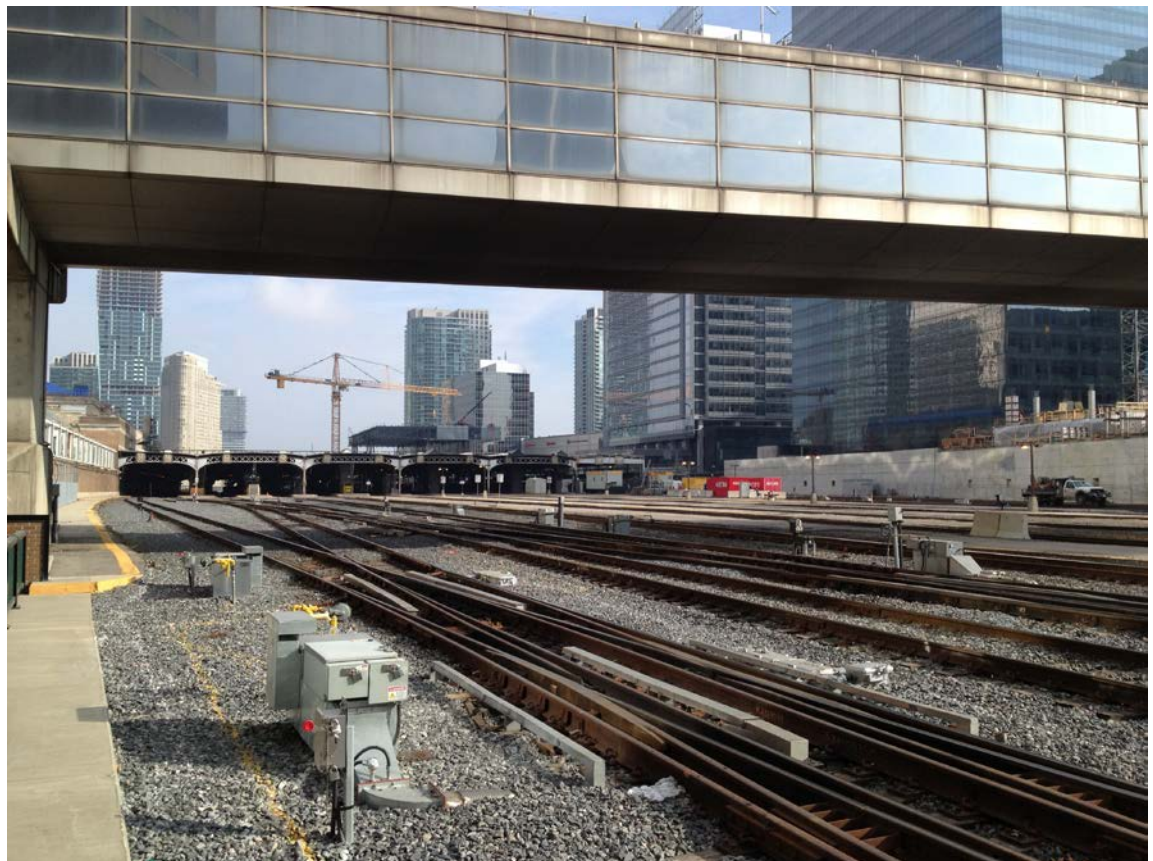


Phase 1 Interim Report

Land Use Study: Development in Proximity to Rail Operations

City of Toronto



Prepared for the City of Toronto
by IBI Group
and Stantec
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Accessibility

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1 Introduction

In recent years there have been increasing concerns about rail safety and the transportation of dangerous goods, with events such as the Mississauga derailment in 1979 and the Lac-Mégantic disaster in 2013 (see sidebar). These events have raised public awareness of the movement of dangerous goods by rail and brought concerns about the safety of the interactions between railway operations and the urban environment to the fore.

The City of Toronto has experienced significant growth in recent years and some of this development has occurred alongside the rail network. In order to support the City's continued growth, the City of Toronto retained IBI Group with Stantec to study land use and development in proximity to rail operations.

The rail corridors in Toronto were built in a variety of configurations, with different widths of rights-of-way, orientations to the surrounding lands and in a variety of urban environments. While the function of almost all of these lines has changed considerably over time, their configuration has not.

In a period of less than 60 years, from 1853 to 1911, the rail network throughout the City of Toronto was established, with the last major line being the entry into Toronto of the Canadian Northern Railway's Montreal to Toronto line through the Don Valley. Since that time the network has not changed very much in terms of configuration. The last major change was the introduction of the CN "bypass" line which re-routed CN through freight trains north of Steeles Avenue, completed in 1965.

MISSISSAUGA 1979

On November 10, 1979 just before midnight, a Canadian Pacific (CP) freight train consisting of 106 cars of mixed cargo, which included dangerous goods/chemicals, derailed at Mavis Road north of Dundas Street in Cooksville (Mississauga). Twenty-three rail cars went off the tracks, and most caught fire including tanker cars which were carrying propane. Three loaded propane tank cars exploded.¹

The fire resulting from this explosion was further fuelled by the chemical contents on other derailed cars. Cars carried a variety of dangerous chemicals, including chlorine. In response to the potential risk of chlorine gas spreading over the surrounding population, nearly 250,000 people were evacuated¹ – the largest evacuation in North America at the time². Fortunately, no deaths or injuries were reported.¹

The Mississauga Railway Accident Inquiry findings, generally referred to as the Grange Commission Report, were published in December 1980 and included recommendations for improvements for rail transportation of dangerous goods.

LAC-MEGANTIC 2013

On July 5, 2013 at around 1:15 am, a train carrying 7.7 million litres of crude oil in 72 tanker cars derailed near the centre of town Lac-Mégantic, Quebec. The train had been parked on a portion of a main track with a descending grade, with engine and hand brakes applied. Due to a combination of events, the train began to roll downhill towards Lac-Mégantic, approximately 11 km (7 miles) away. As it rolled downhill, the train picked up speed, peaking at just over 100 km/h (65 mph).³

Of the 72 tanker cars, 63 derailed, and most of the derailed cars were damaged and punctured. Approximately 6 million litres of crude oil was released and caught fire almost immediately. The fire and subsequent explosions resulted in 47 deaths and destroyed much of the downtown. Approximately 2,000 people were evacuated.³

The Transportation Safety Board completed an investigation in 2014, and made five recommendations regarding the securement of trains, tank car standards, route planning, risk assessments, and emergency response assistance plans.

¹ Mississauga Train Derailment, City of Mississauga, http://www.mississauga.ca/portal/home?paf_gear_id=9700018&itemId=5500001, accessed August 18, 2017.

² 10 of Canada's Worst Train Accidents, Maclean's, July 9, 2013, <http://www.macleans.ca/society/life/10-of-canadas-worst-train-accidents/>, accessed August 18, 2017.

³ Lac-Mégantic Runaway Train and Derailment Investigation Summary, Transportation Safety Board of Canada, <http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/r13d0054/r13d0054-r-es.asp>, accessed August 18, 2017.

1.1 Purpose of Study

In May 2013, the Federation of Canadian Municipalities (FCM) and the Railway Association of Canada (RAC) published the "Guidelines for New Development in Proximity to Railway Operations" (FCM/RAC Guidelines), a collaborative effort between the two groups that provided proximity guidelines and best practices for development along railway lines.

On February 27, 2014 the Canadian Transportation Agency (CTA) cited the FCM/RAC Guidelines in one of its decisions (Decision No. 69-R-2014) regarding a noise complaint filed by Michael Girard. Section 57 of this 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. The Agency notes that the Municipality apparently authorized the residential construction along CP's main east-west rail transportation corridor. However, there was no evidence presented to the Agency of any mitigation measures having been implemented. In fact, CP draws attention to the fact that no berm or noise wall was constructed."⁴

The FCM/RAC Guidelines strongly recommend a proactive approach by municipalities to identify and plan for potential conflicts between rail operations and new developments. Toronto is a highly developed city with higher densities and demand for growth than many other municipalities in Canada. Most lands along rail corridors have been developed, and the city is experiencing greater demand for infill and adaptive re-use of lands in proximity to rail operations. This study considers ways to balance development and growth with the presence of existing and future rail operations in Toronto, and provide tools for the review of development applications.

The purpose of this study is to provide the City with credible and defensible recommendations specific to Toronto that staff can rely on as they respond to development applications adjacent to rail corridors and yards. These recommendations must consider compatibility between rail corridors and potential development adjacent to these corridors, with mitigating measures identified where appropriate and feasible. This study must also balance the protection of people and property should a rail incident occur, the associated liability of the City, and the need to provide high quality developments to meet the City's growth objectives.

It is important to note that the City of Toronto has no jurisdiction over the majority of factors that may result in a train derailment or release of material. Specifically, the City of Toronto has no jurisdiction over rail operations, including the type, configuration, volume or speed of trains or over railway infrastructure and maintenance. The City of Toronto is also not responsible for monitoring or enforcement against trespassing on railway lands.

The key deliverable of this study is a handbook of risk mitigation strategies that can be applied across Toronto, considering the characteristics of the rail network in the City.

This study was planned as two phases with the following tasks:

Phase 1

- Conduct stakeholder interviews with major rail operators in the City regarding the technical aspects of their current and projected future operations. Rail operators include:
 - Canadian National Railway (CN),
 - Canadian Pacific Railway (CP),

⁴ Canadian Transportation Agency Decision No. 69-R-2014, February 27, 2014. Complaint by Michel Girard pursuant to section 95.3 of the Canada Transportation Act, S.C., 1996, c. 10, as amended. <https://www.otc-cta.gc.ca/eng/ruling/69-r-2014>, accessed 2017-07-05)

- Metrolinx,
 - VIA Rail (VIA),
 - Toronto Port Lands Company (TPLC), and
 - Toronto Terminals Railway (TTR).
- Identify and map the inventory of rail infrastructure in the city and categorize which lines are 'principle', 'main', 'spur', 'yard', or any other appropriate category;
 - Provide the profile, including photographic imagery of each major rail corridor/yard (including, where available, operational and incident histories, surrounding land uses, main operator, freight, passenger or both, if freight type of materials carried, frequency, speed, future plans and any other relevant information);
 - Working with City's Project Manager, develop and apply a typology for each major yard and transportation rail corridor which includes, but is not limited to:
 - The identification and evaluation of current and potential future risks associated with each type of corridor/yard; and
 - Categorization and grouping of each piece of rail infrastructure based on common operational traits, with each identified 'Type' graphically represented in an appendix;
 - Provide an Interim Report for Phase 1 (this report).

Phase 2

- Review and assess current or planned for "best practices" regarding rail/sensitive land use safety measures and mitigation approaches used in Canadian cities such as Montreal, Ottawa, Mississauga, Calgary, Edmonton, and Vancouver. The primary goal is to identify which municipal jurisdictions took a general approach to rail mitigation (one set of policies, regulations and standards applied to all land uses both sensitive and non-sensitive) and which (if any) took a more tailored approach (varying standards according to land use or other factors i.e.: geographic, nature of rail corridor, etc.);
- Conduct Consultation through:
 - Internal stakeholder consultation with various City of Toronto departments. The emphasis will be on identifying any operational or technical issues, effect and impact related to mitigative features both on a day to day basis and in the event of an emergency. Questions include, but are not limited to, the following:
 - If a mitigative feature is on lands dedicated or managed by Parks, Forestry and Recreation what are the operational effects?
 - Do certain mitigative features negatively impact the economic function of lands designated for employment uses?
 - In the event of an emergency do certain mitigative features impede emergency responders in terms of access? Do other features assist?
 - Continuation of technical and operational consultations with major rail operators (CN, CP, Metrolinx, VIA, TPLC, TTR) the objective is to gain a better understanding regarding the operators approach to mitigative features and the possible operational impacts/effects of different mitigative strategies;

- With City Planning, consult community, development and industry stakeholders. A final list will be created with City Planning as well requests from individual Ward Councillors.
- Based upon the results of Phase 1 and the consultative process of Phase 2 recommend a range of mitigation measures and criteria for each 'Type' of rail infrastructure in the City. Although within the context of the FCM/RAC Guidelines, the recommended mitigation measures should be specific to Toronto, the experienced condition of the subject rail infrastructure and the various abutting land uses in the City.
- Provide a report on findings, and recommended mitigation strategies/ approaches/ techniques. The recommended mitigation strategies will be compatible and suited to each of the previously identified 'Types' of rail infrastructure found in the City and will be graphically represented within an appendix. The report will also contain any recommended/required Official Plan policy amendments and Zoning By-law amendments

1.2 Background

Relevant policies and guidelines regarding development and growth, and development in proximity to rail corridors, offer direction that can be applied to Toronto. This material is summarized in the previous City of Toronto “North Toronto Subdivision Rail Corridor Risk Assessment and Management Study” (2014) and includes:

- 2014 Provincial Policy Statement;
- 2013 FCM and RAC “Guidelines for New Development in Proximity to Railway Operations”; and,
- 2013 Metrolinx “Adjacent Development Guidelines”.

The Ontario Planning Act requires that residential applications for development within 300 metres of rail corridors must be circulated to the rail operator(s).

In Phase 2 of this study, current or planned practices from other relevant jurisdictions will be reviewed and assessed to help establish recommendations for mitigation measures appropriate for Toronto.

1.2.1 2014 Provincial Policy Statement

The Provincial Policy Statement (PPS) provides policy direction to municipalities on land use planning and development as they pertain to provincial interest, and the provincial goal to enhance the lives of all Ontarians. The PPS aims to provide for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment, The PPS also directs municipalities to protect corridors and rights-of-way for infrastructure including transportation and transit facilities.

Major facilities, as defined under the PPS, include transportation infrastructure and corridors, and rail facilities, among several other types of facilities. It also notes that sensitive land uses can be part of the natural or built environment, and defines these uses as “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.”⁵ The PPS states that these two uses are to be designed with appropriate buffering and/or separation to prevent or mitigate adverse effects and minimize risk to public health and safety.

⁵ Provincial Policy Statement, Ministry of Municipal Affairs and Housing Provincial Planning Policy Branch, 2014

The relevant policies in the PPS, as referenced above, are as follows:

- 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.”⁵
- 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.”⁵

The City is required under the PPS to ensure that its land use planning policies and decisions reflect these directives, and allow for continued presence and operation of Toronto’s railway lines.

1.2.2 2013 FCM/RAC “Guidelines for New Development in Proximity to Railway Operations”

In 2003 the FCM and RAC began a partnership through a Memorandum of Understanding under which both parties would develop a common approach to prevent and resolve issues arising from developments being constructed in close proximity to rail corridors. The FCM/RAC Guidelines were borne of this partnership, with the aim to establish a common proximity guideline for all municipalities, improve awareness among industry and decision makers of issues and the need for effective planning and management, and develop resolution protocols to streamline decisions when conflicts emerged between railway companies, developers and regulators.⁶ The FCM/RAC Guidelines include consideration of building setbacks, noise and vibration, safety barriers, security fencing, stormwater management and drainage, legal agreements, and construction issues.

The FCM/RAC Guidelines define standard mitigation measures for new residential development in proximity to a railway corridor. Along principal main lines, the standard recommended building setback is 30m, measured from the property line to the building face. This setback provides a buffer from railway operations, including noise, vibrations, and emissions, accommodates a safety barrier (i.e., 2.5m earthen berm), and addresses the fundamental land use incompatibilities.⁶ Where the standard mitigation measures are not viable, alternative safety measures are recommended, including the application of the Development Viability Assessment tool.

1.2.3 2013 Metrolinx “Adjacent Development Guidelines”

The Adjacent Development Guidelines were developed by Metrolinx to communicate the implications of development in close proximity to railway corridors, ensure safe and reliable rail operations, and minimize conflicts between current or future rail operations and development.⁷

Metrolinx/GO Transit have reviewed a wide range of projects and municipal by-laws and processes. Based on this experience the Adjacent Development Guidelines were developed to “inform and influence municipal land development approval processes and provide a consistent

⁶ Guidelines for New Development in Proximity to Railway Operations, The Federation of Canadian Municipalities and the Railway Association of Canada, May 2013.

⁷ Adjacent Development Guidelines, Metrolinx, 2013.

framework for land use decisions made in proximity to GO Transit operated railway corridors”⁷ through the use of standards and best practices.⁷

The Adjacent Development Guidelines identifies mandatory measures for residential developments, and recommended measures for other types of developments. The mandatory safety measure for residential land use is the combination of a 2.5 m berm and 30 m building setback. The Adjacent Development Guidelines also identifies mandatory or recommended technical studies, including noise and vibration impacts.⁷

1.3 Study Area

There are over 200 km (130 miles) of rail corridors across Toronto, owned or operated by Metrolinx, CN, CP, TTR, and TPLC. Rail corridors are referred to as subdivisions and are typically measured in miles. The subdivisions within the bounds of the City of Toronto are illustrated in Exhibit 1-1. Exhibit 1-2 lists the subdivisions with owner and length indicated.

Exhibit 1-2 – List of Rail Corridor Subdivisions within City of Toronto Limits

SUBDIVISION (GO RAIL SERVICE)	OWNER	LENGTH (MILES)	LENGTH (KILOMETRES)
Agincourt Industrial Spur	CP	1.13	1.82
Bala (Richmond Hill GO)	Metrolinx	13.27	21.36
Belleville	CP	14.50	23.34
Canpa	Metrolinx	2.60	4.18
Don Branch	Metrolinx	3.20	5.15
Galt (Milton GO)	CP	7.20	11.59
GECO Branch	CN	2.28	3.67
Halton	CN	1.89	3.04
Havelock	CP	1.40	2.25
Highbury Industrial Lead	CN	0.45	0.72
Humberline Industrial Spur	CN	1.21	1.95
Islington Service Spur	CP	1.27	2.04
Kingston (Lakeshore East GO)	Metrolinx	16.40	26.39
MacTier	CP	9.41	15.14
Newmarket (Barrie GO)	Metrolinx	10.52	16.93
North Toronto	CP	5.90	9.50
Oakville (Lakeshore West GO)	Metrolinx	8.72	14.03
Staines Cross Connection	CP	1.10	1.77
Toronto Harbour District	TPLC	3.50	5.63
Union Station Rail Corridor	Metrolinx	3.50	5.63
Uxbridge (Stouffville GO)	Metrolinx	8.22	13.23
Weston (Kitchener GO)	Metrolinx	11.60	18.67
York	CN	3.74	6.02
TOTAL LENGTH		133.01	214.06

2 Rail Safety Trends in Canada

The Transportation Safety Board of Canada (TSB) is an independent agency governed by the Canadian Transportation Accident Investigation and Safety Board Act (S.C 1989, c.3). The TSB collects transportation accident data and conducts investigations for rail, air, marine and pipeline modes of transportation.

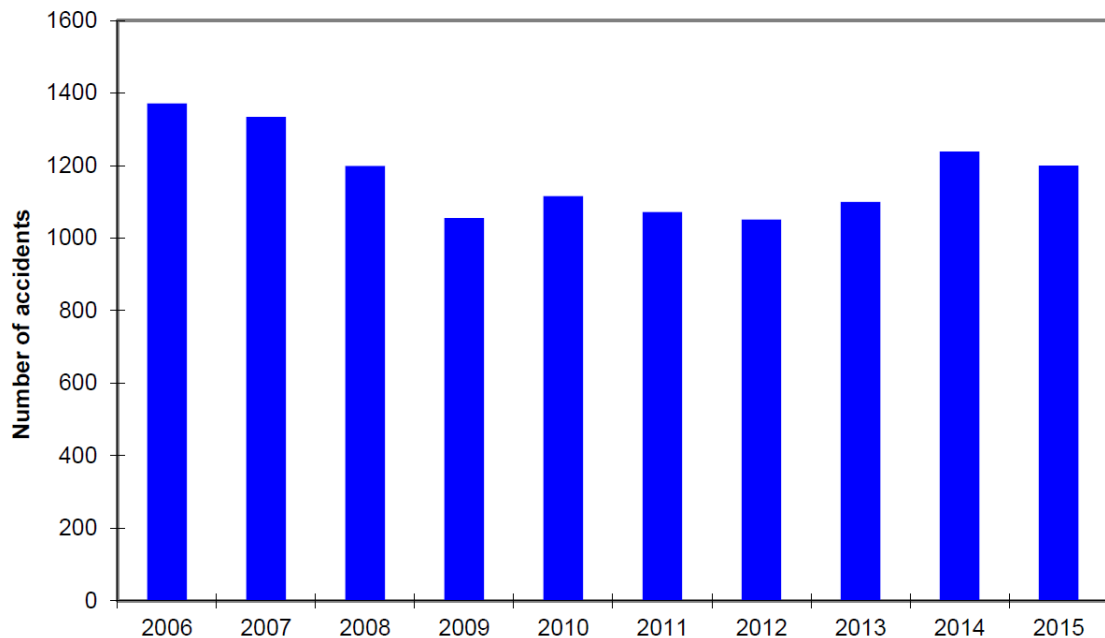
The most recent statistical summary available from the TSB is “Statistical Summary - Railway Occurrences 2015”⁸. In 2015 across all of Canada, 1,200 rail accidents were reported to the TSB (Exhibit 2-1). The TSB notes this is a 3% decrease from the 2014 total of 1,238 and an 8% increase from the 2010 to 2014 average of 1,115 rail accidents.

In 2015, most rail accidents (approximately 62%) involved single cars or cuts of cars, locomotives, and track units. The remainder were made up of accidents involving freight trains (approximately 34%), and passenger trains (approximately 4%).

The majority of rail accidents (62%) were non-main-track derailments and collisions (Exhibit 2-2); this is related to the finding above that the majority of rail accidents involve single cars. The TSB also notes that most non-main-track accidents have low severity outcomes, occurring during low-speed switching operations (i.e., speeds of less than 16 km/h or 10 mph).

The following sections review main-track, non-main-track, crossing and trespasser statistics reported to the TSB across Canada in 2015.

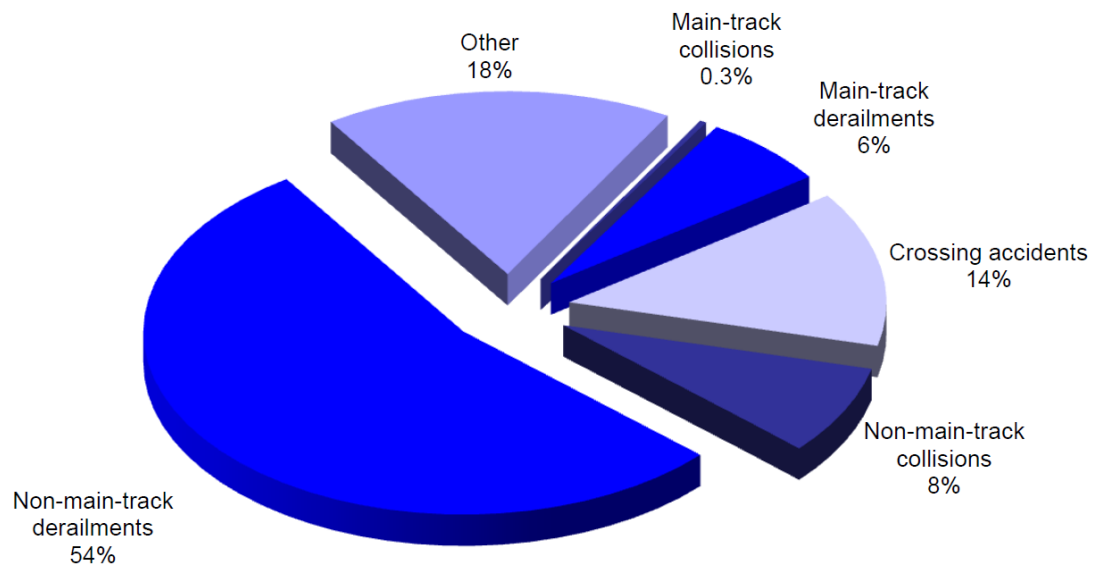
Exhibit 2-1 - Number of Rail Accidents reported in Canada, 2006–2015



(Source: Transportation Safety Board of Canada, Statistical Summary Railway Occurrences 2015, <http://www.tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, April 2016)

⁸ Transportation Safety Board of Canada, Statistical Summary - Railway Occurrences 2015, <http://tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, accessed May 15, 2017.

Exhibit 2-2 - Percentage of Rail Accidents in Canada by Type, 2015



(Source: Transportation Safety Board of Canada, Statistical Summary Railway Occurrences 2015, <http://www.tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, April 2016)

2.1 Main-track collisions and derailments

Across Canada in 2015, there were four main-track collisions and 77 main-track derailments (Exhibit 2-3).

No fatalities or serious injuries resulted from main-track collisions or derailments in 2015; however, 12 main-track derailments involved dangerous goods and three of these resulted in a release of product (crude oil or liquefied petroleum gas).

Of the 77 main-track derailments in 2015, 21 occurred in Ontario (27%), with 7 of the 21 Ontario derailments (33%) involving 6 or more cars.

“Main-track collisions and derailments are the most serious categories of rail accidents in terms of potential risk to the public and of financial loss (e.g., when passenger trains are involved or dangerous goods are released from trains that derail in populated areas).”⁹

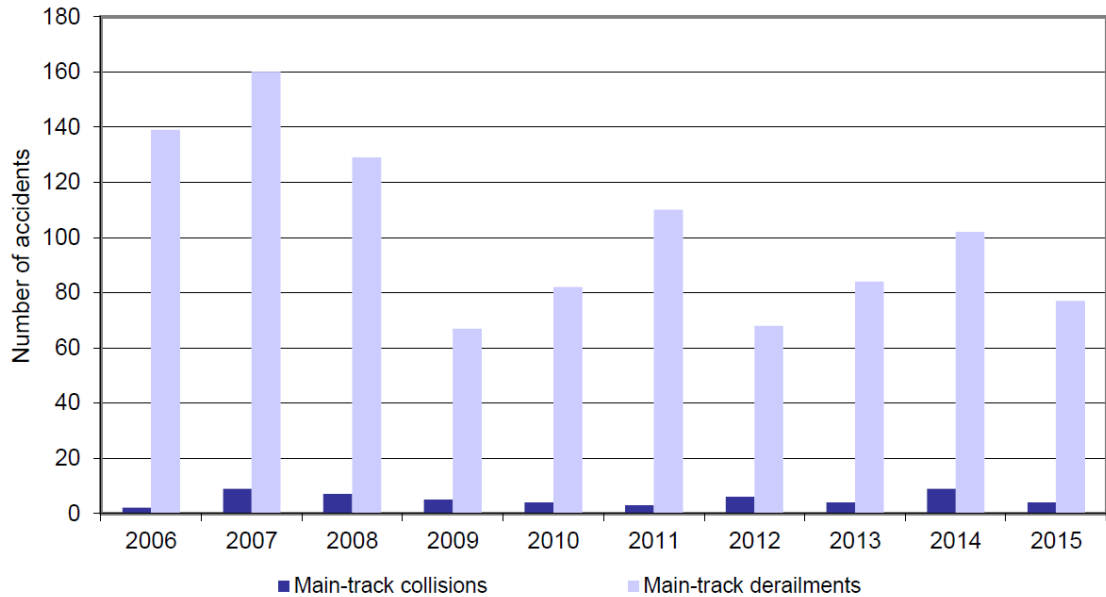
Occurrences are normally reported to TSB with one assigned factor. However, the TSB may assign additional factors to an occurrence. When multiple factors are assigned to a rail accident, the TSB notes that they are considered to have acted in combination to contribute to the occurrence (see Appendix A for details).

Of the main-track derailments in 2015, the assigned factors were:

- 39% track-related, compared with the 5-year average of 37%
- 29% equipment-related, compared with the 5-year average of 31%
- 18% actions-related, compared with the 5-year average of 21%.

⁹ Transportation Safety Board of Canada, Statistical Summary - Railway Occurrences 2015, page 5 of <http://tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.pdf>

Exhibit 2-3 - Number of Main-Track Collisions and Derailments in Canada, 2006–2015



(Source: Transportation Safety Board of Canada, Statistical Summary Railway Occurrences 2015, <http://www.tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, April 2016)

2.2 Non-main track collisions and derailments

Across Canada in 2015, there were 95 non-main-track collisions and 647 non-main-track derailments (Exhibit 2-4).

No fatalities or serious injuries resulted from non-main-track collisions in 2015. Dangerous goods were involved in 34% of non-main-track collisions; none resulted in a release of product.

Of the non-main-track collisions, 33% also resulted in derailments, and most (74%) of those derailments involved only one car.

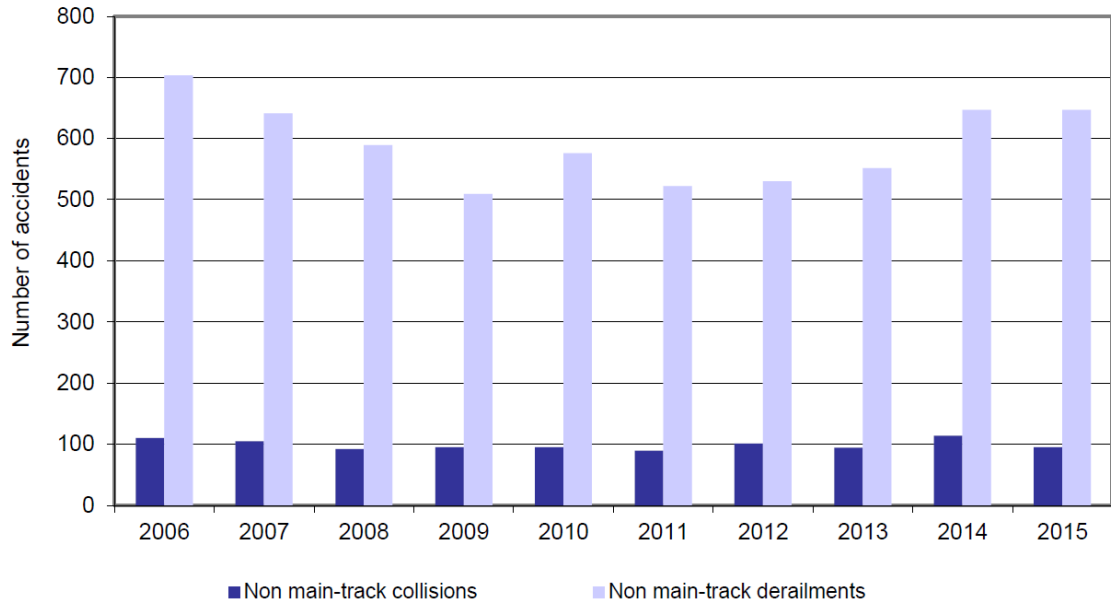
Of the non-main-track derailments, most (83%) involved 1 or 2 cars. No fatalities or serious injuries resulted from non-main-track derailments in 2015. Dangerous goods were involved in 14% of non-main-track derailments; 2 resulted in a release of dangerous goods (ammonium nitrate, styrene monomer).

For non-main-track collisions in 2015, assigned factors were 88% actions-related, compared with 87% for the last 5-year average (Appendix A).

For non-main-track derailments in 2015, assigned factors were (Appendix A):

- 51% actions-related, compared to the 5-year average of 45%
- 31% track-related, compared to the 5-year average of 34%
- 9% environmental-related, unchanged from the 5-year average of 9%.

Exhibit 2-4 - Number of Non-Main-Track Collisions and Derailments in Canada, 2006–2015



(Source: Transportation Safety Board of Canada, Statistical Summary Railway Occurrences 2015, <http://www.tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, April 2016)

2.3 Crossing accidents

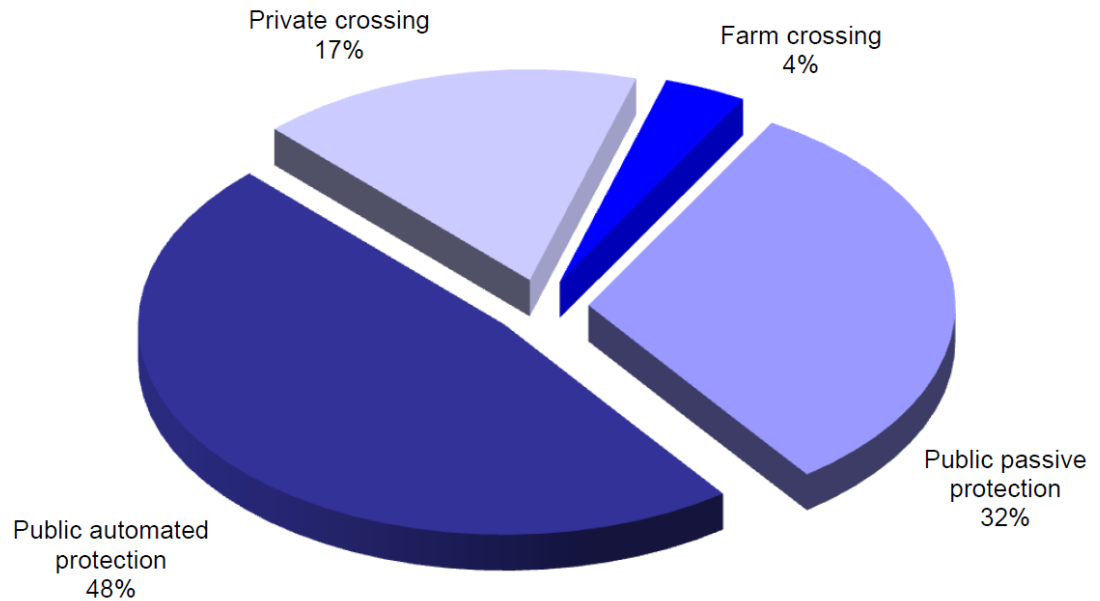
Across Canada in 2015, there were 165 crossing accidents, with 18% of these resulting in either serious or fatal injuries. This is a decrease of accident frequency, compared to the 2014 total of 185 and the 5-year average of 182.

Most crossing accidents occurred at public automated crossings (48%), followed by public passive crossings (32%) (Exhibit 2-5). The TSB notes that there are nearly twice as many passive crossings as automated crossings in Canada; however, automated crossings have a higher number of accidents due, in part, to higher vehicle and train traffic volumes at these crossings.

There were 15 fatal crossing accidents in 2015, down from the 21 reported in 2014 and the 5-year average of 23. While pedestrian crossing accidents accounted for 5% (8) of the total, pedestrians accounted for 27% (4) of the fatal crossing accidents.

Six crossing accidents resulted in derailments, and one crossing accident resulted in a release of dangerous goods (from a tanker truck struck at a level crossing).

Exhibit 2-5 - Percentage of Crossing Accidents by Type of Crossing, 2015



(Source: Transportation Safety Board of Canada, Statistical Summary Railway Occurrences 2015, <http://www.tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp>, April 2016)

2.4 Trespasser accidents

Across Canada in 2015, there were 50 trespasser accidents. Trespasser accidents involve persons who are not authorized to be on a railway right-of-way and who are struck by rolling stock at a location other than a railway crossing. The 2015 trespasser accident frequency was down from the 2014 total of 55 and from the 5-year average of 66. The majority of these accidents resulted in fatality (60%) in 2015.

Measures against trespassing are controlled and enforced by railway companies and not the municipality within which the rail corridor runs.

2.5 Summary

In summary, rail collisions and derailments can be caused by a wide range of factors, with equipment and track the most frequently identified factors for main-line derailments.

Based on the review of the TSB's 2015 summary, the following trends in Canada are noted:

- Collisions and derailments occur most frequently on non-main-track;
- Non-main-track collisions and derailments generally involve 1 or 2 cars, and have lower severity outcomes;
- Both main-track and non-main-track collisions and derailments can result in the release of product, including dangerous goods;
- Main-track collisions and derailments are generally related to track and equipment, whereas non-main-track are generally related to actions;
- Crossing and trespasser accidents often result in serious or fatal injuries; and,
- Crossing accidents can result in derailment and/or the release of dangerous goods.

3 Rail Incident History within the City of Toronto

The TSB publishes selected data from its Rail Occurrence Database System for use by industry and the public to advance transportation safety. On or about the 15th of each month, the TSB updates the rail data file, which contains data from January 1, 2004 to the last day of the preceding month (<http://tsb.gc.ca/eng/stats/rail/index-ff.asp>).

This data enumerates the occurrence of railway incidents, specifying several details (e.g. type, location, if a collision resulted, if fire resulted, if dangerous goods were carried, if dangerous goods were released, total injuries, total fatalities, etc.). Incident history within the bounds of the City of Toronto was taken from this database and reviewed.

Non-main-track derailments and collisions accounted for approximately 52% and 10% of all incidents within Toronto, respectively. Of these incidents approximately 15% (49) involved dangerous goods. This is generally consistent with current (2015) Canada-wide railway safety trends discussed in Section 2.

There were 74 trespassing incidents in Toronto over the 13 year period, with approximately 93% resulting in injury or death. While trespassing accounted for only approximately 14% of the incidents recorded, it accounted for 94% of the injuries and 95% of the fatalities of all incidents. Similarly across Canada, the main cause of fatalities is due to incidents involving trespassers on the railway. As noted previously, municipalities do not control or enforce measures against trespassers on railway corridors.

Crossing incidents and movements exceeding limits of authority were also notable contributors to the total number of incidents in Toronto, accounting for 5% and 9%, respectively. There were two occurrences of a fire in Toronto over the period; neither resulted in any injuries or fatalities.

Exhibit 3-1 summarizes the over 19,000 incidents reported across Canada between 2004 and 2016 by type, dangerous goods involvement, and resulting fatalities and injuries. The most frequent incidents, in order of frequency, were:

- Non-Main-Track Train Derailment
- Crossing
- Movement Exceeds Limits of Authority
- Main-Track Train Derailment
- Non-Main-Track Train Collision
- Dangerous Goods Leaker
- Trespasser

Exhibit 3-2 provides the same information for the 531 incidents reported within the City of Toronto between 2004 and 2016. The most frequent incidents, in order of frequency, were:

- Non-Main-Track Train Derailment
- Trespasser
- Non-Main-Track Train Collision
- Movement Exceeds Limits of Authority
- Crossing
- Dangerous Goods Leaker
- Main-Track Train Derailment

Exhibit 3-1 - Incidents Recorded in Canada, 2004-2016

ACCIDENT/INCIDENT TYPE	TOTAL	DANGEROUS GOODS CARS INVOLVED	FATALITIES	INJURIES
Collision Involving Track Unit	298	5	0	8
Crew Member Incapacitated	25	1	1	11
Crossing	2637	64	335	404
Dangerous Goods Leaker	1031	1031	0	0
Derailment Involving Track Unit	145	1	0	1
Derailment Involving Track Unit (No Damage)	5	0	0	0
Employee	133	3	20	77
Fire	305	17	0	0
Main-Track Switch in Abnormal Position	110	0	0	0
Main-Track Train Collision	70	9	1	1
Main-Track Train Derailment	1460	254	57	22
Main-Track Train Derailment (No Damage)	1	1	0	0
Movement Exceeds Limits of Authority	1496	0	0	0
Non-Main-Track Train Collision	1326	433	1	1
Non-Main-Track Train Collision (No Derailment, No Damage)	1	0	0	0
Non-Main-Track Train Derailment	8108	1211	1	2
Non-Main-Track Train Derailment (No Damage)	39	1	0	0
Passenger	28	0	2	13
Rolling Stock Collision with Abandoned Vehicle	98	0	1	2
Rolling Stock Collision with Object	250	10	3	8
Rolling Stock Collision with Object (No Derailment, No Damage)	2	0	0	0
Rolling Stock Damage Without Derailment/Collision	193	51	0	0
Runaway Rolling Stock	169	13	0	0
Signal Less Restrictive Than Required	30	0	0	0
Trespasser	983	1	650	273
Unprotected Overlap of Authorities	73	0	0	0
GRAND TOTAL	19016	3106	1072	823

(Source: Transportation Safety Board of Canada, Railway Statistics,
<http://www.tsb.gc.ca/eng/stats/rail/index.asp>, accessed June 28, 2017)

Exhibit 3-2 - Incidents Recorded within the City of Toronto, 2004-2016

ACCIDENT/INCIDENT TYPE	TOTAL	DANGEROUS GOODS CARS INVOLVED	FATALITIES	INJURIES
Collision Involving Track Unit	4	0	0	0
Crew Member Incapacitated	2	0	1	0
Crossing	25	0	2	0
Dangerous Goods Leaker	11	11	0	0
Derailment Involving Track Unit	3	0	0	0
Derailment Involving Track Unit (No Damage)	0	0	0	0
Employee	0	0	0	0
Fire	2	0	0	0
Main-Track Switch in Abnormal Position	0	0	0	0
Main-Track Train Collision	1	1	0	0
Main-Track Train Derailment	10	1	0	0
Main-Track Train Derailment (No Damage)	0	0	0	0
Movement Exceeds Limits of Authority	46	0	0	0
Non-Main-Track Train Collision	53	15	0	0
Non-Main-Track Train Collision (No Derailment, No Damage)	0	0	0	0
Non-Main-Track Train Derailment	277	34	0	1
Non-Main-Track Train Derailment (No Damage)	0	0	0	0
Passenger	2	0	0	0
Rolling Stock Collision with Abandoned Vehicle	1	0	0	0
Rolling Stock Collision with Object	9	0	0	0
Rolling Stock Collision with Object (No Derailment, No Damage)	0	0	0	0
Rolling Stock Damage Without Derailment/Collision	1	0	0	0
Runaway Rolling Stock	4	0	0	0
Signal Less Restrictive Than Required	4	0	0	0
Trespasser	74	0	52	17
Unprotected Overlap of Authorities	2	0	0	0
GRAND TOTAL	531	62	55	18

(Source: Transportation Safety Board of Canada, Railway Statistics, <http://www.tsb.gc.ca/eng/stats/rail/index.asp>, accessed June 28, 2017)

4 Initial Discussions with Railway Line Owners and Operators

Part of the Phase 1 work program was to contact the owners of railway lines within the City of Toronto and the companies that operated over these lines in order to obtain information on the lines themselves and the trains that are operated on them. An interview guide was developed, requesting the following information:

- Rail Infrastructure
 - Base maps of lines
 - Type (Principal, Main, Spur, Yard)
 - Number of tracks, presence of crossings or switches
 - Location of fencing, noise walls, crash walls
 - Maximum allowable train speeds
 - Track elevation compared to adjacent lands
- Operations
 - Current and historic train volumes (daily, weekly, including number of trains and length of consists, passenger and freight)
 - Incident history, including derailments and trespassing
 - Employee time table, including locations of at-grade crossing, train speed limits, etc.
 - Future plans for track improvements, including spurs, yards or other infrastructure
 - Future plans for service increases (freight and passenger)

A list of contacts was prepared and a letter outlining this study and requesting cooperation was sent out by the City. Subsequently all were contacted by electronic mail or telephone. The agencies contacted to date include:

- CN;
- CP;
- Metrolinx/GO Transit;
- TTR;
- TPLC; and,
- VIA Rail Canada (VIA).

4.1 Canadian National Railway

At the time of writing, no information has been received from CN. Efforts to consult with CN will be continued through the consultation program in Phase 2 of this study.

4.2 Canadian Pacific Railway

At the time of writing, no information has been received from CP. Efforts to consult with CP will be continued through the consultation program in Phase 2 of this study.

4.3 Metrolinx

Metrolinx is an agency of the Provincial Government that operates regional rail and bus services within the Greater Toronto and Hamilton Area (GTHA) and surrounding municipalities. A meeting was held on June 21, 2017 with relevant staff as determined by Metrolinx and representatives of IBI Group and Stantec.

Metrolinx has purchased from CN the rights-of-way within the City for six of the seven commuter rail lines it operates. Metrolinx has also purchased a section of the seventh line, the Milton Line, running from the USRC to West Toronto. The remainder of the Milton Line, west of West Toronto, operates on CP tracks (Exhibit 1-2).

Metrolinx has an ambitious program in development called Regional Express Rail (RER) on five of its lines (all except the Richmond Hill and Milton Lines). RER will involve electrifying each corridor and providing frequent two-way service. As such, RER may include providing additional tracks and structures on the relevant corridors. Metrolinx also operates the Union Pearson Express from Union Station to Pearson International Airport on the Weston Subdivision (Kitchener GO line).

The RER planning, detailed design and implementation for corridor expansions and improvements are in different stages of development across the GO network. Some are currently in the environmental assessment stage, some are in detail design and approaching construction, others are in initial planning. As such, it is premature to analyze the precise spatial relationships of future conditions to adjacent land uses and planned/built form. Metrolinx supplied the project team with the RER Initial Business Case (2015)¹⁰ which includes the outline configuration of tracks required, as foreseen at the time of preparation. Exhibit 4-1 summarizes these changes, Scenario 5 being the recommended plan.

Exhibit 4-1 - Track Changes (within City of Toronto) Proposed in the Metrolinx RER Initial Business Case (2015)

LINE	SCENARIO 4 (FULL BUILD)	SCENARIO 5 (OPTIMIZED - RECOMMENDED)
Lakeshore West	No change	No change
Milton	Restoration of second track West Toronto to Union Station Rail Corridor (USRC)	No change
	Four tracks to West Toronto (2freight, 2 passenger)	
	Overpass of CP freight tracks at West Toronto	
Kitchener	Total of 4 tracks (including UPX)	Total of 4 tracks (including UPX)
Barrie	Double tracking	Double tracking
Richmond Hill	Double tracking	No change
Stouffville	Double tracking	Double tracking
	4 tracks on Kingston Sub from USRC to Scarborough Junction	4 tracks on Kingston Sub from USRC to Scarborough Junction
Lakeshore East	4 tracks on Kingston Sub from USRC to Scarborough Junction	4 tracks on Kingston Sub from USRC to Scarborough Junction
	3 tracks from Guildwood to Pickering	3 tracks from Guildwood to Pickering
Union Station Rail Corridor (USRC)	Additional Island platform with removal of track 15	Additional Island platform with removal of track 15

¹⁰ http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/GO_RER_Initial_Business_Case_Summary_EN.pdf

Metrolinx also provided current requirements for setbacks and other mitigation measures in use for reviewing development applications along rail corridors. Metrolinx encouraged consideration of noise and vibration impacts of rail operations to adjacent development, in particular around rail yards which often operate 24 hours per day.

Information on current operations was also supplied. Metrolinx would like to be closely involved as the project proceeds.

4.4 Toronto Terminals Railways Company

TTR is a company jointly owned by CN and CP which operates the 6.4km USRC from Strachan Avenue in the west to the Don River in the east on behalf of Metrolinx.

Currently USRC is self-contained with most of the property bounded by major roads or embankments. Trains generally move slowly with little danger of derailments. TTR noted that they have not had many problems with adjacent land uses despite recent developments, with the exception of noise complaints. With more daytime traffic, corridor maintenance is being pushed into night hours, causing some problems with residents, in particular in the St. Lawrence neighbourhood.

While passenger traffic, particularly GO, is increasing, freight traffic is very low. One train a week is scheduled through the USRC to serve industry in the port lands but is often operated only once every two or three weeks, and typically consists of five or six cars. CN no longer runs through freight trains along the Lakeshore corridor. CP does not currently operate any trains through the USRC.

Both CN and CP have the right to run trains through the corridor, which could be required if other rail corridors through Toronto are blocked by accidents or construction.

4.5 Toronto Port Lands Company

TPLC is owned by the City of Toronto and owns much of the lands in the port area. TPLC also owns a railway line that connects with the USRC just west of the Don River. This line makes a large loop around the port area, running east from the USRC to serve the waste water treatment plant west of Leslie Street and returning southwest of the Shipping Channel to serve the PortsToronto facilities on Cherry Street.

Currently train volumes are low with less than one CN train a week operating to serve the sewage treatment plant, carrying chemicals. The Keating Yard is no longer used as a yard but only to run around the locomotive on the trains into the port area. PortsToronto does not currently generate any train traffic.

The right-of-way is narrow, generally less than 30 feet (9 metres). TPLC noted that they have not had any problems with abutting land uses but train speeds are quite low.

The TLPC does not have any plans for expansion but does have a responsibility to keep the track open to the PortsToronto facility. TPLC staff indicated that they could redevelop the rail access at some time in the future if the right economic opportunity comes along.

4.6 VIA Rail Canada

VIA operates intercity rail services over four routes to and from Union Station. VIA does not own any lines within the City of Toronto and therefore does not comment on development applications. VIA has a long-term lease on the Willowbrook rail yard on the south side of the Lakeshore West GO corridor in Mimico and is concerned about development adjacent to that yard, in particular related to potential noise complaints as the yard is in operation 24 hours per day.

While there are no confirmed service changes planned, VIA has been upgrading frequencies on services to Ottawa and Montreal. There could also be service improvements on the Lakeshore West and Kitchener GO lines. In the case of the latter line, these would have to be coordinated with the Province's plans for High Speed Rail on this corridor to London and ultimately Windsor.¹¹

VIA is considering electrification over the longer term; however, as VIA does not own the corridors, this must be coordinated with the rail corridor owners. VIA staff noted that electrification would impose a constraint on development over rail corridors.

4.7 Phase 2 Consultation

Additional consultation with the railway line owners and operators is recommended for the next study phase. It is anticipated that the provision of the base maps may facilitate discussion with the railway line owners and operators on existing and future conditions.

In order to create a forward-looking typology, it would be preferable to have input on planned corridor expansions; however this information has not been received to date. The study team will continue to pursue this information through the consultation program in Phase 2 of this study.

5 Base Maps

Base maps of all railway corridors across the City of Toronto were developed using the latest information available from the City. The base maps are provided in Appendix B, including a key map. The base maps include:

- The rail network, including:
 - Main operator (e.g. CN, CP, Metrolinx, TTR, TPLC),
 - Type of traffic (e.g. freight, passenger),
 - Trains per day (approximation for freight based on professional judgement – data not yet received from railway operators),
 - Railway type (e.g. principal main line, secondary main line, spur, yard)
 - Number of tracks,
 - Maximum operating speed,
 - Location of at-grade rail crossings (based on review of aerial imagery – data not yet received from railway owners),
 - Location of crossings and switches (based on review of aerial imagery – data not yet received from railway owners);
- The road network;
- Property fabric (based on the City's open data);
- Watercourses and waterbodies (based on the City's open data);
- Topography; and,
- An aerial background to illustrate existing land uses and natural features.

¹¹ <http://www.mto.gov.on.ca/english/publications/high-speed-rail-in-ontario-final-report/>

6 Database

In conjunction with the data collected for the base map, a database was constructed to tabulate the physical and operating characteristics of each rail corridor in the City, detailing all information collected during the study. This database is provided in Appendix B.

The railways within the City of Toronto are owned by the following companies:

- **CN** operates the largest rail network in Canada, and the only transcontinental network in North America, with approximately 19,600 route-miles of track across its network.¹² While CN historically owned much of the rail lines in Toronto, in recent years it has sold portions to Metrolinx, and continues to operate on Metrolinx-owned corridors. CN currently owns approximately 7% of rail lines in Toronto. CN owns a freight main line that runs near the limits of the city, with relatively short lengths in northeast Scarborough and northwest Etobicoke, and some spur lines.
- **CP** owns and operates a 14,000 mile network, from the Port of Vancouver to the Port of Montreal, and major U.S. industrial centres, including Chicago, Newark, Philadelphia, Washington, New York City and Buffalo.¹³ CP in recent years has also sold a portion of its rail lines in Toronto to Metrolinx, and continues to operate local freight services on Metrolinx-owned corridors. CP currently owns approximately 30% of the rail lines in Toronto. CP's lines continue north, east and west from the Junction (near Dundas Street West and Dupont Street), including main freight lines.
- **Metrolinx** is an agency of the Government of Ontario, which was created to improve the coordination and integration of all modes of transportation in the GTHA. In 2009, Metrolinx merged with GO Transit, the regional rail transit service. When GO Transit was created in 1967, and through most of its existence, it operated passenger trains on CN and CP rail lines. Over the past several years, Metrolinx began acquiring segments of these lines. At present, Metrolinx operates seven commuter rail routes radiating from Union Station, owning 80% of the rail lines it uses, and approximately 60% of all rail lines within Toronto.^{14,15}
- **TTR** is a jointly owned subsidiary of CN and CP, which operates the USRC on behalf of Metrolinx. In 2000, the City of Toronto purchased Union Station from TTR and GO Transit purchased the rail assets through the USRC. Following this sale, TTR continues to maintain and operate the rail assets in the USRC. While the USRC is 5.6 km long, approximately 3% of all rail lines in Toronto, it contains approximately 40km of track because of the number of tracks located in this corridor (up to 16).
- **TPLC** was incorporated by the City of Toronto Economic Development Corporation in 1986, and is wholly owned by the City. TPLC currently owns trackage within the Port Lands, east of the central waterfront.

Existing and future train volume information by subdivision was requested from the rail owners and operators, but was not provided. In light of this, current train volumes were determined through the use of public sources and assumptions; for example, GO train schedules were used to develop passenger train volumes. Exhibit 6-1 provides a summary of this data by subdivision.

¹² CN, Quick Facts and Figures, <https://www.cn.ca/en/about-cn/who-we-are/facts-and-figures>, accessed July 5, 2017.

¹³ CP, Our History, <http://www.cpr.ca/en/about-cp/our-history>, accessed on July 5, 2017

¹⁴ Metrolinx, Metrolinx Overview, http://www.metrolinx.com/en/aboutus/metrolinxoverview/metrolinx_overview.aspx, accessed July 5, 2017.

¹⁵ Metrolinx, Rail Corridor Ownership, http://www.metrolinx.com/en/projectsandprograms/corridorownership/corridor_ownership.aspx, accessed July 5, 2017.

Exhibit 6-1 - Current Volumes and Permissible Speeds of Railways through Toronto by Subdivision and Owner

SUBDIVISION	ELEMENT (MAIN LINE, SPUR, YARD)	VOLUME FREIGHT/ PASSENGER (MAXIMUM NO. OF TRAINS DAILY)	PERMISSIBLE SPEEDS KM/H (MPH)
CN			
York	Main Line	20	80 (50)
GECO Branch	Spur	2	15 (10)
Highbury Industrial Lead	Spur	2	15 (10)
Halton	Main Line	20	80 (50)
Humberline Spur	Spur	2	15 (10)
CP			
Agincourt Industrial Spur	Spur	2	15 (10)
Belleville	Main Line	20	100 (60)
Staines Cross Connection	Secondary	16	25 (15)
Galt	Main Line	32	110 (70)
Havelock (KLR)	Secondary	2	50 (30)
MacTier	Main Line	18	70 (45)
North Toronto	Main Line	20	80 (50)
Islington Service Spur	Spur	2	15 (10)
Metrolinx			
Bala	Main Line	16	105 (65)
Canpa	Secondary	2	25 (15)
Don Branch	Secondary	0	15 (10)
Kingston	Main Line	153	160 (100)
Newmarket	Main Line	16	120 (75)
Oakville	Main Line	205	150 (95)
Union Station Rail Corridor West	Yard	435	100 (60)
Union Station Rail Corridor East	Yard	203	50 (30)
Uxbridge	Main Line	36	80 (50)
Weston	Main Line	206	130 (80)
TPLC			
Harbour Lead	Spur	1>	15 (10)

7 Rail Typologies

The proposed concept for the City of Toronto is to develop a typology that can be applied to railway lines based upon various characteristics of any given segment of a line, within the City of Toronto limits. Each typology is expected to have a set of risk mitigation strategies defined in the next study phase.

7.1 Methodology

A quantitative risk assessment identifies, analyses and ranks potential risks based on statistical methods, probabilities, and potential outcomes. The focus of this study not a quantitative risk assessment of rail corridors or the statistical examination of train incident probabilities. The focus of this study is the qualitative assessment of risk based on rail corridor characteristics. This will provide a practical and proactive approach for the City of Toronto to identify and mitigate potential conflicts between rail operations and adjacent land uses, activities and people.

The history of incidents helps create an understanding of factors that influence risk. Analysis of incidents shows that a train derailment is often caused by more than one factor. As noted in Section 2.5, main-track collisions and derailments are generally related to track condition and equipment, whereas non-main-track are generally related to actions.

While examining past incidents helps to identify trends and patterns, given the number of factors related to rail incidents, it is not possible to predict where or when a future rail incident may occur. In addition, the City of Toronto has no jurisdiction over rail operations and most of the factors that may cause a derailment or release of material.

Therefore, the methodology applied to this study focuses on two key factors:

- The potential for a rail incident to occur; and,
- The potential severity of the outcome.

The proposed typologies were developed considering the following key trends and patterns noted in Section 2.5:

- Collisions and derailments occur most frequently on non-main-track; however non-main-track incidents generally have lower severity outcomes;
- Incident severity is directly related to the speed of the train; main-track collisions and derailments have the greatest potential risk to the public and of financial loss; and,
- Both main-track and non-main-track collisions and derailments can result in the release of product, including dangerous goods.

During Phase 2 of the study, mitigation strategy recommendations will be developed for each rail corridor typology in terms of land use policy and zoning changes. Through the mitigation strategies, potential severity of incidents will be taken into account.

As described in the following sections, the typologies developed for the FCM/RAC Guidelines were the starting point for the methodology.

7.2 FCM/RAC Typologies

The FCM/RAC “Guidelines for New Development in Proximity to Railway Operations” (2013) defines recommends setbacks of new developments from railway corridors to: provide a buffer from railway operations; permit dissipation of rail-oriented emissions, vibrations and noise; and accommodate a safety barrier.

The FCM/RAC Guidelines provided standard recommended building setbacks for new residential development in proximity to railway operations based on six categories, shown in Exhibit 7-1. The recommended setbacks are measured from the mutual property line to the proposed building face. This is intended to protect the entire railway right-of-way for potential future railway expansions.

Exhibit 7-1 - FCM/RAC Guidelines Standard Residential Building Setback

TYPE	SETBACK
Freight Rail Yard	300 m
Principal Main Line	30 m
Secondary Main Line	30 m
Principal Branch Line	15 m
Secondary Branch Line	15 m
Spur Line	15 m

The FCM/RAC Guidelines advises that proponents should contact the relevant railway to obtain information on the classification, traffic volume, and traffic speed, of the railway lines in proximity to any proposed development. However, the following sample classification system is defined:

- **Main Line** (typically separated into "Principal" and "Secondary" Main Line)

- Volume generally exceeds 5 trains per day
 - High speeds, frequently exceeding 80 km/h
 - Crossings, gradients, etc. may increase normal railway noise and vibration
- Branch Line
 - Volume generally has less than 5 trains per day
 - Slower speeds usually limited to 50 km/h
 - Trains of light to moderate weight
- Spur Line
 - Unscheduled traffic on demand basis only
 - Slower speeds limited to 24 km/h
 - Short trains of light weight

In order to develop typologies for the City of Toronto, characteristics of the rail operations were reviewed, as documented in the next section.

7.3 City of Toronto Typology

Each rail corridor type has been considered based on the potential for a rail incident to occur (based on rail infrastructure and operations), and the potential severity of the outcome should an incident occur (based on the type of train traffic, i.e. freight or passenger). Based upon the available information, the rail network is proposed to be categorized into typologies which are similar in terms of their physical and operational characteristics.

In the development of typologies for Toronto, it is important to remember that freight trains can operate on any corridor in the City. Rail lines owned by Metrolinx typically allow the freight railway to continue to operate trains over the lines as required.

Over the last few decades there have been major changes in the configuration of freight services. There is an ongoing decline in local pick-up and delivery of freight cars to sidings, warehouses and factories. The railways (whose traffic has been growing) have concentrated on moving commodities in bulk and using intermodal containers and trailers on flat cars for mixed freight operations rather than separate single car movements from origin to destination. CN and CP have consequently rationalized their networks, concentrating rail freight traffic on fewer trunk lines. Local freight train distribution runs are much fewer than previously.

As discussed in Section 4.3, the RER program is currently under development by Metrolinx. The RER lines will have frequent passenger train services (two to four trains per hour with additional services in the peak). CN and/or CP will continue to have the right to run freight trains over most of the RER routes but such traffic is expected to be infrequent.

Surrounding topography and land uses also play a role in the potential severity of an incident. As such, attributes such as elevation of the rail line with respect to ground level and the proposed type of development adjacent to the corridor are recommended to be taken into account in defining mitigation measures during Phase 2 of this study.

Exhibit 7-2 provides the initial recommendation for rail typologies for the City of Toronto with key features; each typology is described in more detail below. The typology presented will form the basis of a city-wide consultation process, including the public, City staff and councillors, identified stakeholders and agencies. During Phase 2 of this study, mitigation strategies will be developed for the typologies, incorporating feedback received through the consultation program.

Exhibit 7-2 - Recommended Typology for the City of Toronto

TYPE	RAIL CLASS	MAXIMUM OPERATING SPEEDS KPH (MPH)	TRAIN TRAFFIC	LINK TO FCM/RAC TYPOLOGY
A – Principal Through Freight	Class 5	Freight 100 (60) Passenger 130 (80)	Typically higher volume of freight trains with heavier loads, longer trains, and higher speeds	Principal Main Line
B – Regional Express Rail (Passenger)	Class 5	Freight 100 (60) Passenger 160 (100)	Typically higher volume of passenger trains with lighter loads than freight, shorter trains and higher speeds; potential for through freight on these corridors	May include Principal Main Line and Secondary Main Line
C – Commuter Rail (Passenger)	Class 4	Freight 100 (60) Passenger 130 (80)	Typically lower volume of passenger trains with lighter loads than freight, shorter trains and lower speeds; potential for through freight on these corridors	May include Principal Main Line and Secondary Main Line
D – Secondary Freight	Class 3	Freight 65 (40) Passenger 100 (60)	Typically lower volume of freight trains with lighter loads, shorter trains and lower speeds	May include Principal Branch Line and Secondary Branch Line
E – Spurs	Class 1	Freight 15 (10) Passenger 25 (15)	Typically low volume of freight trains with lighter loads, short trains and low speeds	Spur Line
F – Yards	Class 1	Freight 15 (10) Passenger 25 (15)	Consider both freight and passenger rail yards.	Freight Rail Yard

Type A – Principal Through Freight Corridors

Principal through freight corridors typically carry trains with heavier loads and trains operate at higher speeds, with maximum operating speeds of 100 km/h for freight and 130 km/h for passenger. Principal through freight corridors typically carry train volumes exceeding five trains per day and potentially carry dangerous goods. These characteristics are consistent with those of the Main Line characteristics identified by the FCM/RAC Guidelines.

CN typically runs through freight trains north of Toronto, with only small portions of the York and Halton subdivisions, which carry these trains, running through the northeast and northwest corners of the city, respectively.

CP typically runs through freight trains through the central portion of Toronto, along several of its subdivisions, including Galt, MacTier, North Toronto, and Belleville.

Both CN and CP reserve the right to run through freight trains along rail lines that have been sold to Metrolinx.

Type A rail corridors carry high volumes of trains, generally at higher speeds, and are likely to carry dangerous goods through Toronto. Given these characteristics, should an incident occur on a Type A rail corridor the outcome is likely to be more severe compared to other types of rail corridors. As noted previously, the outcome is also dependant on adjacent land use, topography, and other factors.

Type B – Regional Express Rail (Passenger) Corridors

Regional Express Rail (RER) corridors have been proposed by Metrolinx/GO Transit as part of “The Big Move” (2008) strategy. This strategy prioritizes implementation of RER on the Lakeshore line from Hamilton to Oshawa (Kingston and Oakville Subdivisions) by 2023.¹⁶ More detail on the RER plans is provided in Section 4.3.

Express rail is defined in The Big Move strategy as high-speed trains serving longer distance regional trips with two-way all-day service. This service would offer a capacity of 25,000 to 40,000 passengers per hour at its peak, with headways as low as five minutes, and an average speed of 50 to 80 km/h.¹⁶ Maximum operating speeds are 100 km/h for freight and 160 km/h for passenger.

Type B RER corridors are expected to have higher train volumes and maximum speeds than Type A corridors. RER trains are expected to be no more than 12 double-decker cars long, meaning lighter train loads than on Through Freight lines. As noted previously, all RER corridors may carry though freight with dangerous goods at any time, per existing arrangements between Metrolinx, CN and CP.

Given these characteristics, should an incident occur on a Type B rail corridor, the outcome is likely to be less severe than Type A, but there is the potential for outcomes to be as severe. As noted previously, the outcome is also dependant on adjacent land use, topography, and other factors.

Type C – Commuter Rail Corridors

Commuter rail corridors within the City of Toronto are operated by Metrolinx/GO Transit. Commuter rail service is provided along several subdivisions, namely the Kingston, Uxbridge, Bala, Newmarket, Weston, Galt and Oakville subdivisions.

Service varies by route and time of day, with some lines operating all-day service with headways as low as 10 minutes during peak periods and others operating only during peak periods. This offers a peak capacity between 5,000 and 20,000 passengers per hour. Average speeds are between 30 km/h to 50 km/h.¹⁶ Maximum operation speeds are 100 km/h for freight and 130 km/h for passenger.

Commuter service corridors outside of the RER program are expected to have lower train volumes than Type B RER corridors and, as a result, a separate typology is recommended.

Given these characteristics, should an incident occur on a Type C rail corridor, the outcome is likely to be less severe than Type A and B, but there is the potential for outcomes to be as severe. As noted previously, the outcome is also dependant on adjacent land use, topography, and other factors.

Type D – Secondary Freight Corridors

Secondary freight corridors within the city currently include the CP Staines Cross Connection, CP Havelock, former CP Don Branch (no service at present) and the former CP Canpa subdivisions.

Secondary freight corridors typically carry low train volumes, generally less than 5 trains per day, with typical speeds ranging between 10 and 30 km/h. Freight running along these lines can potentially be carrying dangerous goods. Trains are typically shorter on secondary freight corridors. Secondary freight corridors may be used to store loaded or empty freight railcars.

Given these characteristics, should an incident occur on a Type D rail corridor, the outcome is likely to be less severe than Types A, B and C.

¹⁶ Metrolinx, “The Big Move – Transforming Transportation in the Greater Toronto and Hamilton Area”, November 2008.

Type E – Spurs

Spurs are portions of secondary track used to access specific properties or customers, to load and unload railcars. Spurs typically carry only freight trains.

Speeds on spur lines are typically very low, with a maximum operating speed of 15 km/h. While trains may be carrying dangerous goods, the trains are usually moving slowly or stopped, resulting in a reduced potential for severe outcomes when compared to Types A, B, C and D, should an incident occur. As noted previously, the outcome is also dependant on adjacent land use, topography, and other factors.

Type F – Rail Yards

Rail yards are a series of several secondary tracks which are used to configure, store or load/unload railcars or locomotives. Rail yards may serve only freight trains, only passenger trains, or both freight and passenger trains. Rail yards may store loaded or empty freight railcars.

Speeds within yards are typically very low, with a maximum operating speed of 15 km/h. While trains may be carrying dangerous goods, the trains are usually moving slowly or stopped, resulting in a reduced potential for severe outcomes when compared to Types A, B, C and D, should an incident occur. As noted previously, the outcome is also dependant on adjacent land use, topography, and other factors.

However, the noise and vibration associated with yards is typically much greater than rail corridors due to the more intensive rail yard operations, often 24 hours per day. As such, rail yards have been assigned a separate type from Type E.

7.4 Future Uses of Toronto Rail Lines

The preceding discussion describes the current use of rail lines within the City but there are proposals for additional passenger services. These include:

- Use of the Weston, Kingston and Oakville Subdivisions for RER, and potentially High Speed Rail or Higher Speed Rail;
- Implementation of RER on the Galt, Bala and North Toronto Subdivisions; and,
- Introduction of GO services on the MacTier, Don Branch, Belleville and Havelock Subdivisions.

7.4.1 Weston, Kingston and Oakville Subdivisions

The Kitchener Line operates on the Weston Subdivision, currently offering commuter service from Union Station in Toronto to north-central Kitchener, with ten stations between. The Lakeshore East Line operates on the Kingston Subdivision, currently offering commuter service from Union Station in Toronto to Oshawa, with nine stations between. The Lakeshore West Line operates on the Oakville Subdivision, currently offering commuter service from Union Station to West Harbour Station (Hamilton), with eleven stations between.

For the Kitchener Line RER is proposed between Downtown Brampton and Union Station, as well as all-day two-way commuter rail between Mt. Pleasant and Downtown Brampton as part of the 15-year plan under the Big Move (2008) plan. In Metrolinx's Approved Changes to the Big Move (2013) peak period commuter rail is recommended between Kitchener and Mount Pleasant.

For the Lakeshore East and West Lines RER is proposed between Oshawa and Hamilton (including Union Station between), as well as peak period commuter rail between Bowmanville and Oshawa, and Stoney Creek and Hamilton as part of the 15-year plan under the Big Move

(2008) plan. In Metrolinx's Approved Changes to the Big Move (2013) plan the location of the Oshawa Station and alignment between Oshawa and Bowmanville Stations have been adjusted.

Inter-city high speed or higher speed rail is also being considered along these subdivision as part of the Ontario Ministry of Transportation's plan High Speed Rail in Ontario¹⁷, with the first portion running from Toronto to London.

7.4.2 Galt, Bala and North Toronto Subdivisions

The Milton Line operates on the Galt Subdivision, currently offering commuter service from Union Station to Milton, with seven stations between. The Richmond Hill line operates on the Bala Subdivision, currently offering commuter service from Union Station to Gormley, with four stations between. The North Toronto Subdivision is currently used for freight only, with no commuter service.

For the Milton Line two-way all-day commuter service is proposed for the entire line, as part of the 15 year plan under the Big Move (2008) plan. Under the 25-year plan, RER was proposed for the southern portion of this line, from Cooksville to Union Station, with the remainder continuing to operate two-way all-day commuter service, however it is not included in the present RER program due to the difficulty in finding space for additional tracks.

For the Richmond Hill Line two-way all-day commuter service is proposed from Richmond Hill Station to Union Station, as part of the 15-year plan under the Big Move (2008) plan, with future upgrade to RER as part of the 25-year plan. Peak period commuter service is also proposed from Aurora Road (in Aurora) to Richmond Hill Station as part of the 15-year plan.

For the North Toronto Subdivision peak period commuter service is proposed from Dundas West Station to Summer Hill Station, as part of the 15 year plan under the Big Move (2008) plan with trains possibly running through from the Milton, Kitchener and future North Pickering lines. Future RER service through this subdivision is also under consideration.

7.4.3 MacTier, Don Branch, Belleville and Havelock Subdivisions

The MacTier and Belleville Subdivisions currently operate as principal freight corridors, while the Havelock Subdivision operates as a secondary freight corridor. The Don Branch is a secondary freight/passenger corridor, however is currently not in use.

For the MacTier Subdivision peak period commuter service is proposed from Bolton to Union Station as part of the 25 year plan in Metrolinx's Approved Changes to the Big Move (2013) plan.

For the Don Branch Subdivision peak period commuter service is proposed connecting the Havelock (from Seaton in Pickering) and Belleville (from Locust Hill in Markham) Subdivisions to Summerhill Station, as part of the 15 year plan in Metrolinx's Approved Changes to the Big Move (2013) plan.

For the Belleville and Havelock Subdivisions peak period commuter service is proposed, as part of the 15 year plan under the Big Move (2008) plan from Seaton in Pickering and Locust Hill in Markham (at Hwy 407), respectively, to the Don Branch Subdivision.

¹⁷ Ontario Ministry of Transportation, "High Speed Rail in Ontario: Transforming mobility, connecting communities, integrating centres of innovation and fostering regional economic growth and development Special Advisor for High Speed Rail: Final Report", December 2016

8 Next Steps

Given the number of complex factors related to train collisions and derailments, it is impossible to predict where or when a train collision or derailment may occur. The City of Toronto has no jurisdiction over rail owners and operators, but can exert some control over the land use in proximity to rail corridors.

The mitigation strategies to be developed in Phase 2 for each typology are recommended to be based upon:

1. The potential frequency of a collision or derailment, based on train volumes or number of tracks;
2. The potential severity of a collision or derailment, based on permissible train speed; and,
3. The potential release of material, based on the type of train traffic.

Consultation will continue with the railways, including one or more additional meetings with Metrolinx and further requests to CN and CP for input on existing and future operations.

The public, stakeholders and relevant agencies will be consulted through a series of meetings. During this process input and feedback on this report and the risk mitigation options will be collected and incorporated into the final report. Meetings will also be held with City of Toronto staff and councillors and development and industry stakeholders.

A Phase 2 work plan will be developed in consultation with the City of Toronto. Phase 2 is proposed to include:

- Task 5a: Review best practices for development around rail corridors;
- Task 5b: Identify and recommend range of mitigation measures for defined rail corridor types;
- Task 6: Consultation with agencies, partners and the public; and,
- Task 7: Develop a Handbook for Development in Proximity to Rail Corridors in Toronto.