Safety Data

## Table S3: Railways under Federal Jurisdiction, Accidents and Incidents, 2007–2012

| | *2007*[3] | *2008* | *2009* | *2010* | *2011*[R] | *2012*[P] | *Average 2007–2011* |
|---|---|---|---|---|---|---|---|
| **Accident Type** | | | | | | | |
| Crossing collision | 218 | 221 | 188 | 181 | 170 | 187 | 195.6 |
| Trespasser accident | 101 | 73 | 72 | 81 | 67 | 74 | 78.8 |
| Main-track train derailment | 159 | 129 | 67 | 80 | 101 | 63 | 107.2 |
| Main-track train collision | 9 | 6 | 5 | 4 | 3 | 6 | 5.4 |
| Non-main-track train derailment | 631 | 570 | 497 | 541 | 484 | 499 | 544.6 |
| Non-main-track train collision | 102 | 91 | 95 | 93 | 87 | 102 | 93.6 |
| Derailment involving track unit | 2 | 5 | 20 | 11 | 10 | 7 | 9.6 |
| Collision involving track unit | 28 | 22 | 30 | 23 | 23 | 17 | 25.2 |
| Employee accident | 14 | 11 | 12 | 9 | 10 | 5 | 11.2 |
| Passenger accident | 4 | 1 | 0 | 0 | 1 | 2 | 1.2 |
| Rolling stock with object | 4 | 6 | 14 | 3 | 18 | 18 | 9.0 |
| Rolling stock with abandoned vehicle | 12 | 15 | 10 | 9 | 4 | 6 | 10.0 |
| Rolling stock damage without derail./Coll. | 11 | 17 | 13 | 11 | 20 | 9 | 14.4 |
| Fire | 25 | 12 | 20 | 30 | 23 | 17 | 22.0 |
| **Total Accidents** | **1,320** | **1,179** | **1,043** | **1,076** | **1,021** | **1,012** | **1,127.8** |
| **Incident Type** | | | | | | | |
| Main-track switch in abnormal position | 7 | 13 | 4 | 5 | 10 | 5 | 7.8 |
| Movement exceeds limits of authority | 106 | 111 | 106 | 102 | 118 | 120 | 108.6 |
| Signal less restrictive than required | 0 | 3 | 1 | 4 | 3 | 1 | 2.2 |
| Unprotected overlap of authorities | 8 | 7 | 7 | 3 | 7 | 5 | 6.4 |
| Runaway rolling stock | 13 | 16 | 11 | 5 | 15 | 9 | 12.0 |
| Crew member incapacitated | 1 | 2 | 0 | 1 | 0 | 1 | 0.8 |
| Dangerous goods leaker | 88 | 64 | 78 | 40 | 51 | 63 | 64.2 |
| **Total Incidents** | **223** | **216** | **207** | **160** | **204** | **204** | **202.0** |
| **Million Train-Miles (MTM)**[1] | **92.8** | **90.9** | **78.4** | **84.1** | **85.2** | **86.1** | **86.3** |
| **Accidents Per MTM - Accident Rate** | **14.2** | **13.0** | **13.3** | **12.8** | **12.0** | **11.8** | **13.1** |
| **Accident Fatalities** | | | | | | | |
| Crossing collision | 25 | 26 | 19 | 24 | 25 | 29 | 23.8 |
| Trespasser accident | 56 | 47 | 52 | 55 | 45 | 49 | 51.0 |
| Other | 3 | 1 | 0 | 2 | 1 | 4 | 1.4 |
| **Total Fatalities** | **84** | **74** | **71** | **81** | **71** | **82** | **76.2** |
| **Accident Injuries** | | | | | | | |
| Crossing collision | 21 | 36 | 21 | 28 | 22 | 32 | 25.6 |
| Trespasser accident | 27 | 20 | 16 | 19 | 21 | 20 | 20.6 |
| Other | 10 | 7 | 13 | 15 | 9 | 19 | 10.8 |
| **Total Injuries** | **58** | **63** | **50** | **62** | **52** | **71** | **57.0** |
| **Dangerous Goods Involved in Accidents** | **189** | **151** | **132** | **141** | **116** | **119** | **145.8** |
| **Passenger Train Accidents** | **83** | **79** | **68** | **62** | **66** | **48** | **71.6** |
| **Passenger Train-Miles (PTM)**[2] | **6.8** | **6.8** | **6.7** | **6.7** | **6.5** | **6.3** | **6.7** |
| **Passenger Rate** | **12.2** | **11.6** | **10.1** | **9.3** | **10.1** | **7.6** | **10.7** |

Notes: R= Revised data. P = Preliminary data as of January 31, 2013. The reported occurrences cover only the federal jurisdiction. Final figures over preliminary and estimated figures historically have changed less than one per cent. Fatalities and serious injuries involved in incidents are not included in the Fatality and Serious Injury totals. For accident and reportable incident definitions, see Transportation Safety Board Web site: http://www.tsb.gc.ca/eng/stats/rail/2011/ss11.asp#AppB.

1 Train-miles include main-track miles and yard switching miles.

2 PTM = Passenger train-miles; figures are estimated.

3 In 2007, the Transportation Safety Board requested the reporting of missing accident data from one railway that had misinterpreted the accident reporting criteria. The accident data were revised between the years 2001 and 2006. Therefore, comparisons with years prior to 2001 should be made with caution.

*Source: Transport Canada, adapted from the Transportation Safety Board, Transport Canada (activity data)*

**TABLE A4-2: ACCIDENTS – RAILWAYS UNDER FEDERAL JURISDICTION, 1998 – 2003**

| | *1998* | *1999* | *2000* | *2001* | *2002* | *2003* | *1998 – 2002 Average* |
|---|---|---|---|---|---|---|---|
| **Accidents** | | | | | | | |
| Main-track train collisions | 14 | 10 | 9 | 7 | 8 | 6 | 9.6 |
| Main-track train derailments | 108 | 119 | 121 | 127 | 116 | 148 | 118.2 |
| Crossings | 273 | 283 | 263 | 278 | 261 | 248 | 271.6 |
| Non-main-track train collisions | 114 | 100 | 113 | 86 | 112 | 104 | 105.0 |
| Non-main-track train derailments | 388 | 403 | 387 | 385 | 347 | 387 | 382.0 |
| Collisions/derailments involving track units | 13 | 27 | 16 | 18 | 11 | 23 | 17.0 |
| Employee/passenger | 10 | 13 | 13 | 8 | 8 | 6 | 10.4 |
| Trespassers | 78 | 95 | 79 | 79 | 73 | 68 | 80.8 |
| Fires/explosions | 51 | 53 | 32 | 36 | 24 | 23 | 39.2 |
| Rolling stock with object | 11 | 14 | 6 | 14 | 5 | 6 | 9.8 |
| Rolling stock with abandoned vehicle | 1 | 1 | 12 | 5 | 3 | 2 | 4.4 |
| Rolling stock damage without derail./coll. | 14 | 11 | 12 | 17 | 16 | 7 | 14.2 |
| **Total** | **1,075** | **1,129** | **1,063** | **1,060** | **984** | **1,028** | **1,062.2** |
| **Incidents** | | | | | | | |
| Dangerous goods leaker | 272 | 167 | 188 | 194 | 167 | 151 | 197.6 |
| Main-track switch in abnormal position | 14 | 15 | 17 | 9 | 9 | 11 | 12.8 |
| Movement exceeds limits of authority | 107 | 115 | 102 | 94 | 94 | 103 | 102.4 |
| Runaway rolling stock | 20 | 15 | 9 | 10 | 19 | 13 | 14.4 |
| Signal less restricted than required | 9 | 8 | 2 | 7 | 3 | 2 | 5.8 |
| Unprotected overlap of authorities | 16 | 11 | 11 | 4 | 5 | 9 | 9.6 |
| Crew member incapacitated | 0 | 2 | 1 | 4 | 6 | 6 | 2.6 |
| **Total** | **438** | **333** | **330** | **322** | **303** | **295** | **345.2** |
| Million train-miles[1] | 89.7 | 88.8 | 90.2 | 89.5 | 89.6 | 89.5 | 89.5 |
| Accidents/million train-miles | 12.0 | 12.7 | 11.8 | 11.8 | 11.0 | 11.5 | 11.9 |
| **Fatalities** | | | | | | | |
| Crossings | 39 | 37 | 33 | 41 | 46 | 27 | 39.2 |
| Trespassers | 61 | 62 | 54 | 56 | 49 | 46 | 56.6 |
| All others | 1 | 7 | 1 | 2 | 1 | 4 | 2.2 |
| **Total** | **101** | **106** | **88** | **99** | **96** | **77** | **98.0** |
| **Serious Injuries** | | | | | | | |
| Crossings | 43 | 45 | 33 | 47 | 42 | 50 | 42.0 |
| Trespassers | 17 | 34 | 23 | 22 | 21 | 21 | 23.4 |
| All others | 15 | 18 | 10 | 19 | 8 | 6 | 14.0 |
| **Total** | **75** | **97** | **66** | **88** | **71** | **77** | **79.4** |
| **Accidents Involving Dangerous Goods (DG)** | **239** | **221** | **247** | **203** | **220** | **223** | **226.0** |
| **Accidents with a DG Release** | **5** | **7** | **6** | **4** | **5** | **7** | **5.4** |
| **Accidents Involving Passenger Trains** | **68** | **71** | **61** | **76** | **67** | **53** | **68.6** |
| **Passenger Train Accidents per PTM[2]** | **8.4** | **8.5** | **7.0** | **8.6** | **7.6** | **6.0** | **7.9** |
| **Federal Railroad Companies** | 37 | 37 | 38 | 38 | 39 | 40 | |
| **Federal Track Miles** | 41,228 | 39,833 | 39,169 | 39,067 | 38,839 | 39,047 | |

1 Million train-miles include main track miles and yard switching miles. Numbers are estimated for 2003.

2 PTM = Passenger Train-Miles; estimated for 2003.

Notes: The reported occurrences cover only the federal jurisdiction. Canada's rail network was restructured in the mid-1990s. In 2003, the rail network accounted for 83 per cent (with 40 federally regulated companies and 42 provincially), while the remaining 17 per cent were under provincial jurisdiction.
Figures are preliminary as of January 16, 2004. Final figures over preliminary and estimated figures historically have changed less than one per cent. Two fatalities and four serious injuries involved in incidents are not included in the Fatality and Serious Injury totals. For accident and reportable incident definitions, see Transportation Safety Boad Regulation Web site: http://www.bst.gc.ca

*Source: Transportation Safety Board, Transport Canada (activity data)*

## Table S4: Railways under Federal Jurisdiction, Accidents by Province/Territory, 2007–2012

| *Province/Territory* | *Data* | *2007* | *2008* | *2009* | *2010* | *2011[R]* | *2012[P]* | *Average 2007–2011* |
|---|---|---|---|---|---|---|---|---|
| **Newfoundland and Labrador** | Occurrences | 1 | 1 | 4 | 4 | 3 | 4 | 2.6 |
| | Fatalities | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Injuries (serious) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nova Scotia** | Occurrences | 13 | 7 | 8 | 7 | 4 | 6 | 7.8 |
| | Fatalities | 1 | 0 | 1 | 1 | 0 | 0 | 0.6 |
| | Injuries (serious) | 0 | 1 | 0 | 2 | 0 | 0 | 0.6 |
| **New Brunswick** | Occurrences | 25 | 24 | 18 | 18 | 23 | 11 | 21.6 |
| | Fatalities | 3 | 2 | 3 | 1 | 3 | 2 | 2.4 |
| | Injuries (serious) | 3 | 1 | 0 | 0 | 1 | 0 | 1 |
| **Quebec** | Occurrences | 153 | 145 | 115 | 123 | 123 | 113 | 131.8 |
| | Fatalities | 8 | 17 | 8 | 11 | 12 | 8 | 11.2 |
| | Injuries (serious) | 5 | 3 | 8 | 15 | 7 | 4 | 7.6 |
| **Ontario** | Occurrences | 363 | 327 | 287 | 266 | 255 | 197 | 299.6 |
| | Fatalities | 45 | 36 | 33 | 35 | 36 | 35 | 37 |
| | Injuries (serious) | 17 | 24 | 12 | 12 | 14 | 30 | 15.8 |
| **Manitoba** | Occurrences | 109 | 114 | 116 | 114 | 101 | 123 | 110.8 |
| | Fatalities | 4 | 4 | 4 | 4 | 3 | 5 | 3.8 |
| | Injuries (serious) | 7 | 7 | 3 | 6 | 4 | 9 | 5.4 |
| **Saskatchewan** | Occurrences | 130 | 111 | 91 | 123 | 123 | 124 | 115.6 |
| | Fatalities | 2 | 5 | 7 | 7 | 2 | 12 | 4.6 |
| | Injuries (serious) | 4 | 7 | 6 | 4 | 3 | 6 | 4.8 |
| **Alberta** | Occurrences | 279 | 246 | 229 | 245 | 211 | 267 | 242 |
| | Fatalities | 12 | 6 | 6 | 12 | 7 | 12 | 8.6 |
| | Injuries (serious) | 10 | 11 | 10 | 13 | 9 | 12 | 10.6 |
| **British Columbia** | Occurrences | 245 | 204 | 171 | 176 | 177 | 167 | 194.6 |
| | Fatalities | 9 | 4 | 9 | 10 | 8 | 8 | 8 |
| | Injuries (serious) | 12 | 9 | 11 | 10 | 14 | 10 | 11.2 |
| **Northwest Territories and Nunavut** | Occurrences | 2 | 0 | 4 | 0 | 1 | 0 | 1.4 |
| | Fatalities | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Injuries (serious) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Occurrences** | | **1,320** | **1,179** | **1,043** | **1,076** | **1,021** | **1012** | **1,127.8** |
| **Total Fatalities** | | **84** | **74** | **71** | **81** | **71** | **82** | **76.2** |
| **Total Injuries** | | **58** | **63** | **50** | **62** | **52** | **71** | **57.0** |

Note: R= Revised data. P = Preliminary data as of January 31, 2013.

*Source: Transport Canada, adapted from the Transportation Safety Board*

**TABLE A4-3: ACCIDENTS BY PROVINCE – RAILWAYS UNDER FEDERAL JURISDICTION, 1998 – 2003**

| | *1998* | *1999* | *2000* | *2001* | *2002* | *2003* | *1998 – 2001 Average* |
|---|---|---|---|---|---|---|---|
| **Accidents** | | | | | | | |
| Newfoundland and Labrador | 2 | 0 | 3 | 3 | 2 | 0 | 2.0 |
| Nova Scotia | 9 | 13 | 9 | 19 | 11 | 22 | 12.2 |
| New Brunswick | 13 | 23 | 13 | 32 | 24 | 32 | 21.0 |
| Quebec | 186 | 200 | 169 | 164 | 153 | 159 | 174.4 |
| Ontario | 333 | 359 | 341 | 355 | 352 | 373 | 348.0 |
| Manitoba | 111 | 96 | 100 | 91 | 81 | 73 | 95.8 |
| Saskatchewan | 95 | 91 | 80 | 87 | 64 | 80 | 83.4 |
| Alberta | 192 | 183 | 202 | 159 | 169 | 154 | 181.0 |
| Northwest Territories and Nunavut | 0 | 2 | 0 | 1 | 1 | 1 | 0.8 |
| British Columbia | 134 | 162 | 146 | 149 | 127 | 134 | 143.6 |
| **Total** | **1,075** | **1,129** | **1,063** | **1,060** | **984** | **1,028** | **1,062.2** |
| **Fatalities** | | | | | | | |
| Newfoundland and Labrador | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Nova Scotia | 0 | 0 | 1 | 3 | 0 | 0 | 0.8 |
| New Brunswick | 0 | 0 | 1 | 0 | 2 | 0 | 0.6 |
| Quebec | 18 | 27 | 18 | 13 | 18 | 8 | 18.8 |
| Ontario | 45 | 53 | 42 | 46 | 48 | 45 | 46.8 |
| Manitoba | 10 | 4 | 2 | 5 | 6 | 4 | 5.4 |
| Saskatchewan | 6 | 2 | 6 | 11 | 3 | 5 | 5.6 |
| Alberta | 12 | 12 | 7 | 13 | 11 | 8 | 11.0 |
| Northwest Territories and Nunavut | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| British Columbia | 10 | 8 | 11 | 8 | 8 | 7 | 9.0 |
| **Total** | **101** | **106** | **88** | **99** | **96** | **77** | **98.0** |
| **Serious Injuries** | | | | | | | |
| Newfoundland and Labrador | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| Nova Scotia | 1 | 0 | 0 | 9 | 2 | 0 | 2.4 |
| New Brunswick | 1 | 0 | 0 | 3 | 1 | 1 | 1.0 |
| Quebec | 10 | 11 | 12 | 8 | 9 | 8 | 10.0 |
| Ontario | 21 | 43 | 19 | 29 | 28 | 29 | 28.0 |
| Manitoba | 8 | 6 | 5 | 9 | 5 | 5 | 6.6 |
| Saskatchewan | 7 | 10 | 4 | 6 | 4 | 7 | 6.2 |
| Alberta | 17 | 17 | 16 | 16 | 15 | 13 | 16.2 |
| Northwest Territories and Nunavut | 0 | 0 | 0 | 1 | 0 | 0 | 0.2 |
| British Columbia | 10 | 10 | 10 | 7 | 7 | 14 | 8.8 |
| **Total** | **75** | **97** | **66** | **88** | **71** | **77** | **79.4** |

Note: Figures are preliminary as of January 16, 2004.

*Source: Transportation Safety Board*

## Table RA7: Revenue Tonne-Kilometres, by Railway Sector, 2002–2011

(Millions)

| | *2002* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010*[R] | *2011* |
|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 292,182.2 | 293,870.6 | 313,654.4 | 328,269.5 | 330,988.7 | 338,344.4 | 325,019.6 | 288,842.5 | 327,831.6 | 337,929.5 |
| Regional | 18,406.6 | 16,670.7 | 16,857.8 | 15,220.7 | 14,818.9 | 13,701.2 | 14,336.7 | 7,711.3 | 9,802.8 | 10,392.4 |
| Shortlines | 7,151.7 | 7,435.8 | 7,898.5 | 8,652.5 | 6,681.2 | 5,197.6 | 5,462.5 | 3,227.7 | 3,690.1 | 2,925.9 |
| **Total** | **317,740.5** | **317,977.1** | **338,410.8** | **352,142.7** | **352,488.8** | **357,243.2** | **344,818.7** | **299,781.4** | **341,324.5** | **351,247.8** |
| | | | | | Percentage of Total | | | | | |
| Class I | 92.0 | 92.4 | 92.7 | 93.2 | 93.9 | 94.7 | 94.3 | 96.4 | 96.0 | 96.2 |
| Regional | 5.8 | 5.2 | 5.0 | 4.3 | 4.2 | 3.8 | 4.2 | 2.6 | 2.9 | 3.0 |
| Shortlines | 2.3 | 2.3 | 2.3 | 2.5 | 1.9 | 1.5 | 1.6 | 1.1 | 1.1 | 0.8 |

Note: R = Revised data.

*Sources: Transport Canada, Statistics Canada*

## Table RA8: Traffic Received and Forwarded, by Canadian-Based Class II Carriers[1], 2003–2012

(Millions of tonnes)

| *Year* | *Received only* | *Forwarded only* | *Received and Forwarded* |
|---|---|---|---|
| 2003 | 8.51 | 17.95 | 0.52 |
| 2004 | 7.86 | 15.85 | 0.37 |
| 2005 | 8.31 | 16.23 | 0.37 |
| 2006 | 8.17 | 14.92 | 0.37 |
| 2007 | 8.78 | 14.06 | 0.34 |
| 2008 | 8.58 | 12.96 | 0.35 |
| 2009 | 7.08 | 10.58 | 0.75 |
| 2010 | 7.45 | 11.20 | 0.71 |
| 2011[R] | 7.77 | 11.79 | 0.75 |
| 2012[P] | 6.27 | 10.85 | 0.68 |

Notes: P = Preliminary data. R = Revised data.
"Received only" applies to movements in which a Class II carrier was involved by only receiving from Canadian National (CN) or Canadian Pacific Railway (CPR).
"Forwarded only" applies to movements in which a Class II carrier was involved by only forwarding to CN or CPR.
"Received and Forwarded" applies to movements in which one or more Class II carriers received from and forwarded to CN and CPR.
1 Does not include U.S.-based carriers operating in Canada.

*Sources: Transport Canada, Statistics Canada*

## Table RA9: Tonnage Carried, by Railway Sector,[1] 2002–2011

(Thousands of tonnes)

| | *2002* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010*[R] | *2011* |
|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 227,355.8 | 229,930.0 | 247,641.2 | 258,617.5 | 256,043.6 | 260,378.7 | 246,996.3 | 216,365.1 | 239,578.6 | 247,468.7 |
| Regional | 42,855.9 | 43,250.1 | 38,999.5 | 34,038.8 | 32,208.3 | 30,439.0 | 30,367.9 | 21,279.4 | 24,391.1 | 26,773.9 |
| Shortlines | 65,166.3 | 64,285.0 | 69,287.4 | 77,286.7 | 69,112.3 | 62,522.5 | 59,239.3 | 41,202.1 | 46,858.2 | 52,010.1 |
| **Total** | **335,378.0** | **337,465.2** | **355,928.2** | **369,943.0** | **357,364.1** | **353,340.2** | **336,603.5** | **278,846.5** | **310,827.9** | **326,252.7** |
| | | | | | Percentage of Total | | | | | |
| Class I | 67.8 | 68.1 | 69.6 | 69.9 | 71.6 | 73.7 | 73.4 | 77.6 | 77.1 | 75.9 |
| Regional | 12.8 | 12.8 | 11.0 | 9.2 | 9.0 | 8.6 | 9.0 | 7.6 | 7.8 | 8.2 |
| Shortlines | 19.4 | 19.0 | 19.5 | 20.9 | 19.3 | 17.7 | 17.6 | 14.8 | 15.1 | 15.9 |

Note: R = Revised data.
1 Includes significant double-counting of tonnages; not to be considered as originating traffic.

*Source: Transport Canada, Statistics Canada*

**TABLE A6-6: REVENUE TONNE-KILOMETRES, 1990 – 2002**

(Millions of tonne-kilometres)

| | *1990* | *1991* | *1992* | *1993* | *1994* | *1995* | *1996* | *1997* | *1998* | *1999* | *2000* | *2001* | *2002* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 224,751.0 | 236,985.6 | 228,328.7 | 234,478.3 | 262,855.6 | 254,150.0 | 256,994.6 | 278,642.2 | 268,736.7 | 271,495.6 | 291,678.5 | 292,916.6 | 292,195.7 |
| Regional | 22,055.6 | 22,180.6 | 20,900.6 | 20,550.7 | 23,082.3 | 23,997.4 | 23,099.9 | 23,981.3 | 23,771.5 | 21,253.9 | 23,273.4 | 20,847.5 | 19,773.3 |
| Shortline | 1,561.2 | 1,213.4 | 1,217.4 | 1,085.7 | 1,126.0 | 1,492.1 | 1,833.7 | 4,431.2 | 7,717.2 | 8,661.1 | 8,638.3 | 8,719.8 | 9,980.5 |
| **Total** | **248,367.9** | **260,379.6** | **250,446.7** | **256,114.8** | **287,063.9** | **279,639.6** | **281,928.2** | **307,054.7** | **300,225.5** | **301,410.5** | **323,590.2** | **322,483.9** | **321,949.5** |

(Percentage of total)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 90.5 | 91.0 | 91.2 | 91.6 | 91.6 | 90.9 | 91.2 | 90.7 | 89.5 | 90.1 | 90.1 | 90.8 | 90.8 |
| Regional | 8.9 | 8.5 | 8.3 | 8.0 | 8.0 | 8.6 | 8.2 | 7.8 | 7.9 | 7.1 | 7.2 | 6.5 | 6.1 |
| Shortline | 0.6 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.7 | 1.4 | 2.6 | 2.9 | 2.7 | 2.7 | 3.1 |

*Source: Transport Canada, Statistics Canada*

**TABLE A6-7: TRAFFIC RECEIVED AND FORWARDED BY CLASS II CARRIERS,[1] 1996 – 2002**

(Millions of tonnes)

| | *Received only* | *Forwarded only* | *Received and Forwarded* |
|---|---|---|---|
| 1996 | 3.00 | 10.36 | 0.12 |
| 1997 | 4.77 | 13.12 | 0.17 |
| 1998 | 7.47 | 16.70 | 0.49 |
| 1999 | 8.13 | 18.51 | 0.50 |
| 2000 | 8.68 | 18.94 | 0.47 |
| 2001 | 8.57 | 18.48 | 0.48 |
| 2002 | 8.08 | 19.48 | 0.35 |

Notes: Received only: applies to movements in which a Class II carrier was involved by only receiving from CN or CP.
Forwarded only: applies to movements in which a Class II carrier was involved by only forwarding to CN or CP.
Received and Forwarded: applies to movements in which one or more Class II carriers received from and forwarded to CN and CP.

1 Does not include U.S.-based carriers operating in Canada.

*Source: Transport Canada*

**TABLE A6-8: TONNAGE ORIGINATING BY RAILWAY SECTOR, 1990 – 2002**

(Thousands of tonnes)

| | *1990* | *1991* | *1992* | *1993* | *1994* | *1995* | *1996* | *1997* | *1998* | *1999* | *2000* | *2001* | *2002* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 184,632.9 | 189,787.9 | 182,105.2 | 185,118.9 | 208,015.4 | 207,980.7 | 207,927.3 | 224,375.7 | 216,222.3 | 220,617.5 | 230,359.1 | 230,625.4 | 227,355.8 |
| Regional | 55,939.2 | 56,643.9 | 52,429.4 | 51,036.4 | 56,884.2 | 58,024.7 | 56,761.3 | 57,256.1 | 56,157.3 | 49,654.9 | 54,320.4 | 48,677.9 | 46,122.0 |
| Shortline | 24,594.1 | 23,092.6 | 23,423.9 | 21,678.7 | 24,148.0 | 26,258.6 | 28,359.6 | 41,593.7 | 56,572.4 | 62,543.9 | 66,711.2 | 62,315.2 | 70,818.9 |
| **Total** | **265,166.1** | **269,524.4** | **257,958.5** | **257,834.0** | **289,047.7** | **292,264.0** | **293,048.2** | **323,225.5** | **328,952.1** | **332,816.4** | **351,390.6** | **341,618.4** | **344,296.8** |

(Percentage of total)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class I | 69.6 | 70.4 | 70.6 | 71.8 | 72.0 | 71.2 | 71.0 | 69.4 | 65.7 | 66.3 | 65.6 | 67.5 | 66.0 |
| Regional | 21.1 | 21.0 | 20.3 | 19.8 | 19.7 | 19.9 | 19.4 | 17.7 | 17.1 | 14.9 | 15.5 | 14.2 | 13.4 |
| Shortline | 9.3 | 8.6 | 9.1 | 8.4 | 8.4 | 9.0 | 9.7 | 12.9 | 17.2 | 18.8 | 19.0 | 18.2 | 20.6 |

Note: Figures include significant double-counting of tonnages; not to be considered as originating traffic.

*Source: Transport Canada, Statistics Canada*

## Table RA10: Annual Railway Carloadings, 2003–2012

### Total Carloadings by Commodity

(Thousands of Tonnes)

| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* |
|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 22,692.3 | 27,552.7 | 27,205.3 | 31,779.9 | 31,910.3 | 30,499.6 | 36,633.9 | 34,218.3 | 35,420.2 | 36,305.4 |
| Other Agricultural and Food Products | 6,467.7 | 7,362.8 | 8,096.8 | 8,565.9 | 8,932.9 | 8,668.0 | 11,417.0 | 13,802.3 | 13,896.4 | 15,222.6 |
| Coal | 31,773.1 | 33,137.4 | 35,071.5 | 32,847.1 | 35,677.9 | 35,921.2 | 30,774.8 | 37,801.5 | 37,899.4 | 39,219.8 |
| Fertilizer Materials | 27,614.2 | 30,713.8 | 30,040.9 | 26,578.7 | 30,352.7 | 28,910.6 | 17,605.8 | 26,221.6 | 28,787.8 | 24,783.8 |
| Iron Ore and Concentrates (including pellets) | 32,916.1 | 27,849.4 | 32,285.9 | 33,931.1 | 32,813.9 | 34,238.6 | 29,720.5 | 35,886.6 | 33,708.5 | 32,320.0 |
| Ores and Mine Products | 23,129.0 | 25,353.8 | 25,951.3 | 24,866.4 | 22,731.6 | 22,640.1 | 16,907.1 | 17,755.5 | 19,168.0 | 18,874.6 |
| Processed Forest Products | 24,840.2 | 28,984.7 | 32,552.9 | 32,204.1 | 26,907.0 | 20,785.9 | 15,849.4 | 13,393.4 | 17,623.8 | 18,261.9 |
| Non-Processed Forest Products | 17,219.9 | 18,159.3 | 18,163.4 | 15,957.1 | 14,410.4 | 13,153.6 | 10,791.8 | 8,382.3 | 11,773.4 | 11,303.2 |
| Ferrous and Non-Ferrous Metals | 10,630.1 | 12,714.8 | 12,764.6 | 13,546.5 | 13,814.2 | 13,516.9 | 9,376.2 | 11,968.3 | 13,281.5 | 12,281.2 |
| Autos and Parts | 5,165.8 | 5,157.0 | 4,866.7 | 4,578.9 | 4,408.8 | 3,689.0 | 3,024.1 | 3,847.9 | 3,840.8 | 4,620.1 |
| Refined Petroleum Products | 14,371.1 | 14,354.0 | 14,503.2 | 14,425.9 | 15,126.2 | 14,318.5 | 14,506.4 | 14,799.4 | 15,902.4 | 20,770.0 |
| Chemicals | 14,318.8 | 15,927.8 | 15,349.5 | 15,601.9 | 15,120.8 | 14,556.5 | 13,145.1 | 13,281.9 | 14,741.9 | 14,668.8 |
| Miscellaneous | 1,261.6 | 1,246.7 | 1,183.1 | 1,071.9 | 736.2 | 765.6 | 1,730.4 | 1,850.6 | 2,046.6 | 2,182.1 |
| Carload Traffic Loaded | 232,400.0 | 248,514.1 | 258,035.2 | 255,955.2 | 252,942.9 | 241,664.1 | 211,482.5 | 233,209.5 | 248,090.7 | 250,813.5 |
| Intermodal | 26,241.4 | 27,113.9 | 27,771.9 | 28,337.7 | 28,812.9 | 28,165.7 | 24,819.1 | 26,981.3 | 27,530.4 | 29,083.9 |
| **Total** | **258,641.4** | **275,628.0** | **285,807.0** | **284,293.0** | **281,755.8** | **269,829.7** | **236,301.6** | **260,190.9** | **275,621.1** | **279,897.5** |

### Western[1] Carloadings by Commodity

(Thousands of Tonnes)

| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* |
|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 21,998.3 | 26,640.6 | 26,307.5 | 30,929.0 | 31,318.5 | 29,607.2 | 33,768.5 | 31,344.6 | 32,523.4 | 33,788.4 |
| Other Agricultural and Food Products | 4,903.5 | 5,756.9 | 6,377.9 | 6,960.7 | 7,208.6 | 6,908.7 | 7,822.4 | 9,213.0 | 9,796.2 | 9,624.6 |
| Coal | 28,483.6 | 30,126.6 | 31,920.4 | 29,813.0 | 33,151.5 | 33,137.2 | 28,185.2 | 35,190.0 | 35,580.5 | 37,287.0 |
| Fertilizer Materials | 25,155.8 | 28,030.5 | 27,579.8 | 24,946.0 | 28,570.1 | 26,765.3 | 15,835.8 | 24,221.0 | 26,605.2 | 22,754.7 |
| Iron Ore and Concentrates (including pellets) | - | 0.1 | - | - | 0.6 | 0.1 | - | - | 0.0 | 0.0 |
| Ores and Mine Products | 5,452.2 | 5,308.7 | 5,631.4 | 5,283.2 | 4,773.8 | 5,650.7 | 4,094.4 | 5,402.0 | 6,121.2 | 6,309.9 |
| Processed Forest Products | 13,407.2 | 14,382.0 | 18,148.1 | 18,254.1 | 15,831.3 | 11,843.4 | 9,311.5 | 7,374.5 | 10,943.5 | 11,934.1 |
| Non-Processed Forest Products | 11,413.6 | 11,477.5 | 11,849.4 | 10,324.0 | 9,611.1 | 8,813.4 | 7,838.3 | 5,461.3 | 8,408.8 | 8,382.8 |
| Ferrous and Non-Ferrous Metals | 2,178.8 | 2,416.7 | 2,459.2 | 3,021.2 | 3,227.1 | 3,160.3 | 2,203.4 | 2,264.6 | 2,685.0 | 2,799.5 |
| Autos and Parts | 468.7 | 440.0 | 432.1 | 496.6 | 507.0 | 565.9 | 527.0 | 546.7 | 453.4 | 582.2 |
| Refined Petroleum Products | 5,675.9 | 6,092.8 | 6,156.3 | 6,680.7 | 7,040.8 | 6,327.5 | 6,430.2 | 6,807.1 | 7,395.7 | 10,906.6 |
| Chemicals | 7,176.7 | 7,653.1 | 7,615.7 | 7,752.3 | 7,061.9 | 6,703.2 | 6,377.6 | 5,971.4 | 7,314.6 | 7,029.9 |
| Miscellaneous | 380.4 | 363.9 | 335.6 | 274.2 | 242.9 | 229.5 | 196.0 | 169.8 | 202.2 | 242.1 |
| Carload Traffic Loaded | 126,694.7 | 138,689.4 | 144,813.2 | 144,735.0 | 148,545.1 | 139,712.3 | 122,590.4 | 133,965.9 | 148,029.7 | 151,641.7 |
| Intermodal | 10,395.8 | 11,103.4 | 11,762.5 | 12,199.5 | 12,752.6 | 12,721.6 | 11,501.8 | 12,973.9 | 13,699.4 | 15,476.1 |
| **Total** | **137,090.6** | **149,792.7** | **156,575.7** | **156,934.5** | **161,297.7** | **152,433.8** | **134,092.2** | **146,939.8** | **161,729.1** | **167,117.9** |

### Eastern[1] Carloadings by Commodity

(Thousands of Tonnes)

| | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011* | *2012* |
|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 694.0 | 912.1 | 897.8 | 850.9 | 591.8 | 892.4 | 2,865.4 | 2,873.7 | 2,896.8 | 2,517.0 |
| Other Agricultural and Food Products | 1,564.2 | 1,605.8 | 1,719.0 | 1,605.2 | 1,724.3 | 1,759.3 | 3,594.6 | 4,589.3 | 4,100.3 | 5,598.0 |
| Coal | 3,289.5 | 3,010.8 | 3,151.1 | 3,034.0 | 2,526.4 | 2,783.9 | 2,589.6 | 2,611.5 | 2,318.9 | 1,932.8 |
| Fertilizer Materials | 2,458.4 | 2,683.4 | 2,461.1 | 1,632.7 | 1,782.6 | 2,145.3 | 1,770.0 | 2,000.6 | 2,182.5 | 2,029.2 |
| Iron Ore and Concentrates (including pellets) | 32,916.1 | 27,849.3 | 32,285.9 | 33,931.1 | 32,813.2 | 34,238.5 | 29,720.5 | 35,886.6 | 33,708.5 | 32,320.0 |
| Ores and Mine Products | 17,676.8 | 20,045.1 | 20,320.0 | 19,583.2 | 17,957.8 | 16,989.4 | 12,812.7 | 12,353.5 | 13,046.8 | 12,564.7 |
| Processed Forest Products | 11,433.0 | 14,602.6 | 14,404.8 | 13,950.0 | 11,075.7 | 8,942.5 | 6,537.9 | 6,018.9 | 6,680.3 | 6,327.7 |
| Non-Processed Forest Products | 5,806.3 | 6,681.8 | 6,314.0 | 5,633.1 | 4,799.4 | 4,340.2 | 2,953.5 | 2,921.0 | 3,364.6 | 2,920.4 |
| Ferrous and Non-Ferrous Metals | 8,451.3 | 10,298.1 | 10,305.4 | 10,525.2 | 10,587.1 | 10,356.6 | 7,172.8 | 9,703.7 | 10,596.5 | 9,481.7 |
| Autos and Parts | 4,697.1 | 4,716.9 | 4,434.7 | 4,082.3 | 3,901.9 | 3,123.1 | 2,497.0 | 3,301.2 | 3,387.4 | 4,038.0 |
| Refined Petroleum Products | 8,695.2 | 8,261.2 | 8,347.0 | 7,745.2 | 8,085.5 | 7,991.0 | 8,076.2 | 7,992.3 | 8,506.7 | 9,863.4 |
| Chemicals | 7,142.1 | 8,274.7 | 7,733.8 | 7,849.5 | 8,058.9 | 7,853.3 | 6,767.5 | 7,310.4 | 7,427.3 | 7,638.9 |
| Miscellaneous | 881.2 | 882.8 | 847.6 | 797.7 | 493.2 | 536.2 | 1,534.5 | 1,680.7 | 1,844.4 | 1,940.0 |
| Carload Traffic Loaded | 105,705.2 | 109,824.8 | 113,222.0 | 111,220.3 | 104,397.7 | 101,951.8 | 88,892.1 | 99,243.6 | 100,061.0 | 99,171.8 |
| Intermodal | 15,845.6 | 16,010.5 | 16,009.3 | 16,138.2 | 16,060.3 | 15,444.1 | 13,317.3 | 14,007.5 | 13,831.1 | 13,607.8 |
| **Total** | **121,550.9** | **125,835.3** | **129,231.4** | **127,358.5** | **120,458.1** | **117,395.9** | **102,209.4** | **113,251.1** | **113,892.1** | **112,779.6** |

1 The Eastern and Western divisions, for statistical purposes, are separated by an imaginary line running between Thunder Bay and Armstrong, Ontario. Freight loaded at Thunder Bay is included in the Western Division while loadings at Armstrong are reported in the Eastern Division.

*Sources: Statistics Canada, Cat. 52-001; Transport Canada*

**TABLE A6-9: ANNUAL RAIL CAR LOADINGS BY COMMODITY, 1992 – 2003**

**Total Tonnes Loaded by Commodity**

(Thousands)

| | *1992* | *1993* | *1994* | *1995* | *1996* | *1997* | *1998* | *1999* | *2000* | *2001* | *2002* | *2003* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 36,922.2 | 31,430.6 | 39,064.7 | 31,474.7 | 30,197.9 | 35,757.1 | 28,152.6 | 26,520.9 | 30,844.5 | 30,429.5 | 21,844.3 | 22,788.1 |
| Other agricultural and food products | 3,372.9 | 3,679.0 | 4,053.9 | 4,157.2 | 3,903.6 | 4,139.9 | 4,862.9 | 6,320.2 | 7,614.4 | 6,990.2 | 5,831.3 | 6,495.6 |
| Coal | 33,554.1 | 35,213.7 | 37,931.1 | 40,352.9 | 40,403.9 | 42,105.5 | 39,166.2 | 42,411.4 | 40,437.4 | 41,518.0 | 37,003.1 | 31,771.3 |
| Fertilizer materials | 20,929.3 | 19,828.9 | 23,597.9 | 25,334.1 | 25,180.8 | 27,846.1 | 26,922.0 | 25,992.8 | 27,129.5 | 24,472.2 | 26,121.4 | 27,630.6 |
| Iron ore and concentrates (including pellets) | 33,626.6 | 31,405.6 | 37,587.6 | 39,076.3 | 36,938.0 | 39,253.6 | 38,802.7 | 32,252.4 | 38,589.3 | 28,976.6 | 30,090.6 | 32,918.8 |
| Ores and mine products | 17,365.7 | 20,470.1 | 21,131.8 | 20,535.1 | 19,819.0 | 21,682.3 | 21,455.7 | 22,982.3 | 24,754.7 | 25,085.1 | 25,516.9 | 23,207.9 |
| Processed forest products | 16,472.0 | 18,021.9 | 18,320.3 | 17,934.9 | 17,965.5 | 17,355.4 | 19,653.2 | 22,502.7 | 23,227.6 | 23,465.5 | 25,198.2 | 25,048.7 |
| Non-processed forest products | 17,193.9 | 18,326.4 | 21,039.1 | 22,230.9 | 22,703.2 | 24,270.8 | 16,653.7 | 16,599.3 | 16,625.8 | 16,448.8 | 19,334.1 | 17,523.5 |
| **Total forest** | **33,665.8** | **36,348.3** | **39,359.4** | **40,165.8** | **40,668.7** | **41,626.2** | **36,306.9** | **39,102.1** | **39,853.3** | **39,914.3** | **44,532.4** | **42,572.2** |
| Ferrous and non-ferrous metals | 6,686.8 | 7,821.3 | 8,171.0 | 8,119.5 | 8,256.6 | 8,611.4 | 8,948.8 | 9,133.8 | 9,253.3 | 9,674.6 | 10,720.3 | 10,634.0 |
| Autos and parts | 2,795.1 | 3,021.7 | 3,386.7 | 3,609.9 | 3,498.3 | 4,117.2 | 3,573.7 | 4,915.1 | 5,082.6 | 4,869.7 | 5,199.2 | 5,316.0 |
| Refined petroleum products | 6,584.7 | 5,012.8 | 4,373.1 | 4,939.1 | 4,701.2 | 5,202.8 | 10,529.0 | 10,937.4 | 11,339.6 | 12,003.4 | 13,641.8 | 14,368.5 |
| Chemicals | 12,878.4 | 13,123.5 | 13,871.6 | 13,704.5 | 13,274.9 | 13,582.7 | 15,112.5 | 13,512.6 | 14,517.5 | 14,269.6 | 15,051.9 | 14,429.6 |
| Miscellaneous | 4,446.6 | 4,877.1 | 5,151.7 | 4,670.7 | 4,759.6 | 4,983.1 | 5,169.5 | 1,751.0 | 1,801.6 | 1,781.8 | 1,468.4 | 1,353.0 |
| Carload traffic loaded | 208,765.4 | 212,232.8 | 237,680.7 | 236,139.7 | 231,602.5 | 248,908.0 | 239,002.6 | 235,831.9 | 251,217.9 | 239,985.0 | 237,021.5 | 233,485.6 |
| Intermodal | 11,186.0 | 12,147.6 | 15,268.5 | 15,967.7 | 16,517.7 | 17,703.7 | 17,607.3 | 23,712.5 | 21,917.9 | 22,610.1 | 24,798.4 | 26,323.6 |
| **Total** | **219,951.4** | **224,380.4** | **252,949.2** | **252,107.5** | **248,120.1** | **266,611.7** | **256,609.9** | **259,544.4** | **273,135.8** | **262,595.1** | **261,819.9** | **259,809.2** |

**Western Tonnes Loaded by Commodity**

(Thousands)

| | *1992* | *1993* | *1994* | *1995* | *1996* | *1997* | *1998* | *1999* | *2000* | *2001* | *2002* | *2003* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 36,052.1 | 30,402.5 | 38,070.8 | 30,407.0 | 29,207.9 | 34,870.3 | 27,390.0 | 25,492.1 | 29,989.2 | 29,821.5 | 21,362.5 | 22,064.7 |
| Other agricultural and food products | 2,310.8 | 2,558.5 | 3,133.7 | 3,340.9 | 2,994.0 | 3,134.1 | 3,960.7 | 5,173.3 | 6,473.4 | 5,895.1 | 4,344.2 | 4,915.3 |
| Coal | 28,368.4 | 30,974.1 | 34,084.9 | 37,620.1 | 37,272.4 | 39,195.4 | 36,964.6 | 38,925.4 | 36,702.7 | 36,915.4 | 33,155.5 | 28,480.8 |
| Fertilizer materials | 18,495.7 | 17,680.9 | 21,113.6 | 22,984.2 | 22,571.1 | 25,841.0 | 25,274.1 | 24,600.1 | 25,233.2 | 22,381.5 | 23,887.4 | 25,161.8 |
| Iron ore and concentrates (including pellets) | 6.1 | 3.8 | 9.9 | 0.0 | 0.2 | 1.0 | 2.2 | 0.1 | 0.0 | 10.0 | 0.1 | 0.0 |
| Ores and mine products | 3,542.3 | 3,834.2 | 3,829.7 | 3,997.3 | 3,973.2 | 4,499.3 | 4,623.9 | 4,922.7 | 5,720.2 | 5,350.2 | 5,567.4 | 5,514.7 |
| Processed forest products | 9,900.1 | 10,521.7 | 10,545.7 | 10,103.9 | 10,227.1 | 9,721.8 | 11,175.9 | 11,205.5 | 11,592.6 | 12,082.8 | 13,365.9 | 13,487.5 |
| Non-processed forest products | 12,319.8 | 12,364.6 | 13,800.6 | 14,464.4 | 14,103.9 | 15,361.6 | 12,490.4 | 11,492.0 | 11,207.7 | 11,117.6 | 12,657.8 | 11,451.2 |
| Ferrous and non-ferrous metals | 1,461.8 | 1,650.6 | 1,869.6 | 1,738.5 | 1,963.1 | 1,959.8 | 2,111.6 | 2,165.8 | 2,241.0 | 2,135.2 | 2,335.3 | 2,209.2 |
| Autos and parts | 317.0 | 263.4 | 286.0 | 257.6 | 282.4 | 381.2 | 400.8 | 373.2 | 397.8 | 513.8 | 554.6 | 486.6 |
| Refined petroleum products | 2,361.7 | 2,150.2 | 2,103.2 | 2,586.9 | 2,569.3 | 2,386.8 | 3,745.8 | 4,520.5 | 4,725.4 | 4,657.4 | 5,499.0 | 5,663.2 |
| Chemicals | 6,133.9 | 6,053.8 | 6,739.2 | 7,135.5 | 6,871.4 | 6,556.4 | 6,767.2 | 6,584.2 | 6,963.7 | 7,072.1 | 7,495.3 | 7,202.9 |
| Miscellaneous | 2,006.2 | 2,254.8 | 2,227.1 | 1,966.6 | 2,089.9 | 2,188.2 | 2,633.2 | 473.7 | 646.4 | 738.4 | 541.4 | 456.2 |
| Carload traffic loaded | 121,468.9 | 120,713.1 | 137,814.1 | 136,602.8 | 134,125.8 | 146,096.8 | 137,540.4 | 135,928.8 | 141,893.3 | 138,690.8 | 130,766.4 | 127,094.1 |
| Intermodal | 3,446.9 | 3,632.3 | 4,974.2 | 5,332.6 | 5,502.0 | 5,875.2 | 6,248.3 | 8,987.4 | 8,138.8 | 8,568.1 | 9,866.1 | 10,399.1 |
| **Total** | **124,915.8** | **124,345.4** | **142,788.3** | **141,935.4** | **139,627.8** | **151,972.0** | **143,788.7** | **144,916.2** | **150,032.1** | **147,258.9** | **140,632.5** | **137,493.2** |

**Eastern Tonnes Loaded by Commodity**

(Thousands)

| | *1992* | *1993* | *1994* | *1995* | *1996* | *1997* | *1998* | *1999* | *2000* | *2001* | *2002* | *2003* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grain | 870.0 | 1,028.1 | 993.9 | 1,067.7 | 990.0 | 886.8 | 762.7 | 1,028.8 | 855.3 | 608.0 | 481.8 | 723.4 |
| Other agricultural and food products | 1,062.1 | 1,120.6 | 920.2 | 816.3 | 909.6 | 1,005.8 | 902.2 | 1,146.9 | 1,141.0 | 1,095.1 | 1,487.1 | 1,580.3 |
| Coal | 5,185.7 | 4,239.7 | 3,846.2 | 2,732.8 | 3,131.4 | 2,910.2 | 2,201.6 | 3,486.0 | 3,734.8 | 4,602.6 | 3,847.6 | 3,290.5 |
| Fertilizer materials | 2,433.6 | 2,148.0 | 2,484.3 | 2,349.8 | 2,609.7 | 2,005.1 | 1,647.9 | 1,392.7 | 1,896.3 | 2,090.7 | 2,234.0 | 2,468.8 |
| Iron ore and concentrates (including pellets) | 33,620.5 | 31,401.8 | 37,577.7 | 39,076.3 | 36,937.8 | 39,252.6 | 38,800.5 | 32,252.2 | 38,589.3 | 28,966.7 | 30,090.5 | 32,918.8 |
| Ores and mine products | 13,823.3 | 16,635.9 | 17,302.1 | 16,537.8 | 15,845.8 | 17,183.0 | 16,831.8 | 18,059.6 | 19,034.5 | 19,734.9 | 19,949.5 | 17,693.3 |
| Processed forest products | 6,571.8 | 7,500.1 | 7,774.6 | 7,831.0 | 7,738.5 | 7,633.6 | 8,477.3 | 11,297.2 | 11,634.9 | 11,382.7 | 11,832.3 | 11,561.2 |
| Non-processed forest products | 4,874.1 | 5,961.8 | 7,238.5 | 7,766.6 | 8,599.3 | 8,909.3 | 4,163.3 | 5,107.3 | 5,418.0 | 5,331.2 | 6,676.4 | 6,072.3 |
| Ferrous and non-ferrous metals | 5,225.1 | 6,170.7 | 6,301.3 | 6,381.0 | 6,293.5 | 6,651.7 | 6,837.2 | 6,968.0 | 7,012.3 | 7,539.4 | 8,385.0 | 8,424.9 |
| Autos and parts | 2,478.1 | 2,758.3 | 3,100.7 | 3,352.3 | 3,216.0 | 3,736.0 | 3,172.9 | 4,541.9 | 4,684.8 | 4,355.9 | 4,644.7 | 4,829.4 |
| Refined petroleum products | 4,223.0 | 2,862.7 | 2,269.9 | 2,352.2 | 2,131.9 | 2,816.0 | 6,783.2 | 6,416.9 | 6,614.1 | 7,346.0 | 8,142.8 | 8,705.4 |
| Chemicals | 6,744.5 | 7,069.7 | 7,132.5 | 6,569.0 | 6,403.5 | 7,026.3 | 8,345.3 | 6,928.4 | 7,553.9 | 7,197.5 | 7,556.5 | 7,226.6 |
| Miscellaneous | 2,440.4 | 2,622.3 | 2,924.6 | 2,704.1 | 2,669.7 | 2,794.9 | 2,536.4 | 1,277.3 | 1,155.3 | 1,043.5 | 927.0 | 896.8 |
| Carload traffic loaded | 87,296.5 | 91,519.8 | 99,866.6 | 99,537.0 | 97,476.7 | 102,811.2 | 101,462.3 | 99,903.1 | 109,324.5 | 101,294.2 | 106,255.1 | 106,391.5 |
| Intermodal | 7,739.1 | 8,515.3 | 10,294.3 | 10,635.1 | 11,015.7 | 11,828.6 | 11,358.9 | 14,725.1 | 13,779.1 | 14,042.0 | 14,932.3 | 15,924.5 |
| **Total** | **95,035.6** | **100,035.0** | **110,160.9** | **110,172.1** | **108,492.3** | **114,639.8** | **112,821.2** | **114,628.2** | **123,103.7** | **115,336.3** | **121,187.4** | **122,316.0** |

*Source: Statistics Canada, Cat. 52-001; Transport Canada*

## Table RA16: Value of Rail Imports, by Province/Territory of Clearance, 2003–2012

(Millions of dollars)

| *Province/Territory* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011[R]* | *2012[P]* |
|---|---|---|---|---|---|---|---|---|---|---|
| Ontario | 17,201.8 | 18,058.2 | 18,982.5 | 19,737.9 | 21,445.4 | 21,201.5 | 16,276.0 | 20,462.0 | 21,224.8 | 23,843.2 |
| Alberta | 2,327.2 | 2,509.5 | 3,225.4 | 4,119.5 | 4,014.9 | 5,691.3 | 3,882.9 | 4,302.7 | 5,206.0 | 5,498.3 |
| Quebec | 2,218.6 | 2,070.7 | 2,057.8 | 2,050.3 | 2,581.6 | 3,216.8 | 2,774.1 | 2,799.5 | 3,591.1 | 3,976.6 |
| Manitoba | 486.1 | 457.7 | 695.3 | 578.5 | 591.9 | 863.8 | 612.9 | 909.9 | 1,070.8 | 2,665.6 |
| British Columbia | 1,513.5 | 1,498.2 | 1,526.0 | 1,425.2 | 1,533.4 | 1,782.9 | 1,380.2 | 1,760.3 | 1,759.1 | 1,900.7 |
| Saskatchewan | 411.2 | 465.6 | 613.4 | 644.3 | 749.1 | 1,277.9 | 682.2 | 683.0 | 891.4 | 901.4 |
| New Brunswick | 280.1 | 320.0 | 304.2 | 264.0 | 294.4 | 374.8 | 281.0 | 335.0 | 380.6 | 565.8 |
| Nova Scotia | 74.3 | 66.2 | 81.0 | 48.0 | 67.9 | 45.9 | 31.9 | 64.3 | 63.3 | 72.8 |
| Other[1] | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **24,512.8** | **25,446.3** | **27,485.7** | **28,867.7** | **31,278.6** | **34,454.9** | **25,921.3** | **31,316.6** | **34,187.1** | **39,424.5** |

Notes: R = Revised data. P = Preliminary data.
1 Includes Newfoundland and Labrador, Prince Edward Island and Yukon. Ranking of provinces is in descending order, based on the value of the last available year.

*Source: Transport Canada, adapted from Statistics Canada, International Trade Division*

## Table RA17: Volume of Major Rail Commodities Exported, by Top Three[1] Provinces of Origin, 2003–2012

(Thousands of tonnes)

| *Province* | *Commodity* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011[R]* | *2012[P]* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ontario | Forest Products | 4,568.8 | 4,779.4 | 5,013.5 | 4,536.4 | 3,377.0 | 2,753.0 | 1,491.0 | 1,573.2 | 1,959.4 | 1,853.4 |
| | Automotive Products | 3,274.7 | 3,352.1 | 3,104.8 | 2,961.1 | 2,812.6 | 2,004.8 | 1,326.8 | 1,981.8 | 2,123.6 | 2,474.4 |
| | Chemical Products | 2,567.3 | 2,788.8 | 2,614.7 | 2,892.8 | 2,844.7 | 2,583.0 | 1,567.4 | 1,953.0 | 1,913.8 | 2,153.0 |
| | Other Mine Products | 1,426.6 | 1,615.9 | 1,700.1 | 1,602.8 | 1,254.6 | 1,110.3 | 880.5 | 952.4 | 1,013.4 | 1,019.2 |
| | Other | 4,223.4 | 4,642.5 | 4,906.6 | 5,495.2 | 4,964.7 | 4,832.1 | 3,101.6 | 4,553.1 | 4,209.1 | 3,711.8 |
| | **Ontario Total** | **16,060.8** | **17,178.8** | **17,339.8** | **17,488.3** | **15,253.7** | **13,283.1** | **8,367.3** | **11,013.7** | **11,219.2** | **11,211.8** |
| Alberta | Chemical Products | 4,465.7 | 4,787.7 | 4,586.5 | 4,763.4 | 4,472.6 | 4,242.8 | 4,008.5 | 4,830.9 | 5,099.3 | 4,819.4 |
| | Forest Products | 4,174.4 | 4,451.5 | 4,428.9 | 4,224.3 | 3,577.8 | 2,738.3 | 2,473.4 | 2,516.9 | 2,279.6 | 2,402.3 |
| | Petroleum Products | 1,895.1 | 2,178.6 | 2,189.2 | 2,224.4 | 2,230.2 | 1,949.2 | 2,009.8 | 2,051.4 | 2,166.9 | 3,060.3 |
| | Fertilizer Materials | 2,047.2 | 1,696.8 | 1,639.5 | 1,750.5 | 1,773.4 | 1,821.8 | 1,077.2 | 1,978.2 | 2,241.0 | 1,978.5 |
| | Other | 1,324.8 | 1,501.0 | 1,595.1 | 1,696.3 | 1,964.1 | 2,085.5 | 1,652.5 | 1,497.9 | 1,813.5 | 2,002.0 |
| | **Alberta Total** | **13,907.3** | **14,615.6** | **14,439.1** | **14,658.8** | **14,018.1** | **12,837.5** | **11,221.3** | **12,875.2** | **13,600.2** | **14,262.5** |
| Saskatchewan[2] | Fertilizer Materials | 7,756.1 | 8,113.4 | 8,291.2 | 7,579.3 | 9,621.7 | 8,934.7 | 4,176.3 | 8,744.0 | 8,832.4 | 7,589.6 |
| | Grains | 470.2 | 1,110.4 | 1,214.4 | 2,288.4 | 2,300.3 | 2,788.1 | 2,084.9 | 1,736.0 | 1,835.1 | 2,267.9 |
| | Agriculture and Food | 579.8 | 826.7 | 881.0 | 1,010.8 | 1,024.4 | 1,295.8 | 1,134.1 | 1,690.3 | 2,846.2 | 2,910.6 |
| | Petroleum Products | 565.8 | 829.7 | 762.5 | 803.1 | 842.9 | 915.2 | 719.9 | 775.4 | 968.7 | 2,629.1 |
| | Other | 1,264.1 | 1,676.0 | 1,769.7 | 1,483.1 | 1,008.5 | 667.3 | 640.2 | 542.5 | 774.0 | 808.6 |
| | **Saskatchewan Total** | **10,635.9** | **12,556.2** | **12,918.8** | **13,164.7** | **14,797.8** | **14,601.1** | **8,755.5** | **13,488.2** | **15,256.3** | **16,205.7** |
| **Grand Total** | | **40,603.9** | **44,350.6** | **44,697.7** | **45,311.8** | **44,069.6** | **40,721.7** | **28,344.1** | **37,377.1** | **40,075.8** | **41,680.0** |

Notes: R = Revised data. P = Preliminary data.
1 Ranking of the top three provinces of origin and their top commodities is based on a ten-year average.
2 Saskatchewan replaced Quebec as one of the top three provinces of origin in the 2011 Annual Report.

*Source: Transport Canada, Rail Traffic Database*

## Table RA18: Volume of Major Rail Commodities Imported, by Top Three[1] Provinces of Clearance, 2003–2012

(Thousands of tonnes)

| *Province* | *Commodity* | *2003* | *2004* | *2005* | *2006* | *2007* | *2008* | *2009* | *2010* | *2011[R]* | *2012[P]* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ontario | Chemicals | 2,659.7 | 2,462.9 | 2,378.9 | 2,629.1 | 2,648.9 | 2,404.9 | 1,868.6 | 2,160.6 | 2,184.2 | 2,170.5 |
| | Agriculture and Food | 777.3 | 881.4 | 795.3 | 738.9 | 1,116.3 | 1,129.7 | 778.7 | 830.4 | 765.1 | 762.2 |
| | Automotive Products | 1,102.5 | 1,024.8 | 907.5 | 838.1 | 877.4 | 656.3 | 451.1 | 581.3 | 581.5 | 522.9 |
| | Other Mine Products | 672.3 | 590.2 | 617.2 | 609.6 | 629.0 | 584.7 | 574.2 | 755.8 | 749.0 | 837.8 |
| | Other | 1,834.6 | 1,988.2 | 2,185.9 | 2,023.5 | 2,537.9 | 2,518.1 | 1,863.2 | 2,429.1 | 2,535.4 | 2,740.8 |
| | **Ontario Total** | **7,046.3** | **6,947.5** | **6,884.8** | **6,839.3** | **7,809.5** | **7,293.8** | **5,535.7** | **6,757.2** | **6,815.1** | **7,034.2** |
| Alberta | Petroleum Products | 323.1 | 434.5 | 519.4 | 870.3 | 967.2 | 1,920.2 | 2,227.8 | 2,021.9 | 1,543.7 | 1,982.7 |
| | Other Mine Products | 1,036.9 | 1,015.4 | 1,036.5 | 1,089.2 | 1,246.3 | 1,349.1 | 1,050.9 | 1,588.1 | 1,675.2 | 1,306.9 |
| | Metals | 572.3 | 742.3 | 990.2 | 1,109.2 | 884.5 | 816.2 | 355.3 | 722.7 | 854.6 | 1,145.7 |
| | Chemicals | 601.3 | 576.5 | 630.6 | 693.2 | 765.1 | 780.5 | 709.8 | 833.2 | 1,082.3 | 1,045.0 |
| | Other | 1,656.8 | 946.7 | 1,172.2 | 1,254.7 | 1,748.9 | 1,959.7 | 1,330.8 | 1,442.3 | 1,525.0 | 2,573.5 |
| | **Alberta Total** | **4,190.3** | **3,715.4** | **4,348.8** | **5,016.7** | **5,612.0** | **6,825.7** | **5,674.5** | **6,608.3** | **6,680.8** | **8,053.8** |
| Quebec | Chemicals | 1,038.5 | 1,109.5 | 1,080.0 | 1,095.1 | 1,163.8 | 1,090.3 | 1,140.1 | 1,209.6 | 1,159.6 | 1,210.3 |
| | Agriculture and Food | 704.4 | 857.8 | 830.7 | 937.0 | 1,025.4 | 1,050.6 | 977.8 | 927.7 | 858.5 | 918.7 |
| | Petroleum Products | 239.3 | 271.7 | 330.4 | 463.9 | 587.4 | 634.0 | 526.4 | 498.2 | 710.1 | 707.6 |
| | Other Mine Products | 331.1 | 326.7 | 312.3 | 324.5 | 338.6 | 414.2 | 434.5 | 517.4 | 542.0 | 572.5 |
| | Other | 2,169.5 | 2,463.0 | 2,495.7 | 2,561.8 | 3,315.4 | 3,143.9 | 2,568.0 | 2,588.9 | 2,431.2 | 2,103.5 |
| | **Quebec Total** | **4,482.8** | **5,028.7** | **5,049.1** | **5,382.4** | **6,430.5** | **6,333.1** | **5,646.7** | **5,741.8** | **5,701.5** | **5,512.6** |
| **Grand Total** | | **15,719.4** | **15,691.6** | **16,282.7** | **17,238.4** | **19,852.0** | **20,452.5** | **16,856.9** | **19,107.4** | **19,197.3** | **20,600.6** |

Notes: R = Revised data. P = Preliminary data.
1 Ranking of the top three provinces of clearance and their top commodities is based on a ten-year average.

*Source: Transport Canada, Rail Traffic Database*

# Appendix D
# Case Study Information

## D.1 City of Edmonton

# Development Adjacent to Railways

Development sometimes occurs near railways and railyards within Edmonton. When sensitive land uses (such as residential development) are located close to railways, there can be land use conflicts like noise, vibration, and safety concerns.

Currently, standards for development adjacent to railways are reviewed on a case-by-case basis.

## Draft Regulations

In order to give certainty to the development process, the City is considering a set of land use regulations for new development close to railways and railyards.

The proposed amendments would:

- Require Noise Impact Assessments and Vibration Impact Assessments for development within certain distances of the railway or railyard
- Require fences and berms along the property line in order to protect against train derailment
- Require minimum separation distances between the principal building in the new development and the railway or railyard
- Add new definitions to the Zoning Bylaw for noise attenuation fence (sound barrier), railway facility, railway line and railway yard.

## Project Stage

This project is in the draft amendment stage of the text amendment process. There is no target date for the proposed amendments to go to City Council Public Hearing at this time.

The City of Edmonton is committed to citizen engagement. Administration is accepting feedback on regulations pertaining to development adjacent to railways. Please submit comments or questions to chelsey.jersak@edmonton.ca.

## For more information:

**Chelsey Jersak**

| | |
|---|---|
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| | |

## Proposed Amendment - Development Regulations for New Developments Adjacent to Railway Rights-of-way

### General Purpose

To regulate development for properties adjacent to a rail rights-of-way in order to address safety considerations and to protect future residents and business operators from the potentially negative impacts associated with noise, vibration, trespass.

### Application

The regulations in this Section apply to all lands within 1000 metres (depending on the Noise and Vibration Studies) of facilities operated by Canadian National Railway (CN Rail) or Canadian Pacific Railway (CP Rail). This Section does not apply to lands adjacent to Light Rail Transit.

### Noise and Vibration Studies

All new development will be accompanied by noise and vibration studies based on proximity to a rail facility as specified in Tables A through F, unless:

- previously approved and accessible noise and vibration studies exist for the lands between the proposed new development and the rail right-of-way; or
- previously approved and accessible noise and vibration studies exist for lands which have similar location and land use attributes.

### Setbacks, Berm and Fence Requirements

All new developments abutting a rail right-of-way will comply with the Setback, Berm and Fence requirements specified in Tables A through F.

The Setback, Berm and Fence requirements specified in Tables A through F may be relaxed if Noise and Vibrations Studies prove that lesser requirements will mitigate noise and vibration impacts to a level appropriate to the proposed development.

### Types of Railway Rights-of-way

The classification of the Railway Right-of-way shall be determined by either CN Rail or CP Rail. The Table below lists the classes of railway lines for CN Rail and CP Rail.

| CN Rail | CP Rail |
|---|---|
| Principal Main Line | Class 5 |
| Secondary Main Line | Class 4 |
| Principal Branch Line | Class 3 |
| Secondary Branch Line | Class 3 |
| Spur Line | Class 2 |
| Railway Yard | NA |

CN Rail and CP Rail reserve the right to require the developer to install the development regulations applicable to a higher intensity rail line than what the current rail right-of-way is serving if CN Rail or CP Rail expects increasing rail activity on that line. (For example: CN Rail expects one of the Branch Lines to increase in rail activity to the level of a Main Line, then the development regulations shall apply to Main Line expectations.)

**Use Class Based Development Regulations**

The level of development regulations shall be based on the intended Use of that site. If that Use does not require the highest level of developments regulations for sites adjacent to railway rights-of-way, then the developer has two options:

Option 1: Have the development conform to the strictest regulations within that Zone; or

Option 2: Apply the level of development regulations applicable to that Use, but include in a restrictive covenant that certain Uses shall not be permitted on this site unless upgrades to the minimum setback, berm and fence have been completed to conform to the new intended Use.

**TABLE A: All Residential & Residential-Related Uses**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| All Residential & Residential-Related Use Classes and any Uses with sleeping accommodation | All Rail Lines | Within 300 m of the railway rights-of-way | Within 75 m of the railway rights-of-way | 30 m | Height: 2.5 m<br>Width: 12.5 m<br>Slope Ratio: 2.5:1<br>Location: Fully within the property at time of development | Height: 3.0m<br>Type: Acoustic<br>Location: On top of the peak of the berm. The fence will then become the new property line between the property owner and the rail company. | Property Owner | Home owner shall be responsible in maintaining the berm up to and including the fence. The rail company shall be responsible for the berm facing the railway rights-of-way. |
| | Rail Yards | Between 300 m and 1000 m of the railway rights-of way | Between 300 m and 1000 m of the railway rights-of way | 300 m | N/A | N/A | N/A | N/A |

**Use Classes included in Table A:**

- All Residential Uses (See Section 7.2 of Zoning Bylaw 12800)
- All Residential-Related Uses (See Section 7.3 of Zoning Bylaw 12800)
- Hotels
- Motels
- Detention and Correction Services
- Extended Medical Treatment Services
- Protective and Emergency Services (fire and ambulance stations only)
- Child Care Service

**TABLE B: Intermittently Occupied Institutions**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| Intermittently Occupied Institutions (Schools and Event Oriented Activities) | Principal & Secondary Main Lines, Rail Yards | Within 75 m of the railway rights-of-way (when necessary) | Within 75 m of the railway rights-of-way (when necessary) | 30 m | Height: 2.5 m<br>Width: 12.5 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 3.0 m<br>Type: Acoustic<br>Location: On top of the peak of the berm. The fence will then become the new property line between the property owner and the rail company. | Property Owner | Property owner shall be responsible in maintaining the berm up to and including the fence. The rail company shall be responsible for the berm facing the railway rights-of-way. |
| | Principal & Secondary Branch Lines, Spur Lines | Within 75 m of the railway rights-of-way (when necessary) | Within 75 m of the railway rights-of-way (when necessary) | 15 m | Height: 2.0 m<br>Width: 10 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 2.0 m<br>Type: Acoustic<br>Location: On top of the peak of the berm. The fence will then become the new property line between the property owner and the rail company. | Property Owner | Property owner shall be responsible in maintaining the berm up to and including the fence. The rail company shall be responsible for the berm facing the railway rights-of-way. |

**Use Classes included in Table B:**

- Carnivals
- Commercial Schools
- Drive-in Motion Picture Theatres
- Community Recreation Services
- Exhibition and Convention Facilities
- Indoor Participant Recreation Services
- Natural Science Exhibits
- Private Clubs
- Private Education Services
- Public Education Services
- Public Libraries and Cultural Exhibits
- Religious Assembly
- Spectator Entertainment Establishments
- Spectator Sports Establishments

**TABLE C: High Activity Outdoor Uses**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| High Activity Outdoor Uses | Principal & Secondary Main Lines, Rail Yards | N/A | N/A | 30 m | Height: 2.5 m<br>Width: 12.5 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 1.83 m<br>Type: Chain link<br>Location: On top of the peak of the berm. The fence will then become the new property line between the property owner and the rail company. | Property Owner | Property owner shall be responsible in maintaining the berm up to and including the fence. The rail company shall be responsible for the berm facing the railway rights-of-way. |
| | Principal & Secondary Branch Lines, Spur Lines | N/A | N/A | 15 m | Height: 2.0 m<br>Width: 10 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 1.83 m<br>Type: Chain link<br>Location: On top of the peak of the berm. The fence will then become the new property line between the property owner and the rail company. | Property Owner | Property owner shall be responsible in maintaining the berm up to and including the fence. The rail company shall be responsible for the berm facing the railway rights-of-way. |

**Use Classes included in Table C:**

- Outdoor Amusements Establishments
- Outdoor Participant Recreation Services
- Public Parks

**TABLE D: Commercial**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| Commercial (mainly Retail and Office activities) | Principal & Secondary Main Lines, Rail Yards | Within 75 m of the railway rights-of-way (when necessary) | Within 75 m of the railway rights-of-way (when necessary) | 30 m | Height: 2.5 m<br>Width: 12.5 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 1.83 m<br>Type: Chain link<br>Location: Along the mutual property line with the rail company | Property Owner | Property owner shall be responsible in maintaining the entire berm and fence. |
| | Principal & Secondary Branch Lines, Spur Lines | Within 75 m of the railway rights-of-way (when necessary) | Within 75 m of the railway rights-of-way (when necessary) | 15 m | Height: 2.0 m<br>Width: 10 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 1.83 m<br>Type: Chain link<br>Location: Along the mutual property line with the rail company | Property Owner | Property owner shall be responsible in maintaining the entire berm and fence. |

**Use Classes included in Table D:**

- Adult Mini-Theatre
- Animal Hospitals and Shelters
- Auctioneering Establishments
- Bars and Neighbourhood Pubs
- Broadcasting and Motion Picture Studios
- Business Support Services
- Casinos and Other Gaming Establishments
- Convenience Retail Stores
- Custom Manufacturing Establishments
- Drive-in Food Services
- Equipment Rentals
- Flea Market
- Funeral, Cremation and Internment Services
- General Contractor Services
- General Retail Stores
- Government Services
- Greenhouses, Plant Nurseries and Market Gardens
- Health Services
- Household Repair Services
- Limited Contractor Services
- Major Alcohol Sales
- Major Amusement Establishments
- Major Second-hand Stores
- Minor Alcohol Sales
- Minor Amusement Establishments
- Minor Second-hand Stores
- Mobile Catering Food Services
- Nightclubs
- Personal Service Shops
- Professional, Financial and Office Support Services
- Restaurants
- Specialty Food Services
- Veterinary Services
- Warehouse Sales

**TABLE E: Industrial and Automotive**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| Mainly Industrial and Automotive -Related Activities | Principal & Secondary Main Lines, Rail Yards | N/A | N/A | 15 m | Height: 2.0 m<br>Width: 10 m<br>Slope Ratio: 2.5:1<br>Location: fully within the property at time of development | Height: 1.83 m<br>Type: Chain link<br>Location: Along the mutual property line with the rail company | Property Owner | Property owner shall be responsible in maintaining the entire berm and fence. |
| | Principal & Secondary Branch Lines, Spur Lines | N/A | N/A | 0 m | N/A | Height: 1.83 m<br>Type: Chain link<br>Location: Along the mutual property line with the rail company | Property Owner (fence only) | Property owner shall be responsible in maintaining the fence. |

**Use Classes included in Table E:**

- Aircraft Sales/Rentals
- Automotive and Equipment Repair Shops
- Automotive and Minor Recreation Vehicle Sales/Rentals
- Convenience Vehicle Rentals
- Fleet Services
- Gas Bars
- Major Service Stations
- Minor Service Stations
- Rapid Drive-through Vehicle Services
- Recycling Depots
- Train Station
- Truck and Mobile Home Sales/Rentals
- General Industrial Uses
- Land Treatment
- Special Industrial Uses
- Vehicle and Equipment Sales/Rentals
- Essential Utility Services
- Major Impact Utility Services
- Minor Impact Utility Services
- Protective and Emergency Services (Except fire and ambulance stations)
- Recycled Materials Drop-off Centre

**TABLE F: Rural and Low Intensity Uses**

| Land Use | Railway Classification | Noise Assessment Study Area | Vibration Assessment Study Area | Minimum Setback to Principal Building | Berm Dimensions and Location | Fence Dimensions and Location | Responsible for building the berm and fence | Responsible for maintaining the berm and fence |
|---|---|---|---|---|---|---|---|---|
| Extensive Development, Rural, Agriculture, Natural Areas and Parking. | Principal & Secondary Main Lines, Rail Yards | N/A | N/A | 0 m | N/A | Height: 1.83 m Type: Chain link Location: Along the mutual property line with the rail company | Property Owner (fence only) | Property owner shall be responsible in maintaining the fence. |
| | Principal & Secondary Branch Lines, Spur Lines | N/A | N/A | 0 m | N/A | Height: 1.83 m Type: Chain link Location: Along the mutual property line with the rail company | Property Owner (fence only) | Property owner shall be responsible in maintaining the fence. |

**Use Classes included in Table F:**

- Non-accessory Parking
- Temporary Storage
- Farms
- Livestock Operations
- Natural Resource Development
- Non-commercial Farms
- Small Animal Breeding and Boarding Establishments
- Cemeteries
- Tourist Campsites

## D.2 City of Windsor

(c) The construction of fencing adjacent to the railway right-of-way or rail yards.

*ABANDONED RIGHTS-OF-WAYS*

7.2.8.4 Council shall encourage the reuse of abandoned railway rights-of-ways for the enhancement of the transportation system as outlined in the Community Based Strategic Rail Study including:

(a) Protecting such railway right-of-way in its entire length; and

(b) Permitting cycling and recreational facilities.

*FUTURE TRANSPORTATION PLANS*

7.2.8.5 Council shall plan for the eventual retirement of rail lines identified in the Community Based Strategic Rail Study by:

(a) Encouraging the abandonment of rail lines identified in the Community Based Strategic Rail Study in conjunction with upgrades of other rail lines to accommodate increased rail traffic at increased speeds;

(b) Encouraging the development of employment lands or redevelopment of brownfield sites adjacent to abandoned rail corridors; and

(c) Initiating a study following abandonment of any rail corridor to determine the best use.

*HIGH SPEED RAIL*

7.2.8.6 Council shall encourage and support the construction of a high speed rail network along the Windsor – Quebec City corridor as well as a high speed rail connection to Detroit.

*IMPROVED RAIL TUNNEL*

7.2.8.7 Council shall encourage the construction of improved rail tunnel facilities.

*DEVELOPMENT ADJACENT TO A CORRIDOR*

7.2.8.8 Council shall evaluate a proposed development adjacent to a Rail Corridor, in accordance with the following:

(a) All proponents of a new development within 300 metres of a rail corridor, may be required to complete a noise study to support the proposal, and if the need for mitigation measures is determined by such study, shall identify and recommend appropriate mitigation measures, in accordance with the Procedures chapter of this Plan;

(b) All proponents of new development, located within 75 metres of a rail corridor, shall complete a vibration study to support the

proposal, and if the need for mitigation measures is determined by such study, shall identify and recommend appropriate mitigation measures, in accordance with the Procedures chapter of this Plan;

(c) All proponents of new development adjacent to a rail corridor will consult with the appropriate railway company prior to the finalization of any noise or vibration study required by this Plan;

(d) All proponents of new development abutting a rail corridor shall incorporate appropriate safety measures such as setbacks, berms and security fencing to the satisfaction of the Municipality, in consultation with the relevant public agency and the appropriate railway company.

*DEVELOPMENT ADJACENT TO A RAIL YARD*

7.2.8.9 Council shall protect designated rail yards from incompatible development. Accordingly, development adjacent to a Rail Yard designated on Schedule C: Development Constraint Areas will be subject to the following:

(a) New residential development and other new sensitive land uses, which require a rezoning (exclusive of a zoning by-law consolidation), plan of subdivision or plan of condominium are not permitted within 300 metres of a designated Rail Yard;

(b)

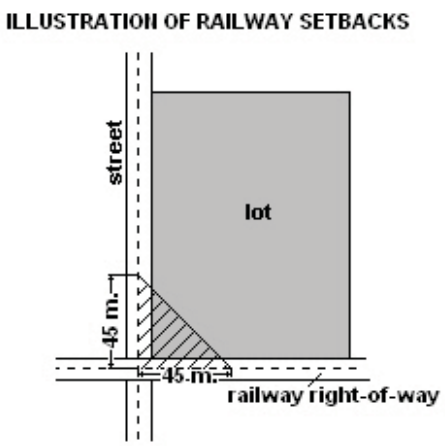
(c) All proponents of new residential development and other new sensitive land uses, located between 300 and 1000 metres of a designated Rail Yard (exclusive of the George Avenue Rail Yard unless required by the City), which require a rezoning (exclusive of a zoning by-law consolidation), plan of subdivision or plan of condominium shall complete a noise study to support the proposal, an, if the need for mitigation measures is determined by this study, shall identify and recommend appropriate mitigation measures, in accordance with the procedural policies in this Official Plan;

(d) All proponents of new development within 75 metres of a designated Rail Yard shall complete a vibration study to support the proposal, and, if the need for mitigation measures is determined by the study, shall identify and recommend appropriate mitigation measures, in accordance with the procedural policies in this Official Plan;

(e) All proponents of new residential development and other sensitive land uses, within 1000 metres of a designated Rail Yard, which requires a rezoning (exclusive of a zoning by-law consolidation), plan of subdivision or plan of condominium will consult with the appropriate railway company prior to the finalization of any noise and/or vibration abatement study required y this Official Plan; and

## D.3 City of Ottawa

# Setbacks from Railway Rights-of-Way in Rural Zones (Sec. 68)

| | | | | |
|---|---|---|---|---|
| | | | | |
| **68.** | In Rural Zones, | | | |
| | (1) | No obstruction to the vision of motor vehicle operators higher than one metre above grade including but not limited to buildings, structures, parking, storage or vegetation is permitted on any lot abutting an at-grade intersection of a street and a railway track within the triangle formed by connecting to a point 45 metres from the intersection of the centerline of the street and the centerline of the railway right-of-way (see illustration). | |  |
| | (2) | For the purposes of subsection (1), an agricultural crop, chain link fence or other similar feature that can be seen through is not an obstruction. | | |
| | (3) | No building within 30m of a railway right-of-way is to be used for a residential use building, day care or school. | | |
| | | | | |

‹ Residential use building setback from mineral aggregate zones (Sec. 67) up Setback from Watercourses (Sec. 69) ›

## In This Section

## D.4 Town of Canmore

4.1.4.3 Notwithstanding any of the above-described projections, no projections of any type are permitted that are less than 2.5 metres above finished grade over any yard setbacks required for vehicular access.

## 4.1.5 Non-Residential Building Projections

Commercial building projections are not generally permitted into yard setbacks with the exception of building eaves. Building eaves may extend 1.0 metre into any yard setback. A permanent structural canopy may be allowed at the discretion of the Development Authority where it provides shelter to a public walkway below. Any projection over a street will only be allowed where acceptable to the Town and an encroachment agreement is entered into.

## 4.1.6 Setbacks from Arterial Roadways

Building setbacks from arterial roadways shall be 9.0 m where vehicular access to the arterial road is proposed. However, in instances where a lot fronting onto an arterial roadway has vehicular access to a laneway, this laneway access shall be used and no access shall be allowed onto the arterial roadway. The 9.0 m setback requirement shall not apply when vehicle access is provided by a laneway or where a lesser setback is established with a "build-to" regulation within a land use district.

## 4.1.7 Setbacks from Trans-Canada Highway

Residential buildings adjacent to the Trans-Canada Highway shall be setback a minimum distance of 27.5 m from the nearest limit of the highway right-of-way or adequately screened by a fence, wall or berm to the satisfaction the Development Authority.

## 4.1.8 Setback and Screening from C.P.R. Railway Line

4.1.8.1 Residential buildings and visitor accommodation adjacent to the C.P.R. railway line shall be set back a minimum distance of 27.5 m from the centre line of the railway right-of-way.

4.1.8.2 All residential buildings and visitor accommodation adjacent to a railway line shall be screened from such by a fence, wall, or berm to the satisfaction of the Development Authority.

## 4.1.9 Setbacks for Future Road Widening

4.1.9.1 Setbacks from Existing Bow Valley Trail Right-Of-Way
When considering an application on a site fronting a portion of the Bow Valley Trail right-of-way described in Table 4.1.9.2 the Development Authority shall require, that buildings are set back from the existing right-of-way by the front yard setback requirement of 4.5 metres plus the applicable distance shown in the table to ensure that adequate right of way is available to accommodate future transportation requirements (e.g. road widening, cycling and pedestrian pathways).

c. Tourist homes shall not interfere with the rights of nearby residents to quiet enjoyment of a residential neighborhood or dwelling unit

d. The Development Officer acting reasonably may inspect the tourist home establishment to ensure compliance with this Bylaw and the development permit

e. The operator of the tourist home shall:
   1. Not advertise the tourist home unless in possession of a valid development permit at the time the advertisement is placed and displayed
   2. Within a residential district, utilize a maximum of 50% of the area between the residence and the street for driveway and parking. The remainder of this area shall be landscaped with natural landscaping to the satisfaction of the Development Authority
   3. Not display any form of on-site advertising related to the tourist home, except as provided for in this Bylaw
   4. Ensure that the building conforms to the Alberta Building Code
   5. Enter into a Short Form Development Agreement with the Town of Canmore, confirming the conditions of approval
   6. Remain in conformance with the Canmore Business Registry License Bylaw for the operation of a tourist home
   7. Provide the name and telephone number of a local (Bow Valley) individual or management company responsible for the management of the tourist home.

## 4.16 Noise Attenuation from Railway and Trans-Canada Highway

All residential and visitor accommodation developments adjacent to the Trans-Canada Highway or a railway must be designed so that the exterior noise levels do not exceed CMHC guidelines of 55 dBA or 24 hr. Leq interior within the building. Development permit applications shall include a professionally prepared acoustical report to confirm compliance with this requirement.

## 4.17 Screening of Commercial Impacts from Residential Development

4.17.0.1 The intent of screening is to limit potential impacts of commercial developments on adjacent residential or visitor accommodation uses. Within commercial districts, buildings shall be designed to incorporate adequate screening of mechanical, venting and other systems from pedestrian areas and adjacent buildings.

4.17.0.2 Screening is not limited to visual impacts but also includes minimizing the impacts of noises and odours which may negatively impact adjacent commercial or residential uses.

4.17.0.3 In order to reasonably contain impacts within the development site, mechanical systems, garbage, storage areas, venting and other apparatus shall be screened from adjacent properties, including public property, to the satisfaction of the Development Authority.

## D.5 City of London

**4.32 MINIMUM DISTANCE SEPARATION (MDS)**

The Province of Ontarioâ€™s Minimum Distance Separation regulations are included in Section 45 (Agricultural Zone), Schedules C and D, of this By-law. Typically these regulations, and associated Implementation Guidelines, which establish separation distances between urban and rural uses, are applied in the Agricultural (AG) Zone, however, they can be applied in other zones such as Rural Settlement Commercial (RRC) or Urban Reserve (UR). Lands to be rezoned from an Agricultural (AG) or Urban Reserve (UR) Zone to any other zone to permit a residential, facility, commercial, industrial or recreational use will comply with the MDS1 calculation in Schedule C.

Expansions to existing livestock facilities will need to comply with the MDS II calculation in Schedule D when they are located close to zones permitting residential, facility, commercial, recreation or industrial uses.

The MDS I regulations will apply to development proposed through building permit on existing lots of record only in the following Zone variations: Agricultural (AG) Zone, Rural Settlement Commercial (RRC) zone or Urban Reserve (UR) Zone. The MDS II regulations shall apply to all lots of record.
(deleted and re placed by Z.-1-091877)
(Z-1-051390)

**4.33 SETBACK REQUIREMENTS ADJACENT TO OIL AND GAS WELLS**

The standard setback; consistent with the *Oil, Salt and Gas Resources Act*; for new wells next to existing development or new development next to existing wells is 75m (246 ft.). Variations to this setback can be made through consultation with the City and Province.
(Z-1-051390)

**4.34 MINIMUM SETBACKS REQUIRED FOR DEVELOPMENT ADJACENT TO RAILWAY LINES ON LANDS ANNEXED TO THE CITY ON JANUARY 1, 1993.**

The following regulations apply to all main buildings in the Residential (R1 to R11, OR); Regional (RF), Community (CF) and Neighbourhood Facility (NF); and Open Space (OS1 and OS2) Zone variations that abut a Rail Transportation (RT) Zone.

1. To address safety issues the following regulations apply:

| Classification of Track | Setback without Berm | Setback with Berm | Required Size of Berm |
|---|---|---|---|
| Principal Main Line | 120 m (394 ft.) | 30 m (98.4 ft.) | 2.5 m (8.2 ft.) |
| Secondary Main Line | 120 m (394 ft) | 30 m (98.4 ft.) | 2.0 m (6.6 ft.) |
| Principal Branch Line | 60 m (197 ft.) | 15 m (49 ft.) | 2.0 m (6.6 ft.) |

2. To address vibration issues, evaluation of ground-borne vibration from rail traffic will be required within 75m (246 ft.) of the railway line and shunting yards.

3. To address noise issues, evaluation of noise from rail traffic through a Noise Impact Study will be required within 120m (394 ft.) of the railway line and shunting yards in accordance with Ministry of the Environment (MOE) guidelines.

Variations to the noise and vibration standards can be made if an Environmental Noise & Vibration Study is submitted and accepted by the General Manager of Planning and Development in support of the request. These reports can be used as a basis for varying the standards where site specific barriers or topographical features are present which may warrant changes. The specific standards can be applied through the development, consent or subdivision agreement.
(Z.-1-051390)

## D.6 Queensland, Australia

## Australian standards, QR and TMR technical requirements and standard drawings

Where reference is made to an Australian Standard, a QR and TMR technical requirement, or standard drawing, all referenced requirements and standards are taken to mean the version current at the time of lodgement of a development application.

A proposed development is to comply, where relevant, with the QR and TMR technical requirements and standard drawings outlined below.

Note – The following list of QR and TMR technical requirements and standard drawings is current at the time of publication (Appendix 1). Future editions or amendments to this list will be available and remain current on QR and TMR's websites.

- *MCE-SR-001 - Design of road overbridges (Revision F dated 30-09-2010)*
- *MCE-SR-002 - Work in or about QR property (Revision F dated 27-09-2010)*
- *MCE-SR-003 - Work adjacent to overhead line equipment (Revision E dated 30-09-2010)*
- *MCE-SR-005 - Design of buildings over or near railways (Revision C dated 30-09-2010)*
- *MCE-SR-006 - Design of footbridges (Revision G dated 30-09-2010)*
- *MCE-SR-007 – Design and selection criteria for road/rail interface barriers (Revision A dated 30-09-2010)*
- *MCE-SR-008 – Protection screens (Revision A dated 30-09-2010)*
- *MCE-SR-012 – Collision protection of supporting elements adjacent to railways (Revision B dated 30-09-2010)*
- *MCE-SR-014– Design of noise barriers adjacent to railways (Revision A dated 30-09-2010)*
- *MCE-SR-016 - Requirements for services under the railway corridor (non-QR services) (Revision A dated 30-09-2010)*
- *Standard Drawing 1474 - Steel beam guardrail installation and set out*
- *Standard Drawing 2544 - Standard security fence (50 mm chain link fabric)*
- *Standard Drawing 2545 - Standard timber fence (1800 mm high timber paling fence)*
- *Standard Drawing 2550 - Standard rural fences (miscellaneous site layout details)*
- *Standard Drawing 2754 - Standard clearances for new structures*
- *Standard Drawing 2614 - Standard rural fences (fencing with rail posts)*

Compliance with QR's standards is generally deemed to satisfy the railway manager's requirements. Development proposals that deviate from these standards will need to be supported by sound argument and proof that the railway manager's core requirements and objectives are not compromised.

To avoid frustrations or delays, it is strongly recommended that any proposal to modify or waive requirements contained in the standards be discussed with TMR and QR at the earliest opportunity. It may be necessary to undertake a risk assessment in conjunction with QR, to validate the proposal.

## Notes

1. The Queensland Fire and Rescue Service plays a significant role in ensuring the safety of development. Therefore, safety considerations should be discussed with the Queensland Fire and Rescue Service prior to the lodgement of a development application.
2. Where a proposed development necessitates the crossing of a railway corridor by utility services or other infrastructure, resource evidence is required under Section 264 of the *Sustainable Planning Act 2009*. This should be obtained from TMR prior to the lodgement of a development application.

# Appendix E
# FCM Response Letter

April 17, 2014

Dave Grigg
Senior Associate – Rail Infrastructure
Hatch Mott MacDonald
2800 Speakman Drive,
Mississauga, Ontario
L5K 2R7

Dear Mr. Grigg:

Thank you for contacting us with regards to your request for clarification on the Guidelines for New Development in Proximity to Railway Operations ("The Guidelines"). The Proximity Guidelines Committee, of the FCM-RAC Proximity Initiative, who developed the guidelines with DIALOG, has reviewed your questions and offers the following answers.

1. Please see section 2.1.1 of the guidelines – these measures have been developed based on a detailed analysis of past incidents and derailments by the railway industry for our first guidelines in 2004. The 30 metre setback with berm was devised by a careful analysis of aerial photographs of derailments. It was determined through this analysis that 30 metres, with a berm, was a minimum safe distance for derailments. It must be mentioned, however, that a 30 metre setback will not afford protection in the event of a catastrophic event involving hazardous materials. The 30 metre set back also creates a minimum buffer zone from the noise and vibrations associated with railway operations. The guidelines (chapter 3) recommend that further noise and vibration testing be done by qualified acoustical engineers to establish if any additional set-back distance and/or any other additional mitigation measures are required before a development is approved.

In support of the 30 metre setback – a recent ruling of the Canadian Transportation Agency (CTA) is a good reference /support document; Decision No. 69-R-2014 (February 27, 2014). The CTA dismissed the complaint and cited the Proximity Guidelines and Best Practices in section 56 of the decision. In section 57 of the decision the CTA wrote “A municipality takes a risk when deciding to allow housing development in close proximity to a railway right of way and the Agency is of the opinion that municipalities have a responsibility to assess compatibility issues before approving a housing development along a railway right of way, and if they approve a development, to ensure that the necessary mitigation measures are implemented.”

2 &4. The Guidelines were written specifically to offer alternatives where it was not otherwise feasible to set a building back 30 metres with a berm, or where there may be adaptive reuse of structures that are already abutting a railway corridor. The vertical and horizontal application of the 30 metre buffering zone as illustrated on page 27 of the Guidelines, was never intended to be a "catch all" solution, it is offered as one of many possible solutions. The guidelines should be read and applied as a whole as every site is unique and must be comprehensively studied by qualified professionals, in consultation

with the railway operators, to arrive at a solution where possible, that ensures safety, and sustainable living with regards to noise, vibration and emissions. As outlined in the guidelines – being closer to the noise/vibration source will require more mitigation measures. It, in fact, may not be possible to accommodate infill development in proximity to railway corridors under some circumstances.

3. Crash walls should be located/integrated on the side(s) of the podium facing the railway corridor. Again this is site specific and depends on the variables per section 3.6.1.3 of the guidelines.

The FCM-RAC Proximity Guidelines Committee noted that it is important to appreciate that the guidelines exist to support a process and are not intended to prescribe comprehensive technical specifications. That being said, please don't hesitate to direct any further questions to me and I will be pleased to circulate them to the committee for their input.

Regards,

Cynthia Lulham

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