FORESIGHT DEVELOPMENT GROUP

Development Viability Assessment – 1125 Pembina Highway, Winnipeg, Manitoba

Draft Report



May 2021 – 21-1534

May 14, 2021

1558 Willson Place
Winnipeg, Manitoba
Canada
R3T 0Y4
Telephone
204.453.2301
Fax
204.452.4412

Foresight Development Group
100 – 128 James Avenue
Winnipeg, Manitoba
R3B 0N8

Attention: Mr. Ryan Ridge

Development Viability Assessment of Residential Development
1125 Pembina Highway, Winnipeg, Manitoba

Dear Mr. Ridge:

At the request of Foresight Development Group, Dillon Consulting Limited (Dillon) was asked to provide a development viability assessment for the above-mentioned proposed development. Our findings are documented in this report for your consideration.

If you have any questions, please contact Adam Prokopanko at 204-782-8185 or at aprokopanko@dillon.ca.

Sincerely,

DILLON CONSULTING LIMITED

Adam Prokopanko, M.C.P, E.I.T.
Project Manager

Dave Poole, M.Sc., CRM
Senior Risk Specialist

AP:bg

Our file: 21-1534

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Definitions

Annual Individual Risk – The annual frequency at which an individual may be expected to sustain a given level of harm (e.g., fatality) from the realization of specified hazards.

Carloads Originated – A carloads originated is one which is loaded and begins its journey on a particular railroad.

Dangerous Goods Release – Loss of control over a dangerous good in transportation.

Gross Ton-Mile – The movement of total train weight over a distance of one mile. Total train weight is comprised of the freight cars, their contents and any inactive locomotives. It excludes the weight of the locomotives pulling the trains.

Hazard – A chemical, physical, social or political condition that has the potential to cause damage or any kind of harm to people, property, environment or business continuity.

Inherent Risk:

1. A risk which is impossible to manage or transfer away is said to be an inherent risk; and
2. The risk that exists when no controls have been put in place.

Risk – The chance of injury or loss, measured as the probability and severity of an adverse effect on health, property, the environment or other things of value. "Risk" is a way of expressing damage to a receptor due to a hazard, taking into account both the likelihood and magnitude of damage. The concept of risk includes four components:

- Hazard inherent in an activity;
- Consequence of an undesirable event;
- Likelihood that an undesirable event will occur; and
- Perception about the combined importance of the first three.

Risk = Likelihood of undesirable event x Consequences of that event

Risk Assessment – A process for making quantitative and/or qualitative assessment, analysis and evaluation of risks and hazards.

Train-Mile – The movement of a train the distance of one mile.

1.0 Introduction

Foresight Development Group (Foresight) is proposing a residential development located at 1125 Pembina Highway (referred to as the Proposed Development) which will be constructed in one phase and the site will contain:

- One six-storey apartment building with basement level underground parking;
- Outdoor ground level parking stalls along the north property line; and
- Landscaped outdoor areas.

The Proposed Development is located adjacent to the Canadian National (CN) Letellier Subdivision. Given the proximity of the Proposed Development to freight rail operations, Foresight was advised to follow the Federation of Canadian Municipalities Rail Proximity Guidelines (FCM Guidelines) and have a Development Viability Assessment (DVA) completed for the Proposed Development.

The goal of the DVA is to demonstrate that the risks associated with the Proposed Development are:

- Recognized;
- Understood; and
- Mitigated, such that it does not impede current and future rail operations, and it addresses public safety issues.

As such, Dillon Consulting Limited (herein referred to as Dillon or "team") was retained to complete the DVA, focusing on environmental risks, health and safety risks to the public and operational risks to CN. The risks, including physical and chemical hazards, will be evaluated during construction and at full occupancy for two time periods (2021 and 2031).

Section 2.0 of the report summarizes the project setting, which includes details of the Proposed Development including during construction and at full occupancy, description of the parcels including topographic details and site drainage and an overview of the rail infrastructure and traffic adjacent to the Proposed Development. Details of the DVA methodology, analysis and findings are presented in **Sections 3.0** and **4.0** of the report, with conclusions and recommendations provided in **Section 5.0**.

1.1 Assumptions

Information was obtained from the following sources to complete the analysis in this report:

- Railway operations and regulatory subject matter experts;
- Publically available databases, documents and records; and
- Information provided by Foresight.

1.2 Development Viability Assessment (DVA) Team

Dillon's project team has extensive experience across Canada working with developers, Class 1 Railways (e.g., CN), and municipalities to address rail proximity issues associated with various types of land development. This includes not only conducting property specific DVAs, but also supporting the development of a new land use policy for development adjacent to rail corridors.

Credentials of the key project team members are provided below.

Dave Poole, M.Sc., CRM – Senior Risk Specialist

Dave is a Partner at Dillon with over 25 years of experience conducting risk assessments, due diligence assessments and strategic advisory services. He is a Certified Risk Manager (CRM) through the Global Risk Management Institute and has extensive experience advising the railway industry, municipalities and developers on the risks, developing frameworks and management plans related to rail operations and proximity issues in Canada and the United States.

Audrey Lebel Désorcy, B.B.A. – Risk Specialist

Audrey has a Bachelor's degree in Business Administration with over 10 years of project management, risk management, research and data analysis and municipal permitting experience. Since 2012, Audrey has been working on rail-related operational risk management projects such as Crude by Rail Transload Projects, Grade Crossing Risk Assessments, Land Development Viability Assessment and Grade Crossing Need and Suitability Studies.

Adam Prokopanko, EIT, M.C.P. – Project Manager and Risk Analyst

Adam is a planner and engineer-in-training with degrees in both civil engineering and city planning. This gives him the skills to be adept at explaining technical information in an accessible manner. He has worked on a number of transportation studies in both cities and rural areas around Manitoba. His experience includes both high-level planning as well as site-specific modelling studies such as the development viability assessment for 2735 and 2737 Pembina Highway.

1.3 Limitations

The data utilized for the risk assessment included data from various sources, as outlined throughout the report. Although the data has been utilized in many risk assessments, there may be errors and omissions of which the authors are unaware and which may lead to variations in the frequencies.

2.0 Project Setting

2.1 Proposed Development

2.1.1 Overview

The Proposed Development would be located at 1125 Pembina Highway (see **Figure 1**) adjacent to the CN Letellier Subdivision. It is our understanding that the Proposed Development will consist of (see **Figure 2** and **Figure 3**):

- One six-storey apartment building with approximately 82 residential units, a common room and lobby on the main floor and basement level underground parking;
- Outdoor ground level parking stalls along the west property line; and
- Landscaped outdoor areas.

The approximate width of the Proposed Development adjacent to freight rail operation is 60.3 metres (m) (197.73 foot west property line). For discussion purposes, "North" is designated towards the top of **Figure 1**.

Figure 1: Location of Proposed Development



Figure 2: Proposed Development – Site Plan

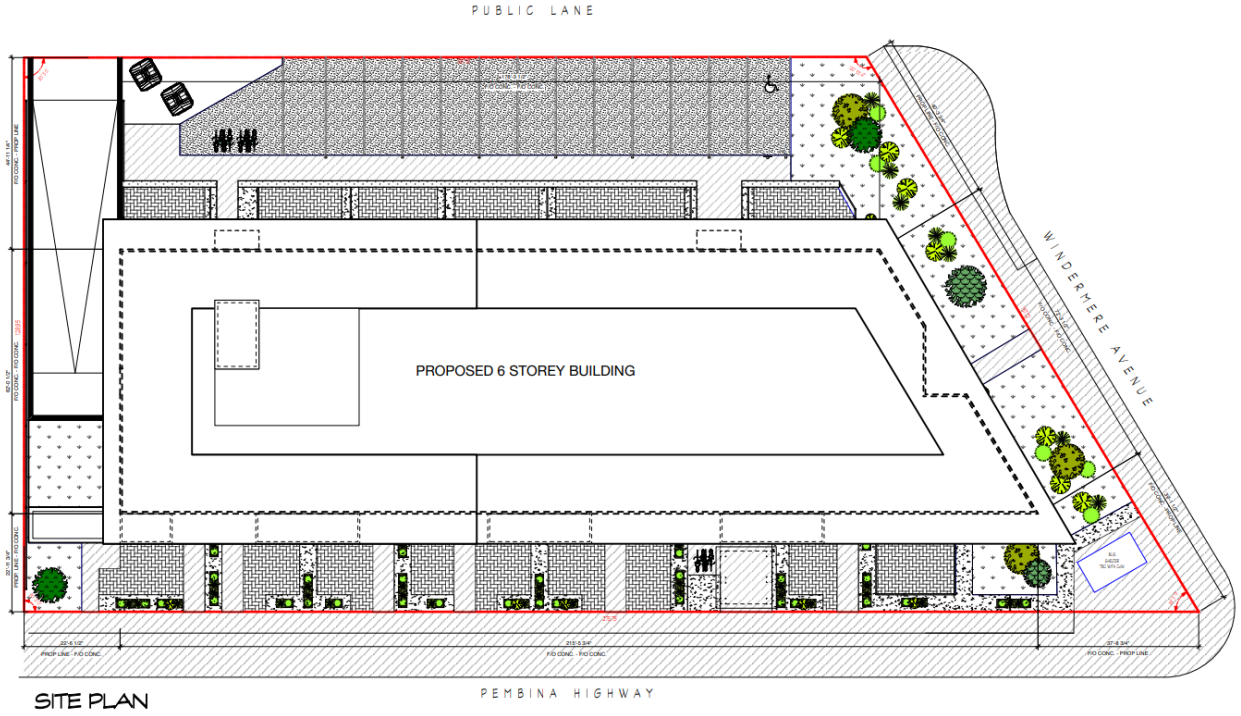


Figure 3: Proposed Development – Conceptual Elevations



2.1.2 Site Environmental Setting

In general, the topography of the land at the Proposed Development location slopes very slightly away from the middle of the site towards Pembina Highway to the east and the public lane to the west. The Letellier Subdivision is at an elevation approximately 1 m higher than the public lane and the entire development parcel. This was confirmed during a site visit on April 8, 2021 as shown in **Figure 4** and **Figure 5**. Overall, the Proposed Development location and the surrounding areas are very flat, as shown in **Figure 6.**

Figure 4: Looking Northwest from Proposed Development towards Letellier Subdivision



Figure 5: Looking South from Windermere Avenue at Proposed Development and Letellier Subdivision



Figure 6: Topography at the Proposed Development Location and Surrounding Area

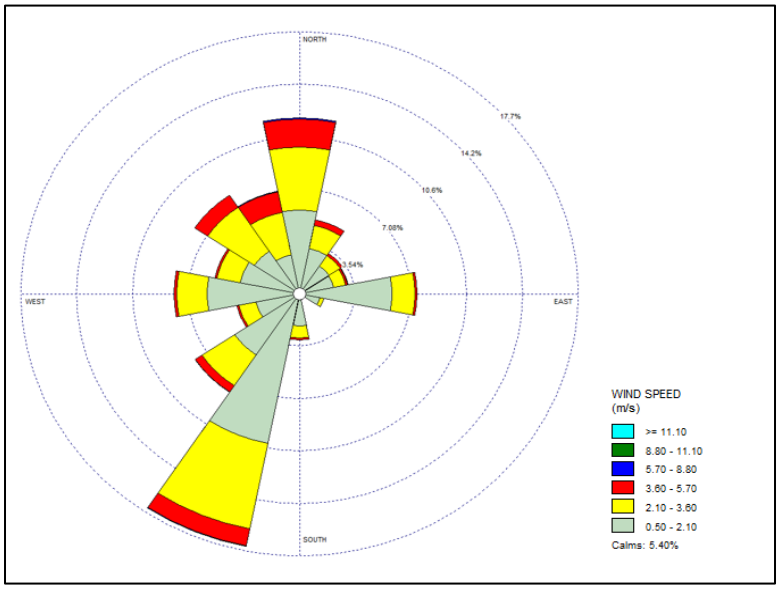


en-ca.topographic-map.com/maps/pl7x/Winnipeg/

2.1.3 Wind Speed and Direction

A wind speed and direction analysis was conducted based on the conditions observed at the nearest weather station, located at The Forks approximately 5 kilometres (km) north of the Proposed Development. The directional and speed analysis shown in **Figure 7** is based on five consecutive years of hourly data from 2016 to 2020.

Figure 7: Wind Speed Direction (Blowing From) at the Forks Weather Station, 2016-2020



The analysis shows that southwesterly winds (SW and SSW) prevail, occurring approximately 25% of the time, followed by northerly winds (N) occurring approximately 12% of the time. Overall, the prevailing winds from the Letellier Subdivision towards the Proposed Development will occur approximately 35% of the time. The annual average wind speed measured at the station is 1.86 m/s (6.7 km/hr).

2.1.4 Construction and Development Details

The Proposed Development will be built in a single phase. During construction, there will be no access to the Proposed Development from the adjacent Letellier Subdivision. All earthworks will take place within the property lines of the Proposed Development. A stationary tower crane will not be used, but a mobile crawler crane will be used during construction, such as the one shown in **Figure 8**.

Figure 8: Example Mobile Crawler Crane[1]



It is assumed that the mobile crawler crane will be located within the Proposed Development parcel and its boom will swing between the Proposed Development and tractor trailers containing building materials staged along the public lane. Thus, it is not probable for the boom of the mobile crawler crane to swing onto the railway property. Further, the overhead electrical power line along the shared property line between the public lane and the CN Letellier Subdivision would prevent the boom from swinging onto the railway property for safety reasons.

[1] Source: http://cranepedia.blogspot.com/2015/08/part-and-function-of-mobile-crawler.html

As shown in **Figure 2**, vehicle access to the Proposed Development will be from the public lane to the west of the development site, accessed via Windermere Avenue. According to the proponent, a 1.83 m high fence is being proposed along the south property line to safeguard access to the neighbouring property. All pedestrian access to the Proposed Development will be off Pembina Highway, Windermere Avenue and the public lane.

2.2 Railway Details

The Proposed Development is located adjacent to CN's Letellier Subdivision immediately south of Milepost (MP) 0.45 of the at-grade Windermere Avenue crossing.

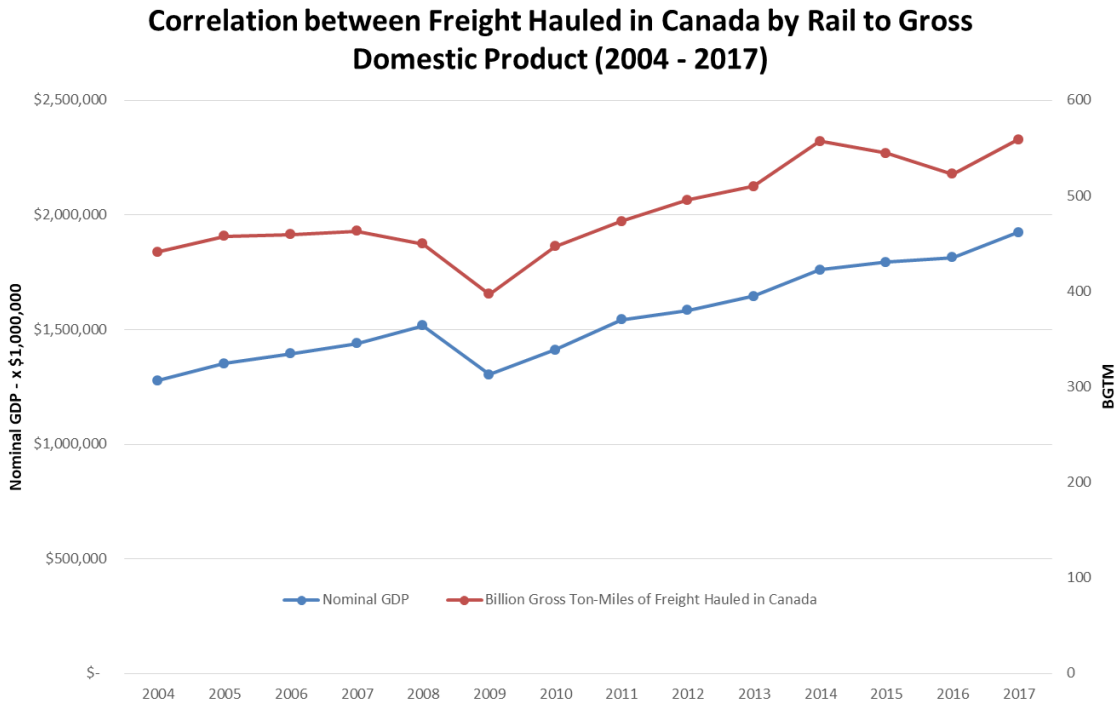
To obtain a site-specific understanding and confirmation of current and future rail operations, Dillon sent CN an information request on March 30, 2021 and followed up on April 21, 2021 (See **Appendix A**). To date, no response has been received from CN. In order for this study to move forward, publically available information was collected and is being used within this report. Using the Transport Canada Grade Crossing database, the Transportation Safety Board database, the Canadian Rail Atlas, and information provided by the City of Winnipeg (the City), the following assumptions were made:

- There is one rail track;
- An average of three freight trains per day travel along the Letellier Subdivision;
- The posted speed limit is 20 mph (or 32 km/hr);
- The rail gauge is 286,000 lbs;
- The closest railway switch is 275 m (900 feet) north of the Proposed Development – this is within the average length of a freight rail train and therefore puts the Proposed Development within the range of effects from switching operations;
- There are no maintenance, inspection or staging operations being performed at this location;
- The Transportation Safety Board (TSB) designated the Letellier Subdivision as a "Main Track" for tracking of rail accidents on this subdivision;
- The Letellier Subdivision is classified as a "Principal Branch Line" under the FCM Guidelines rail classification;
- The TSB database has the following records of derailment incidents in the study area between MP 0.45 and MP 0.55 from 1984 to 2020.
    - MP 0.5, 2016 (Occurrence # R16W0214) Loose banding that had fallen off a railcar jammed into the switch point derailing one end of a bulkhead flat car carrying lumber. No injuries or DG release.
    - MP 0.55, 2010 (Occurrence # R10W0181) The derailment consisted of one empty hopper car derailing at the Rockman Street public crossing. No injuries or DG release. Several crossings in the vicinity were blocked by the train as local police and CN officials responded; and
- The TSB database has the following records of crossing incidents in the study area between MP 0.45 and MP 0.55 from 1984 to 2020. There were no trespassing incidents recorded over that timeframe.

- MP 0.45, 2005 (Occurrence # R05W0088) CN maintenance of way equipment was struck by a vehicle at the Windermere Avenue crossing. No injuries.
- MP 0.45, 2010 (Occurrence # R10W0307) A CN ballast regulator struck a vehicle on the Windermere Avenue crossing. No injuries.
- MP 0.55, 2008 (Occurrence # R08W0267) A train struck a vehicle on the Rockman Street crossing. No injuries.

Lastly, growth projections for train traffic was determined using a financial model developed by Dillon that correlates rail traffic to gross domestic product, as shown in **Figure 9**. Assuming a start year of 2021, with an estimated 10-year time frame, the projected increase in train traffic (as a function of tonnage of goods hauled) to the year 2031 is approximately 38.8 % (using Billion Gross Ton-Miles (BGTM) forecast)).

Figure 9: Canadian Freight Rail Forecast Model



2.3 FCM Guidelines

Based on the pre-application feedback provided by the City, it is our understanding that the City is recommending that the proponent follow the applicable FCM Guidelines or to submit a DVA.

Through the pre-application feedback, the City also identifies that CN has previously identified the Letellier Subdivision as a “Principal Branch Line” under the FCM Guidelines rail classification.

The "Branch Line" classification is defined as:

- Volume generally has less than five trains per day;
- Slower speeds usually limited to 50 km/hr; and
- Trains of light to moderate weight.

Using the above information, the standard FCM safety mitigation measures would be as follows.

2.3.1.1 Building Setbacks

The recommended building setbacks for new residential development adjacent to a Principal Branch Line is 15 m. The setback is to be measured as a straight-line horizontal distance from the mutual property line to the building face. It is measured from the mutual property line to ensure the entire railway property is protected for potential future rail expansion. Appropriate uses within the setback area include roads, parkland and other outdoor recreational space, unenclosed gazebos, garages and other parking structures and storage sheds. Additional details can be found in Section 3.3 on the FCM Guidelines.

2.3.1.2 Earthen Berm

With a full setback a 2 m above grade berm with side slopes not steeper than 2.5 to 1. Additional details can be found in Section 3.6 on the FCM Guidelines. The earthen berm is to be located along the shared property line within the building setback.

2.3.1.3 Security Fencing

Residential development must include a 1.83 m high chain link fence along the entire mutual property line, to be constructed by the owner entirely on private property. Other materials may also be considered, in consultation with the relevant railway and the municipality. Additional details can be found in Section 3.7 on the FCM Guidelines.

2.3.1.4 Stormwater Management and Drainage

Stormwater management and drainage infrastructure proposed with the Development should not adversely impact the function, operation or maintenance of the corridor, or should not adversely affect area development. Additional details can be found in Section 3.8 on the FCM Guidelines.

Additional guidelines for noise and vibration might be applicable as per Sections 3.4 and 3.5 of the FCM Guidelines. This DVA focuses on safety and therefore noise and vibration will not be discussed.

The Proposed Development deviates from the following standard mitigation measures within the FCM Guidelines:

- There is no existing fencing between the public lane and the CN Letellier Subdivision;

- No fencing is proposed between the Proposed Development and the public lane; and
- No earthen berm is incorporated within the Proposed Development.

These deviations are acknowledged and taken into consideration when completing this DVA.

3.0 Scenario Development

In order to complete the risk assessment, credible scenarios need to be developed that take into consideration:

- Site Details;
- Railway Details; and
- Construction and Development Details.

Further details that rationalize the scenarios are provided below.

3.1 Scenarios – Site Details

The site details that need to be considered when developing credible "what-if" scenarios include existing site drainage patterns of the Property, topography and environmental setting. Based on our understanding of the site details for the Property, the following scenarios were identified:

- **Scenario 1** – Topography is such that there is a limited risk of surface water runoff generated from within the Proposed Development towards the Letellier Subdivision. Therefore, standard construction practices to limit sediment runoff during construction would be appropriate and no further risk analysis is deemed necessary. See **Table 8** of **Section 5.2** for additional details; and
- **Scenario 2** – Encountering contaminated soils within proximity of the property line to the Letellier Subdivision during construction activities are considered a contingent risk given that the Proposed Development does not share the property line with the CN Letellier Subdivision. No further risk analysis is deemed necessary and specific mitigation measures are identified in **Table 8** of **Section 5.2** for consideration.

The meteorological conditions (wind speed and direction) are taken into account when evaluating scenarios under Railway Details (see **Section 3.2**).

3.2 Scenarios – Railway Details

Due to the nature of rail operations that are taking place adjacent to the Proposed Development, the following scenarios were analyzed:

- **Scenario 3** – Physical hazards of a train derailment that impacts the Proposed Development, leading to a public fatality; and
- **Scenario 4** – Chemical hazards due to the releases of DG that has the potential to cause a public fatality; therefore, requires public evacuation of the Proposed Development.

3.2.1 Scenario 3 – Train Derailment Leading to Public Fatality

Train traffic within proximity of the Proposed Development was analyzed to determine the public fatality risk due to the physical hazards of a train derailment, using the concept called the Rail Proximity Envelope (RPE) as shown in **Figure 10**. The RPE reflects the areas of the Proposed Development that could be exposed to the physical hazards of a train derailment involving two or more derailed rail cars – 30 m setback from the property line and 7 m high. The 30 m distance reflects the length of the longest rail car that is typically utilized in Canada that would be involved in a jackknife type derailment.

Figure 10: Rail Proximity Envelope



3.2.2 Scenario 4 – Dangerous Good Release Leading to Public Evacuation

Requirements of Section 113 and 114 of the *Canada Transportation Act* state that "Federal railways must, without delay, carry all traffic tendered by shippers". This includes Dangerous Goods (DG), which must be transported following the Transportation of Dangerous Goods Regulations. Therefore, the transportation of DG by rail is considered an inherent risk, as it cannot be avoided. Due to the inherent risks posed by DG, we focused on the likelihood of evacuations related to DG releases, to determine the need for a rail-specific Emergency Response and Management Plan, as a preventative measure.

3.3 Scenarios – Construction and Development Details

During construction of the Development, the following scenarios were identified:

- **Scenario 5** – Construction debris falling onto the rail tracks from crawler crane. As pointed out in **Section 2.1.4**, there are safety constraints due to the overhead power line along the shared property line between the public lane and the CN Letellier Subdivision that would prevent this from happening. As such, no further analysis is deemed necessary for this scenario. See **Table 8** of **Section 5.2** for additional details; and
- **Scenario 6** – Construction worker getting struck by passing train.

The apartment building is considered high density residential occupancy, plus the grade level outdoor parking stalls that are adjacent to the property line with the CN Letellier Subdivision. Taking this into consideration, we have identified the following additional scenarios:

- **Scenario 7** – Structural damage to the building due to a train derailment; and
- **Scenario 8** – Pedestrian originating from the Proposed Development that trespasses and is struck by a train.

3.3.1 Scenario 6 – Construction Worker Struck by Passing Train

Given the proximity of landscaping activities adjacent to the CN Letellier Subdivision, there is the potential for a construction worker to be unaware of active rail operations and inadvertently walk onto the railway tracks, which could result in being struck by a passing train. To mitigate this risk, rail operations awareness training should be provided to all construction workers and be included in any site-specific health and safety plan during construction. No further analysis was deemed necessary for this scenario.

3.3.2 Scenario 7 – Structural Damage to Building due to Train Derailment

If a train derailment results in the impact and damage to primary structural members of an apartment building, there is the potential risk that the overall structural integrity of the building would be compromised, increasing the risk of a progressive failure of the primary structure. Therefore, this scenario is viewed as a contingency risk under a worst-case derailment scenario – a head-on collision of a structural member. It should also be re-stated that the risk to occupancy within the apartment building will be analyzed through Scenarios 3 and 4.

3.3.3 Scenario 8 – Trespassing from the Development

Given that there will be an increase in population living within proximity of a railway corridor, there is a corresponding increased risk of trespassing, especially if there are:

- Specific ingress and/or egress points from the Proposed Development;
- Unfenced or unsecured points along the property line; and
- Insufficient pedestrian and cyclist access to existing rail crossings.

The major ingress and egress points (e.g., doors) from the Proposed Development along the west property line front onto the public lane located between the Proposed Development and CN Letellier. Most vehicles and pedestrians accessing the Proposed Development to or from the west are expected to take the public lane a short distance north to Windermere Avenue, with a small proportion heading south along the public lane to Rockman Street. According to the proponent, a 1.83 m high fence is being proposed along the south property line. All pedestrian access to the Proposed Development will be off Pembina Highway, Windermere Avenue or the public lane.

There are no attractive destinations located directly west of the proposed development as the immediate west side of the railway property consists of an established residential neighbourhood. It is possible that some people may find it more convenient to trespass directly across the railway property when walking to or from their homes. However, there are only a tiny fraction of trips where this would provide a more direct route than using the Windermere Avenue or Rockman Street crossings. These would be existing residents living west of CN Letellier Subdivision and are not expected to increase as a result of the Proposed Development. There are suitable sidewalks and a low-volume road crossing with crossbucks and flashing lights at the Windermere Avenue crossing immediately north of the development providing safe pedestrian and cyclist access to people travelling west. No trespassing incidents have been recorded on this stretch of the CN Letellier Subdivision.

As the residential population densifies in this area as a result of the Proposed Development and other residential developments, the City of Winnipeg should consider fencing between the public lane and the CN Letellier Subdivision. This fencing would need to be installed along the entire length between the Windermere Avenue and Rockman Street crossings in order to be effective, and installation should be coordinated with CN as it is outside of the Proposed Development. Irrespective of the fencing, , it is recommended that "No Trespassing" signage be erected to remind pedestrians that they are not allowed along the CN Letellier Subdivision.

In addition to the above, it is recommended that behaviour patterns of occupants within the Proposed Development be monitored to determine if trespassing is occurring, combined with a proactive public safety communication such as Operations Lifesaver to advise people of the dangers of trespassing.

Given the proposed mitigation measures, no further risk analysis is deemed necessary. As such, the scenario was not brought forward to the risk assessment.

3.4 Summary – Scenario Development

In total, nine scenarios were identified (summarized in **Table 1**). Three scenarios were brought forward to the risk assessment, while risk mitigation measures were identified for the remaining six scenarios. Further details on the risk assessment are provided in **Section 4.0** of this report.

Table 1: Summary of Identified Scenarios

Scenario	Recommendations
Site Details	
Scenario 1 – Stormwater runoff and sediment loading onto Letellier Subdivision during construction.	Mitigation – refer to **Section 3.1**.
Scenario 2 – Encountering contaminated soils within proximity of the property line.	Mitigation – refer to **Section 3.1**.
Railway Details	

Scenario	Recommendations
Scenario 3 – Train derailment leading to public fatality.	Risk Assessment – see **Section 3.2.1**.
Scenario 4 – DG release leading to public evacuation.	Risk Assessment – see **Section 3.2.2**.
Construction and Operations Details	
Scenario 5 – Construction debris falling onto rail tracks.	Mitigation – refer to **Section 3.3**.
Scenario 6 – Construction worker struck by passing train.	Mitigation – refer to **Section 3.3.1**.
Scenario 7 – Structural damage to building due to train derailment.	Risk Assessment – refer to **Section 3.3.2**.
Scenario 8 – Trespassing from the Development.	Mitigation – refer to **Section 3.3.3**.

4.0 Risk Assessment

4.1 Risk Criteria

The risk criteria that will be used for the risk assessment will cover the following scenarios:

- **Scenario 3** – Train derailment of two or more derailed cars leading to public fatality – See **Section 4.1.1**;
- **Scenario 4** – Dangerous Good release leading to public evacuation – See **Section 4.1.2**; and
- **Scenario 7** – Structural damage to building due to train derailment – See **Section 4.1.1**.

4.1.1 Risk Criteria – Public Fatality

When dealing with industrial-based hazards, such as freight rail, and its potential to impact the general public, the Major Industrial Accidents Council of Canada (MIACC) developed risk criteria to help evaluate the tolerance level of fatality-based risks based on the type of land use (**Table 2**). This table outlines the various categories and their associated maximum tolerable frequencies. Another way of interpreting this information would be to say that for a risk frequency of $\leq 1.00 \times 10^{-4}$, someone would have to be standing in the location of the associated hazard for a period of 10,000 years and at some point during that time, a fatality would occur from the hazard.

Table 2: MIACC Risk Criteria – Public Fatality

Land Use/Occupancy Definition	Applicability to the Development	Maximum Tolerable Frequency Each year, there is a [insert] chance of a Fatality	Minimum Tolerable Return Period The chances of a Fatality are 1 in [insert] years	Annual Probability of Occurrence Each year there is a [insert] chance of fatality
Manufacturing (industrial, warehouses, open space, parkland, golf courses)	Parkade, Parking Lot and Open Space	$\leq 1.00 \times 10^{-4}$	≥10,000	0.01%
Low-Density (single family residential, townhouses, recreation centres, entertainment complexes)	Not Applicable	$\leq 1.00 \times 10^{-5}$	≥100,000	0.001%
High-Density (high-density residential, motels, hotels)	Residential Units	$\leq 1.00 \times 10^{-6}$	≥1,000,000	0.0001%
Sensitive (day cares, hospitals, group homes)	Not Applicable	$\leq 0.30 \times 10^{-6}$	≥3,333,333	0.00003%

The MIACC Risk Criteria – Public Fatality reflects that no mitigation for a specific parcel is deemed necessary, as long as the Maximum Tolerable Frequency for the specific land use(s) or occupancy is met; otherwise, mitigation is needed.

4.1.1.1 Manufacturing Uses

Manufacturing uses are land uses which include typically manufacturing, industrial and storage type of uses. Additionally, open park spaces and parking lots would typically be included within manufacturing uses.

4.1.1.2 Low-Density Uses

Low-density uses include land uses with residential and commercial low-density developments. These are described typically as bungalows, row homes, small shopping centers and small office buildings.

4.1.1.3 High-Density Uses

High-density uses include both residential and commercial high-density uses. This includes developments such as high-rise condo towers, high-rise office buildings and hotels.

4.1.1.4 Sensitive Uses

Sensitive uses are defined by the nature of the land use taking place in the developments. These are categorized separately, as it is recognized that they may include more long-term occupancy, occupants with mobility issues and vulnerable occupants. Examples of sensitive uses include daycares, hospitals, seniors' residences and schools.

4.1.2 Risk Criteria – Public Evacuation

The MIACC Risk Criteria (as shown in **Table 2**) was developed for individual *fatality* frequencies, not public evacuation frequencies; therefore, the MIACC Risk Criteria needed to be adapted. Historical records[2] of industrial incidents were reviewed to compare the number of incidents that resulted in public evaluations (to prevent fatalities) versus the number of incidents that resulted in public fatalities.

Over the 30-year timeframe, there were 119.1 incidents that resulted in public evacuations for every one incident that resulted in one or more fatalities – an indication of the threshold that emergency responders gauge the need to evacuate in order to prevent public fatalities. As such, this "threshold" was utilized as a proxy to reflect the public "tolerance" to what is considered an acceptable level of risk for a freight train incident that necessitates public evaluation, and determine whether a site-specific evacuation plan that takes rail-based hazards into consideration is necessary. The corresponding adjustment to the MIACC Risk Criteria is summarized in **Table 3**.

[2] Public Safety Canada's Canadian Disaster Database for Technology- Related Incidents (e.g., fire, hazardous chemical, infrastructure failure, explosion) from 1987-2016, a 30-year timeframe.

Table 3: Evacuation-based Risk Criteria (Adaptation of MIACC Risk Criteria)

Land Use/Occupancy Definition	Applicability to the Development	Maximum Tolerable Frequency Each year, there is a [insert] chance of an Evacuation	Minimum Tolerable Return Period The chances of an Evacuation are 1 in [insert] years	Annual Probability of Occurrence Each year there is a [insert] chance of an Evacuation
Manufacturing (industrial, warehouses, open space, parkland, golf courses)	Applicable to Proposed Development	$\leq 1.19 \times 10^{-2}$	≥84	1.19%
Low-Density (single family residential, townhouses, recreation centres, entertainment complexes)	Not Applicable	$\leq 1.19 \times 10^{-3}$	≥840	0.11%
High-Density (high-density residential, motels, hotels)	Applicable to Proposed Development	$\leq 1.19 \times 10^{-4}$	≥8,398	0.01%
Sensitive (day cares, hospitals, group homes)	Not Applicable	$\leq 3.57 \times 10^{-5}$	≥27,994	0.003%

4.2 Risk Assessment Results: Scenario 3 – Train Derailment Leading to Public Fatality

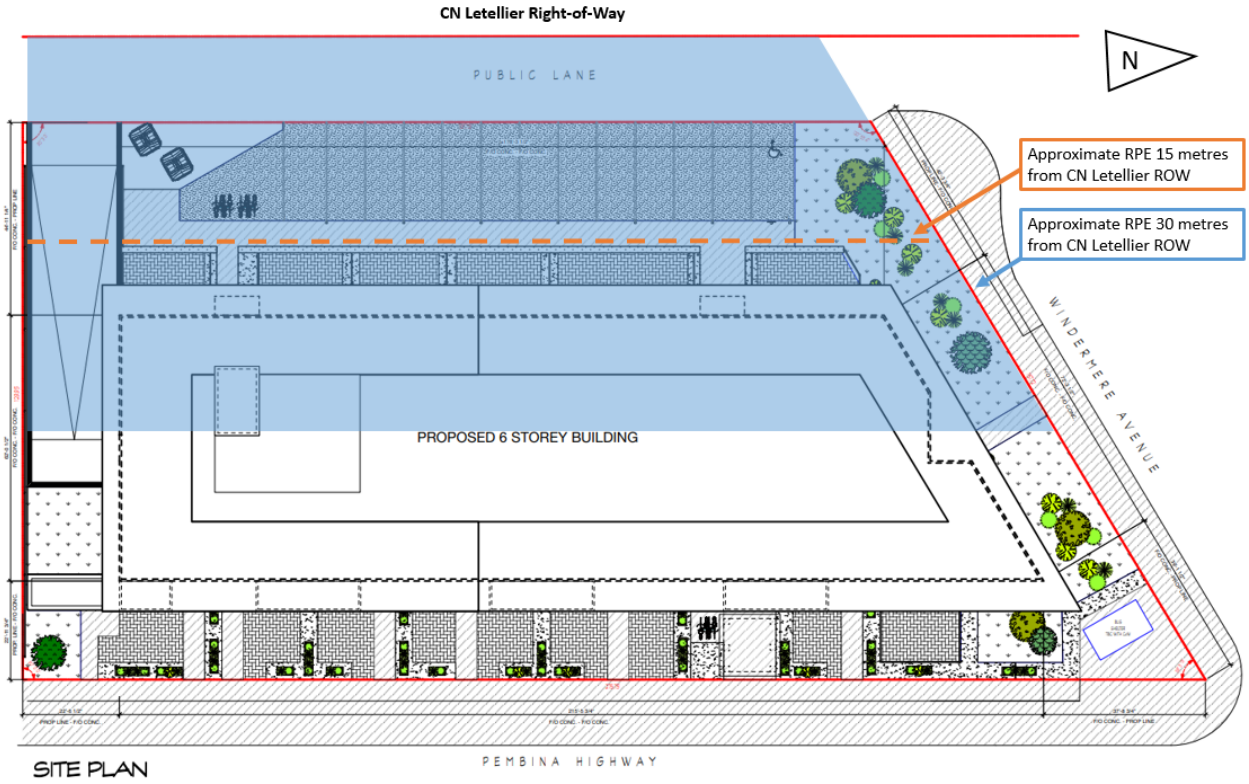
As stated in **Section 3.2.1**, the proximity of the Proposed Development to adjacent rail operations is such that there is the risk of a train derailment that, if it were to occur, can result in public fatalities within the Rail Proximity Envelope (RPE). The likelihood of a train derailment that could lead to one or more public fatalities within the RPE is based on the analysis of the TSB Rail Occurrence database from the period of January 1, 2004 to December 31, 2020, that took the following factors into consideration:

1. Accident Type: The frequency of main-track derailments including two or more derailed cars leading to one or more fatalities;
2. Rail Activity Type: All rail activities with the exception of inspection and maintenance, were included;
3. Train Type: All train types except commuter and passenger trains were included;
4. Approximate Train Speed: The speed of the train, which determines how many cars are likely to derail (potential impact zones);
5. Approximate Train Speed: The speed of the train, which influences the likelihood of a derailment; and
6. Train Traffic: The number of trains that are travelling within proximity of the Proposed Development in the year 2021 and 10 years into the future.

The risk assessment also took into account two factors, which are specific to the Proposed Development:

1. The width of any building and the corresponding parking lots that are within the RPE; and
2. The corresponding occupancy type within the RPE.

Figure 11: Approximate Overlay of RPE within Proposed Development



Utilizing the information shown in **Section 2.2**, Dillon estimated the frequency (as Return Period) of train derailments of two or more derailed cars, both present and future, which could lead to a fatality for each of the occupancy types within the RPE. Findings are summarized in **Table 4**.

Table 4: Risk Assessment Findings: Scenario 3 – Train Derailment Leading to Public Fatality

Occupancy/Location	Return Period	Findings (Colour coding represents the applicable Land Use/Occupancy Definition – see Table 2)
Year 2021		
Residential Units	> 1 in 1,000,000 years	**No exceedance of Risk Criteria**
Parkade (1st storey)	> 1 in 10,000 years	**No exceedance of Risk Criteria**
Ground Level Parking Area	> 1 in 10,000 years	**No exceedance of Risk Criteria**
Year 2031		
Residential Units	> 1 in 1,000,000 years	**No exceedance of Risk Criteria**

Occupancy/Location	Return Period	Findings (Colour coding represents the applicable Land Use/Occupancy Definition – see Table 2)
Parkade (1st storey)	> 1 in 100,000 years	**No exceedance of Risk Criteria**
Ground Level Parking Area	> 1 in 10,000 years	**No exceedance of Risk Criteria**

The findings show that there are no exceedances of the Risk Criteria, for both current (Year 2021) and future (Year 2031) train traffic. Further, the Return Period results are such that there are no exceedances of the Risk Criteria for any land use occupancies, even ones classified as "Sensitive" where the Minimum Tolerable Return Period is ≥ 3,333,333 years.

4.3 Risk Assessment Results: Scenario 4 – Dangerous Good Release Leading to Public Evacuation

This scenario is based on rail incidents or accidents (derailment, collision, etc.) resulting in a DG release, requiring the evacuation of the public from the Proposed Development (see **Section 3.2.2**). The likelihood of this scenario is based on the analysis of the TSB Rail Occurrence database that took the following factors into consideration:

1. Accident Type: All accident types with the exception of non-main track accidents leading to an evacuation;
2. Rail Activity Type: All rail activities with the exception of inspection and maintenance;
3. Train Type: All train types except commuter and passenger trains;
4. Approximate Train Speed: 0 to 20mph; and
5. Train Traffic: The number of trains that are travelling within proximity of the Proposed Development in the year 2021 and 10 years into the future.

The risk assessment also took into account two factors which are specific to the Proposed Development:

1. The width of the parcel at the Proposed Development; and
2. The corresponding occupancy type of within the Proposed Development which is high density residential.

Section 113 and 114 of the *Canadian Transportation Act* state that "Federal railways must, without delay, carry all traffic tendered by shippers". This includes DG, which must be transported following the Transportation of Dangerous Goods Regulations; therefore, the transportation of DG by rail is considered an inherent risk of freight rail and cannot be avoided by developments adjacent to rail. This analysis considered the worst-case DG release, that of anhydrous ammonia.

According to the 2020 Edition of the Emergency Response Plan prepared by Transport Canada (called CANUTEC), which would be referenced by the City of Winnipeg Fire and Paramedic Services when responding to a derailment involving an anhydrous ammonia car, the minimum evacuation distance if

there is a risk of a fire is 1,600 m in all direction. Details are found in Guide 125 of the CANUEC Guide – see https://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide125/id119/mnid195 .

Utilizing the information above, Dillon estimated the frequency (as Return Period) of accident and/or incident resulting in an evacuation, both present and future. As shown in **Table 5**, the findings show that there are no exceedances of the Risk Criteria, for both current (year 2021) and future (year 2031) train traffic. Further, the Return Period results are such that there are no exceedances of the Risk Criteria for any land use occupancies, even "Sensitive" where the Minimum Tolerable Return Period is ≥ 27,994 years.

Table 5: Risk Assessment Findings: Scenario 3 – Dangerous Good Release Leading to Public Evacuation

Occupancy/Location	Return Period	Findings (Colour coding represents the applicable Land Use/Occupancy Definition – see Table 3)
Year 2021		
Proposed Development	> 1 in 8,398 years	**No exceedance of Risk Criteria**
Year 2031		
Proposed Development	> 1 in 8,398 years	**No exceedance of Risk Criteria**

4.4 Risk Assessment Results: Scenario 7 – Structural Damage to Building due to Train Derailment

This scenario is based on a worst-case event for a derailed train to have a head on collision with a structural member within the RPE. The RPE extends onto the proposed footprint of the residential units as shown in **Figure 10**; therefore, the likelihood of a train derailment resulting in the worst-case event (striking a critical structural member) was calculated and compared to the MIACC Risk Criteria – Public Fatality for High Density Land Use.

To complete the calculation, the following factors were taken into account with the findings summarized in **Table 7**:

1. Accident Type: The frequency of main-track derailments including two or more derailed cars;
2. Rail Activity Type: All rail activities with the exception of inspection and maintenance were included;
3. Train Type: All train types except commuter and passenger trains were included;
4. Approximate Train Speed: The speed of the train, which determines how many cars are likely to derail (potential impact zones);
5. Approximate Train Speed: The speed of the train, which influences the likelihood of a derailment; and
6. Train Traffic: The number of trains that are travelling within proximity of the Proposed Development in the year 2021 and 10 years into the future.

Table 6: Risk Assessment Findings: Scenario 8 – Structural Damage to Building due to Train Derailment

Occupancy/Location	Return Period	Findings (Colour coding represents the applicable Land Use/Occupancy Definition – see Table 2)
Year 2021	> 1 in 1,000,000 years	**No exceedance of Risk Criteria**
Year 2031	> 1 in 1,000,000 years	**No exceedance of Risk Criteria**

Given that there were no exceedances of the Risk Criteria, a Train Impact Structural Review is deemed to be unnecessary.

5.0 Conclusions and Recommendations

5.1 Conclusions

A total of eight scenarios were identified and analyzed within the DVA that cover risks associated with:

1. Site Details;
2. Railway Details; and
3. Construction and Development.

Of the nine, only three were identified that required a risk assessment to be completed that considered:

- **Scenario 3** – Train derailment leading to public fatality;
- **Scenario 4** – DG release leading to public evacuation; and
- **Scenario 7** – Structural damage to building due to train derailment.

The MIACC risk-based land use standards were utilized to determine whether the risks were considered acceptable based on the occupancy and land-use activities that will be taking place at the Proposed Development. Our conclusions are summarized in **Table 7**.

Table 7: Risk Assessment Conclusions for Scenarios 3, 4, and 8

Total Risk	Conclusions
Scenario 3 – Risk of a public fatality	Acceptable level of risk based on current and future rail growth. No mitigation measures required, such as a setback, berm or a crash wall.
Scenario 4 – Risk of a public evacuation of the development due to a DG release	Acceptable level of risk based on current and future rail growth. A rail specific emergency evacuation plan is not deemed necessary.
Scenario 7 – Risk of structural damage to building due to train derailment	Acceptable level of risk based on current and future rail growth. No mitigation measures required.

The risks associated with the remaining five scenarios are considered manageable based on proposed design and construction measures outlined in **Section 5.2**.

5.2 Recommendations

A summary of the recommendations for the remaining five scenarios are summarized in **Table 8**.

Table 8: Summary of Recommendations

Scenario	Recommendations
Scenario 1 – Stormwater runoff and sediment loading onto Letellier Subdivision during construction.	Topography is such that there is a limited risk of surface water runoff generated from within the Proposed Development towards the Letellier Subdivision. Therefore, standard construction practices to limit sediment runoff during construction would be appropriate and no further risk analysis is deemed necessary.
Scenario 2 – Encountering contaminated soils within proximity of the property line to the Letellier Subdivision during construction activities. This is considered a contingent risk.	If suspected contaminated soils are encountered during construction within proximity of the property line to the rail corridor, Foresight should initiate discussions with CN on next steps.
Scenario 5 – Construction debris falling onto rail track.	It is assumed that the mobile crawler crane will be located within the Proposed Development parcel and its boom will swing between the Proposed Development and tractor trailers containing building materials staged along the public lane. Thus, it is not probable for the boom of the mobile crawler crane to swing onto the railway property. Further, the overhead electrical power line along the shared property line between the public lane and the CN Letellier Subdivision would prevent the boom from swinging onto the railway property for safety reasons.
Scenario 6 – Construction worker getting struck by passing train.	Rail operations awareness training should be included in any site-specific Health and Safety Plan during construction.

Scenario	Recommendations
Scenario 8 – Pedestrian originating from the Development that trespasses and is struck by a train.	The major ingress and egress points from the Proposed Development along the west property line front onto the public lane located between the Proposed Development and CN Letellier. There are no attractive destinations located directly west of the Proposed Development as the west side of the railway property consists of an established residential neighbourhood. Lastly, there are suitable sidewalks and crossings located at Windermere Avenue and Rockman Street on either side of the development providing safe pedestrian or cyclist access to people travelling west. Fencing between the public lane and the CN Letellier Subdivision should be considered by the City of Winnipeg. This fencing would need to be installed along the entire length between the Windermere Avenue and Rockman Street crossings in order to be effective. Installation should be coordinated with CN as it is outside of the Proposed Development and the property line along the public lane is shared with the City of Winnipeg. Irrespective of the above, it is recommended that "No Trespassing" signage be erected to remind pedestrians that they are not allowed along the CN Letellier Subdivision. It is recommended that behaviour patterns of occupants within the Proposed Development be monitored to determine if trespassing is occurring, combined with a pro-active public safety communication such as Operations Lifesaver to advise people of the dangers of trespassing.

6.0 Closure Statement

This report has been prepared for Foresight Development Group, their agents and the City of Winnipeg. This report may become public document upon submission. The report is based on information provided to, or obtained by Dillon Consulting Limited (Dillon) as indicated in the report, and applies solely to site conditions existing at the time of the Development Viability Assessment and on future projected traffic.

The material in it reflects Dillon's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Sincerely,

DILLON CONSULTING LIMITED

Adam Prokopanko, M.C.P., E.I.T.
Project Manager

Dave Poole, M.Sc., CRM
Senior Risk Specialist

AP:bg

Our file: 21-1534

Appendix A

Emails to CN

Prokopanko, Adam <aprokopanko@dillon.ca>

Proposed Development in proximity to rail - 1125 Pembina, Winnipeg, MB

2 messages

Prokopanko, Adam <aprokopanko@dillon.ca> Tue, Mar 30, 2021 at 11:00 AM
To: proximity@cn.ca
Cc: Dave Poole <dpoole@dillon.ca>, "Désorcy, Audrey" <adesorcy@dillon.ca>

Hello CN,

Dillon is currently working on a technical study for a proposed land development project located at 1125 Pembina Hwy, Winnipeg, MB (see image below). In order to complete the study, we need a good understanding of the current and future rail operations adjacent to the proposed development.



If possible we would like information/confirmation on:

Rail line name: CN Letellier Subdivision
Rail line FCM classification:
How and what is the track used for:
Posted speed limit:
What does the train traffic look like (historical & future). If you have daily train traffic data for the last 5 years that would be ideal. If not we are looking for the following:

- The number of train(s) per day or per week:

- Average Train length:
- Average Train Gross Tons:
- % of DG and if possible % by class
- What does the future train traffic look like (~10 years horizon)?

Thanks in advance for any help you can provide,
Adam

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Adam Prokopanko
Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba, R3T 0Y4
T - 204.453.2301 ext. 4048
F - 204.452.4412
AProkopanko@dillon.ca
www.dillon.ca



Prokopanko, Adam <aprokopanko@dillon.ca> Wed, Apr 21, 2021 at 11:54 AM
To: proximity@cn.ca
Cc: Dave Poole <dpoole@dillon.ca>, "Désorcy, Audrey" <adesorcy@dillon.ca>

Hello CN,

I am following up on this request. We are hoping to get this information within the next week so that it can be integrated into the technical studies. If we are unable to get the requested information we will use reasonable assumptions to move forward.

Thanks,
Adam
[Quoted text hidden]

