

2150 LAKE SHORE RAIL SAFETY STRATEGY

2150 - 2194 - LAKE SHORE
BOULEVARD WEST
23 PARK LAWN ROAD
TORONTO

RAIL SAFETY STRATEGY

1.1/ Executive Summary

1.2/ Purpose of Report

1.3/ Approach to Rail Safety

1.4/ Risk Management Recommendations

1.5/ Project Objectives and Next Steps

1.1/ **EXECUTIVE SUMMARY**

This Rail Safety Strategy has been prepared by Hatch Ltd. (“Hatch”) on behalf of the land owners, FCR (Park Lawn) LP and CPPIB Park Lawn Canada Inc., in support of an Official Plan Amendment application for the redevelopment of 2150-2194 Lake Shore Boulevard West and 23 Park Lawn Road (“the site” or “2150 Lake Shore”). This document is also intended to provide input into the City’s Secondary Plan for the site and immediately adjacent lands.

A new Park Lawn Transit Hub will be designed to accommodate a convergence of transit services, as well as be an anchor to a new, mixed-use, transit-oriented community at 2150 Lake Shore Boulevard West (2150 Lake Shore). The new Park Lawn GO Station and 2150 Lake Shore development together create what will be known as the new Park Lawn Transit Hub and will be herein referred together as the ‘Project’ in this report. The new transit hub will enable access and service to Metrolinx’s Lakeshore West GO line, TTC’s Humber Bay area bus and streetcar routes, and pedestrian and cycling trails to the front doors of new offices and workplaces, mixed-income housing, retail and restaurant offerings for a diversity of needs and lifestyles, and a significant featured park area for the community. The Park Lawn Transit Hub, made possible by the 2150 Lake Shore development, will be able to fulfil the growth and last mile challenges for the immediate Lakeshore community here, as well as the wider region of the Greater Toronto and Hamilton Area (GTHA).

1.2/ **PURPOSE OF REPORT**

Hatch was retained by Allies and Morrison (A+M), the project master planners, and CPPIB Park Lawn Canada Inc and FCR (Park Lawn) LP, the project owners to undertake a “Rail Safety and Development Viability Assessment (DVA)” for the proposed development at 2150 Lake Shore. In terms of rail safety, there is a specific focus on the parts of the development scheme that will be immediately adjacent to and/or over the rail corridor, as well as physically integrated with the GO station.¹ This is done with the understanding that these areas are most at risk to potential derailment scenarios and other rail-associated impacts² onto people and property by virtue of being in close proximity to rail corridors and their train operations.

The purpose of this “Rail Safety Strategy Report” is to provide the project team with initial guidance and strategic recommendations on rail safety solution(s) that could feasibly meet the following criteria:

1. Be responsive to the unique site conditions and strategic goals of Park Lawn Transit Hub, as a transit-oriented development (TOD) scheme;
2. Provide an appropriate mitigation design strategy against rail-associated risks, while being designed to the highest possible urban design standards to fit the aesthetic and functional quality of a multimodal transit hub

environment; and

3. Work within current approvals process and framework through close engagement and consultation with relevant stakeholders (i.e. the City and Metrolinx) to respect and remain consistent with rail safety rules and regulations that are enforced and advocated by the industry.

This strategy report will conclude with recommended next steps to further discussions with stakeholders and risk manage uncertainties underpinning the rail safety solutions herein recommended. The assessment and findings within this strategy report will then be further developed and updated into an official “Rail Safety and DVA Report” that will be certified by an engineer and submitted to the City of Toronto, Metrolinx, and their respective peer reviewers as part of the project’s rezoning applications.

1

With reference to the work-in-progress master plan being developed by A+M et. al, these specific areas of focus are namely ‘Block D1’ and ‘Block D2’. See Figure 1

2

Train derailment is the most severe risk associated with developing next to a rail corridor, and as such is the main risk that rail safety requirements and mitigating measures are designed to protect against. In addition to train derailments, other potential risks include dangerous goods leaks, trespassing, trains exceeding speed limits, etc.

1.3/ **APPROACH TO RAIL SAFETY**

For this preliminary stage of the project, the approach to assessing rail safety and developing a ‘rail safety strategy’ that can then be further developed together with stakeholders is summarized below.

‘Section 1.3: Guidelines, Methodology and Approvals’ explains how a Rail Safety and Development Viability Assessment (DVA) should be conducted in response to project-specific conditions, and within the context of existing regulations, guidance and procedures.

The key guidelines and procedures referred to for this report is the Federation of Canadian Municipalities/Railways Association of Canada (FCM/RAC) “Guidelines for New Development in Proximity to Railway Operations,” released in 2013, in conjunction with AREMA/AECOM’s guidelines for safety barrier design released in 2014.¹ These references have incorporated careful considerations from railways owners (i.e. Metrolinx and CN Rail), and are also recognized and adopted by the City of Toronto in its approvals process.

Of important note, current rail safety guidelines and requirements were developed under the premise that private development buildings and their uses remain physically and functionally separate to rail and transit assets and operations. This is not the case at Park Lawn Transit Hub—nor is it consistent with

the new Provincial mandate to deliver transit projects in partnership with private developers; the City’s growth plan to intensify transit nodes and corridors; and transit agencies’ business strategy to capitalize on TODs. The Park Lawn Transit Hub project fundamentally proposes integration of private and public uses and spaces where development will partially occur within, and over the air rights of the rail corridor. (The act of developing the air rights over a rail corridor or transit station will be herein referred to as ‘overbuilding’.) To date, no development project with this level of integration with railway infrastructure and operations has been actualized in the GTHA.

As such, there are specific rail safety requirements that need to be carefully examined, on a case-by-case basis, for its appropriate application to a project such as the Park Lawn Transit Hub. This will be summarized in ‘Section 1.4: Risk Management Recommendations’ by considering the following:

¹ Specifically, these are the “Crash Wall Submission Guidelines” revised in July 2014 by AECOM, and the accompanied “Development of Crash Wall Design Loads from Theoretical Train Impact” released in 2014 by AREMA/AECOM. Both were developed by AECOM in consultation with Canadian National Railway (CN), Canadian Pacific Railway (CP) and GO Transit. Other relevant guidelines may include safety barrier design guidelines for piers and bridges that are constructed over rail corridors.

- Unique qualities and conditions of the development site that affect rail safety;
- Specific rail safety requirements that need to be examined for the relevance of this project;
- Preliminary assessment on the appropriate application of minimum requirements for the project; and lastly
- A mitigation design strategy that could feasibly satisfy the requirements and principles set out in currently adopted guidelines, while being consistent with the public sector's policies and plans for TOD.

The recommended mitigation design strategy would provide an equivalent or better protection against rail-associated risks than the standard measures recommended by industry guidance while ensuring development viability for project site.



Park Lawn GO Station Square

1.4/ **RISK MANAGEMENT RECOMMENDATIONS**

SITE-SPECIFIC CONDITIONS THAT AFFECT RAIL SAFETY

There are site-specific conditions along the rail corridor at 2150 Lake Shore that will affect the overall risk-profile of the corridor here, and consequently the final recommended rail safety requirements (i.e. setbacks, permitted uses, safety barriers, etc.) These site-specific conditions include:

- The rail corridor being on an elevated embankment that is higher than the rest of the 2150 Lake Shore site with a downhill gradient towards the Humber River. This condition might increase the severity of a potential derailment due to the elevated height a derailed train will fall from. (This will specifically affect safety barrier height requirements as measures are typically taken from the top-of-rail. There may be instances where height requirements can be taken from the adjacent ground level and will require further assessment and discussions with Metrolinx. The safety barrier design would need to be considered in light of potentially greater impacts.) However, the master plan has the adjacent lands being raised to the height of the railway, which means the effective height of the adjacent development is level with the tracks, with potential basement areas within and outside of, the buildings

immediately adjacent, creating basement areas below the platform and station areas between the rail tracks and the adjacent buildings.

- The rail corridor borders most of the development site's north-western property boundary and thus exposes those adjacent portions of the site to rail-associated risks. On the other hand, this is also an opportunity to increase access to the transit hub and its passenger railway services beyond the primary entrances/exits at the main GO station building.¹
- The rail corridor operates within a passenger-oriented train environment that prioritizes the expansion and electrification plans by its railway owner, Metrolinx. Though Canadian National (CN) Rail currently maintain freight operational rights here, when Metrolinx's rail expansion/electrification plans are fully implemented in the near future, there will be even more frequent passenger train service and consequently fewer available track slots that can accommodate freight trains during GO operation hours (approximately 5am to 1am). Freight activity has a declined (and declining) presence in this territory.
- Any freight activity here would be limited to as needed freight bypass/reroutes. It will also be technically constrained to the

¹ Of course, station access will be limited to the actual lengths of the station platforms and its pedestrian connections (i.e. underground tunnels, bridges, etc.)

center tracks of the rail corridor in a slow-fast-fast-slow configuration, while the side tracks serve express or stopping passenger trains alighting/boarding via the side station platforms (once the new Park Lawn GO Station is delivered).

Ultimately, mitigation requirements for new developments are typically required to be provided for within the development site. Though there are common instances where site conditions that lie outside the site’s property limits, and specifically within the rail corridor, can be considered as contributing to the overall rail safety solution for the project (i.e. when setbacks are measured from within the rail corridor, from closest active track, as opposed to a measure from the mutual property line between the corridor and the development site.) These unique instances require agreement with Metrolinx, the railway owner, and will be discussed later in the report.

KEY RAIL SAFETY CONSIDERATIONS RELEVANT TO PROJECT

The following rail safety considerations are especially relevant to the project because of the highly-integrated development scheme for Park Lawn GO Station and 2150 Lake Shore.

Setback requirements and its measurement so that they are appropriate for transit hubs and enables integration with private development. To date, guidelines and standards have been written under the premise that private development is only developed next to rail corridors. Metrolinx is currently drafting an update to its guidance to specially address the blended risk profile of “transitory spaces” (the transitionary space between station and private development areas). The updated guidance,

anticipated to be released near the end of this year, will permit alternative safety measures including reduced setback requirements to “sensitive-uses”. This report will include early commentary from Metrolinx on these updates, prior to the official release of its updated guideline, made possible via the project team’s ongoing engagement and consultation with Metrolinx. It is worth noting that overbuild is being considered on other parts of the GO network, and there is the potential (although that is not planned for Park Lawn GO at this time) that overbuild may eventually be appropriate here.

Definition of station areas and permitted uses within the setback area that would activate and make viable the transitory space within the setback area. By designing for a seamless user experience integrating transit services, amenities and last mile destinations (i.e. offices and workplaces); a high-performing transit hub can be achieved in terms of safety, access, ridership, quality of service, and diversified revenue streams that benefit both the public and private stakeholders involved. This will require a clear understanding of the type of uses/activities envisioned in the setback area (or transitory space) and its sensitivity level to potential rail risks. The uses permitted within the setback area will play an important role in helping to transition and buffer station areas and services with private development areas and amenities.

Safety barrier design variants and its location within the setback area that would help the project achieve the same or better level of protection as the standard measure prescribed in the FCM/RAC guidelines.² As well, provide sufficient defence for the permitted uses within the setback area while

2 The standard measure is 30 m setback that applies to principle and secondary main lines and is measured from the mutual rail property line to the closest sensitive-use structure, i.e. office and residential. 2150 Lake Shore is adjacent to principle main lines, see Section 4.4 Rail Classification and Minimum Requirements for more information.

designing for permeability and seamless passenger/pedestrian flow throughout the Park Lawn Transit Hub. To date, safety barriers for new development in an urban environment typically take the form of crash walls, which provides zero permeability and would not be appropriate for a transit hub environment. As such, alternative approaches such as free-standing caissons, columns, or bollards that are spaced apart to allow permeability, while still providing adequate rail safety protection, will be explored and recommended in consultation with Metrolinx. Visual and physical permeability like passenger flow is a critical quality for a high-performing transit hub.

Station overbuild requirements that would enable intensification at transit nodes in alignment with City of Toronto and Provincial policy, and Metrolinx’s business strategy. As well, to act on and facilitate the government’s mandate to deliver transit projects in partnership with the private sector.³ To date, a station overbuild project has not been fully explored and delivered on a Metrolinx rail corridor. Nevertheless, there is appetite and executive direction from Metrolinx to pursue and realize this opportunity for Park Lawn Transit Hub at 2150 Lake Shore and has agreed to provide consultation specific to the project.

Beyond an assessment of potential rail-associated risks, overbuilding (over the rail corridor) will also require a noise and vibration, and air quality impacts assessment; as well as technical requirements to protect for (rail) electrification works during and post construction. Section 5.5 of this report provides an overview of these other risk factors to consider when developing over rail corridors. A fuller assessment will be required in subsequent detailed design phases of the

project.

PRELIMINARY RAIL SAFETY AND DEVELOPMENT VIABILITY ASSESSMENT (DVA)

The preferred, standard rail safety measures set out in the guidelines are not practical for the project’s development scheme due to several factors. The primary factor being that a new Park Lawn GO station will be highly-integrated with the development scheme at 2150 Lake Shore. Standard rail safety measures were developed to principally separate the spaces and uses between railway operations and private development.

3 By unlocking development potential over rail corridors and making use of air rights, the incremental value realized for the development can be leveraged to fund transit projects where economics is supportive.

A well-designed transit hub will need (in no particular order): 1) a mix of uses that can help transition and buffer transit operations and services with privately-operated amenities and functions, and 2) physical and visible permeability for pedestrian flow, access and 3) safety.⁴ These are the project's design goals for a high-performing transit hub. Therefore, a site and project specific approach of achieving the same or better risk mitigation as the standard measure is required for the new Park Lawn Transit Hub.

The standard FCM/RAC measure that applies for Park Lawn Transit Hub at 2150 Lake Shore is as follows:

- For new development in proximity to principle main line rail operations, a minimum 30 m horizontal setback to sensitive uses; with an earthen berm and sound wall is required for rail safety.

The earthen berm in the above standard case is the main safety barrier to rail-associated risks. Alternative safety barriers may be crash walls, crash colonnades, and/or crash bollards—as long as the barrier system is “designed to provide the equivalent resistance in the case of train derailment as a standard berm,” per the FCM/RAC Guidelines.⁵

The FCM/RAC Guidelines also allow marginal reductions to the recommended setback requirement of up to 5 m through a reciprocal increase in the height of the safety barrier. Furthermore, horizontal setback requirements may be substantially reduced with the construction of an alternative safety barrier, and that setback requirements may be measured

as a combination of horizontal and vertical distances, as long as the horizontal and vertical value add up to the recommended setback. Under these allowances, the project may apply the following adjusted rail safety requirements:

- A minimum 25 m total setback to sensitive uses that can be achieved through horizontal and vertical distances; with a crash wall, crash colonnades, and/or crash bollards of equivalent resistance.

Under this requirement, the Park Lawn Transit Hub design will be able to provide physical and visible permeability for pedestrian flow, access and safety via its application of alternative safety barriers with substantial spacing like crash colonnades and/or bollards.⁶

Where the recommended setbacks are not technically or practically feasible due, for example, to site conditions or constraints, then a Development Viability Assessment (DVA) should be undertaken to evaluate the conditions specific to the site, determine its suitability for new development, and suggest options for mitigation. The need for a case-by-case evaluation of rail safety requirements and its mitigation measures is acknowledge and advocated by FCM/RAC.

In response to the unique site conditions at Park Lawn Transit Hub as outlined in Section 1.4.1, and its development scheme as outlined in 1.4.2, an agreement needs to be reached with Metrolinx, the railway owner, as to where the setback requirement may be measured from; whether a minimum 25 m setback requirement is appropriate, still, in an integrated transit hub environment; and the

4 These characteristics are also critical and consistent with the principles of crime prevention through environmental design (CPTED)—a requirement for transit hub/station design.

5 Definition of crash wall per the 2013 FCM/RAC Guidelines in Appendix F on page 105.

6 Per meeting with Metrolinx in June 2019, safety barrier systems can be composed of multiple design variants of a crash wall, including crash colonnades and/or bollards that are spaced apart. The minimum design requirements of such barrier systems must comply with the 2014 AREMA/AECOM crash wall guidelines.

location and type of uses permitted within the setback area to help transition and buffer transit operations and services with privately-operated amenities and functions.

The proponents of this project engaged early on with Metrolinx as key stakeholders to consult with on rail safety recommendations for an integrated, Transit Oriented Development (TOD) project at Park Lawn GO Station. A discussion meeting took place in June 2019, where the above considerations were presented, and Metrolinx provided positive indication to the following recommendations:⁷

- Reduced 20 m total setback requirement to sensitive uses, with a safety barrier system;
- Setbacks can be measured from the edge of dynamic train envelope to the closest, active track;⁸
- Sensitive uses occur in ‘assembly’ spaces, where people dwell and inhabit a certain area for a prolonged time, on a regular basis, i.e. an office cubicle, or designated seating in a restaurant, etc.; while
- Non-sensitive uses occur in ‘passive’ spaces, where people are transient and do not dwell in a certain area for a prolonged period of time in a hard to predict manner, i.e. station platforms areas, waiting areas, retail space with no designated seating, etc.;
- All station areas are considered non-sensitive in nature, due to the inherent risk accepted by users when entering train station environments (and being close to moving trains);
- Specific to transit stations, certain types of uses may be located within the setback, or ‘transitory’ area between station and private development spaces especially if the uses are felicitous with transit services, i.e. quick retail, convenience amenities, fast casual restaurants, etc.
- The uses allowed within the setback/transitory area should be located immediately behind a safety barrier system, and beyond the reach of a possible derailed train;⁹
- Structural elements supporting sensitive uses above may be located within the setback area when located immediately behind a safety barrier;
- In addition to crash walls, alternative safety barriers may take the form of crash colonnades and/or bollards with substantial spacing in between to allow for visible and physical permeability;¹⁰
- Safety barriers can be located anywhere within the setback area, and can be provided for in multiple lines of defence;¹¹ and

7 Hatch and its transport team engaged with stakeholder, Metrolinx, the railway owner, in June 2019. See Appendix A – Hatch Project Memo on Rail Adjacency Guidance and Design Rationale for detailed summary of the meeting’s outcomes where Metrolinx’s recommended rail safety mitigation requirements were discussed.

8 This is versus a setback being typically measured from the mutual property line (between the rail corridor and the development site). A measure taken at the edge of dynamic train envelope will still ensure Metrolinx retains flexibility to rail corridor expansion plans since Metrolinx has confirmed that no additional tracks will be added to the rail corridor here. This is reinforced by the side platforms located on either side of the rail corridor.

9 The probable location of where a derailed train would stop/impact can be determined through an Energy Balance Analysis, referred to as Method 2 of the AECON crash wall guidelines.

10 Provided the safety barrier design meets the AECOM crash wall guidelines and provides equivalent resistance to a train derailment at this location as a standard berm. Any safety barrier solution proposed will be subject to Metrolinx’s designated peer reviewer (i.e. AECOM) to confirm compliance with crash wall guidelines. Within the guidelines, alternative safety barrier solutions are acknowledged and can be assessed on its effectiveness to provide adequate rail safety protection.

11 This is consistent with the Transportation Safety Board (TSB)-advocated philosophy of “depth in defense,” in which multiple and diverse lines of defense are employed to mitigate risks

- Minimum height of a safety barrier is 2.31 m, measured from the top-of-rail.

The application of alternative safety barrier systems, together with setback reductions and permission of certain types of uses within the setback area, are recommended for the project to achieve a well-designed, high-performing transit hub per the design goals above.

Further to the above rail safety recommendations, there are additional risk factors and safety requirements to consider when overbuilding (or, developing the air rights over a rail corridor.) These are as follows:

- Minimum vertical height clearances to any building overhangs over transit corridors to maintain minimum operating height requirements for GO electrification and TTC streetcar/LRT electrification.
 - 7.6 metres clearance envelope over the rail corridor¹²; and
 - 4.6-4.7 metres clearance envelope over LRT corridor (to the electrified wires).
- Metrolinx has stated that a noise and vibration, air quality and fire protection assessment must accompany development plans over the rail corridor and may require design clearance envelope requirements for any overhanging building components (over the rail corridor), as well.

The risks to people and property posed by railway operations and activities must be considered and, as appropriate, mitigated. This report responds to these requirements—within the context of existing regulations, guidance, and procedures considering site-specific characteristics—and with the understanding that rail safety solutions are unique to each site

and project, seeks to make recommendations on feasible options to further discuss and advance with the railway stakeholders.

MITIGATION DESIGN STRATEGY

The following section summarizes early recommendations for the design of specific mitigation measures, based on Metrolinx’s guidance and the following principles set out in the FCM/RAC Guidelines for mitigation design:¹³

- Standard mitigation measures are desired as a minimum requirement.
- In instances where standard mitigation measures are not viable, alternative development solutions may be introduced in keeping with the Development Viability Assessment process.
- All mitigation measures should be designed to high urban design standards. Mitigation solutions, as developed through the Development Viability Assessment process, should not create an onerous, highly engineered condition that overwhelms the aesthetic quality of an environment.

FCM/RAC implores that these principles for mitigation design be considered when applied to a specific project. For the new Park Lawn Transit Hub project, a mitigation design strategy is being examined for specific application to developments at Blocks D1 and D2 of the 2150 Lake Shore master plan. See Figure 1.

The primary mitigation measures set out in the FCM/RAC Guidelines include a combination of setback distances and safety barriers to mitigate against the potential impact from

12 Metrolinx GO Electrification Enabling Works ET Standards, Rev-1. 2016.

13 Per the 2013 FCM/RAC Guidelines, Section 3.1 – Principles for Mitigation Design.

a train derailment or incident. This aligns with the Transportation Safety Board (TSB)-advocated philosophy of “depth in defence,” in which multiple and diverse lines of defence are employed to mitigate risks. The proposed development will be protected from possible accident events, notwithstanding the subject property’s existing low risk profile, through the following rail safety measures to further reduce the risk:

- 1. **Setbacks** – Setbacks to the rail corridor are an important safety measure to act as a physical buffer that allows residents and other users of the development to escape in the event of a derailment, and especially if the event results in smoke and/or fire. Non-sensitive or ‘passive’ uses are permitted within the setback area, and may include pick-up/drop-off, loading and parking, certain kinds of retail and food/beverage establishments, waiting areas, common elements of a commercial/residential development like lobbies and amenities, indoor/outdoor recreational spaces and facilities, storage, and/or back-of-house mechanical spaces and service areas.

Application of Setbacks at Park Lawn Transit Hub:

At 2150 Lake Shore, the recommended total minimum setback requirement of 20 m will be achieved by a combination of vertical and horizontal distances, measured from the edge of dynamic train envelope to sensitive uses proposed within the development. The main sensitive uses that will be in close proximity to the rail corridor here are offices and certain types of commercial-retail and/or restaurant establishments where users/occupants are anticipated to remain in a defined area for a prolonged period of time as part of a routine

schedule, i.e. office cubicles and/or sit-down dining establishments. These sensitive uses should be located beyond the recommended 20 m setback.¹⁴

- 2. **Non-Sensitive Use (‘Transitory’) Zone** – The setback defence is further strengthened through the definition of a non-sensitive use zone within the setback area that allows productive use of space (typically behind a safety barrier), as well as provide a physical buffer to the sensitive uses beyond. Non-sensitive uses may include certain kinds of retail, certain outdoor recreational spaces and facilities, storage, back-of-house or service areas.

Application of Non-Sensitive (‘Transitory’) Zone at Park Lawn Transit Hub:

Within the setback area on both the ground floor/station square level and the station platform/mezzanine level, certain types of commercial-retail use that are both non-sensitive and beneficial to the station are recommended. These may include, for example, grab-and-go food and beverage establishments, convenience retail, office lobbies, atriums, and/or waiting areas, etc. The sensitivity level of commercial-retail uses is determined as a function of whether the space is continuously occupied and is a routine occurrence that can be reasonably predicated.

- 3. **Safety Barriers** – In addition to setback distances, the FCM/RAC Guidelines recommend the use of safety barriers to absorb and deflect the energy impact of a derailed train. Safety barriers can take the form of berms and ditches when setback distances are not restrained, or concrete crash walls, colonnades and/or bollards that can be

14 For example, ‘front-of-house’ retail spaces are typically considered a sensitive use; while ‘back-of-house’ retail spaces are considered non-sensitive use.



Figure 1 – Working master plan of Park Lawn Transit Hub at 2150 Lake Shore, with Blocks D1 and D2 shown

designed to resist the impact of a derailment as part of an alternative rail safety solution that is appropriate for urban settings like Park Lawn Transit Hub.

Application of Safety Barriers at Park Lawn Transit Hub:

At the platform level, multiple lines of defence of safety barrier systems will be provided through a combination of crash colonnades and/or bollards that could cumulatively provide the same level of protection as the standard measure. Crash colonnades and/or bollards that can be spaced several meters apart are being recommended to enable permeability and pedestrian flow within the transitory area between the transit terminal and the integrated private development. Crash colonnades/ bollards are typical safety barrier solutions for supporting piers at rail bridges and a similar

approach would taken at Park Lawn Transit Hub.

There are three typical, rail adjacency scenarios across the development scheme between the Park Lawn GO Station and Blocks D1 and D2, specifically. These scenarios are presented and summarized below on how rail safety recommendations could be met, and the above described mitigation design strategies applied specifically to Park Lawn Transit Hub. These are set out in the next pages:

The key differences between the three recommended rail adjacency scenarios are as follows:

1. **Setback Distances**
 - a. Scenario 1: Total setback distance is $\geq 25\text{m}$, achieved through a combination of horizontal and vertical setbacks with

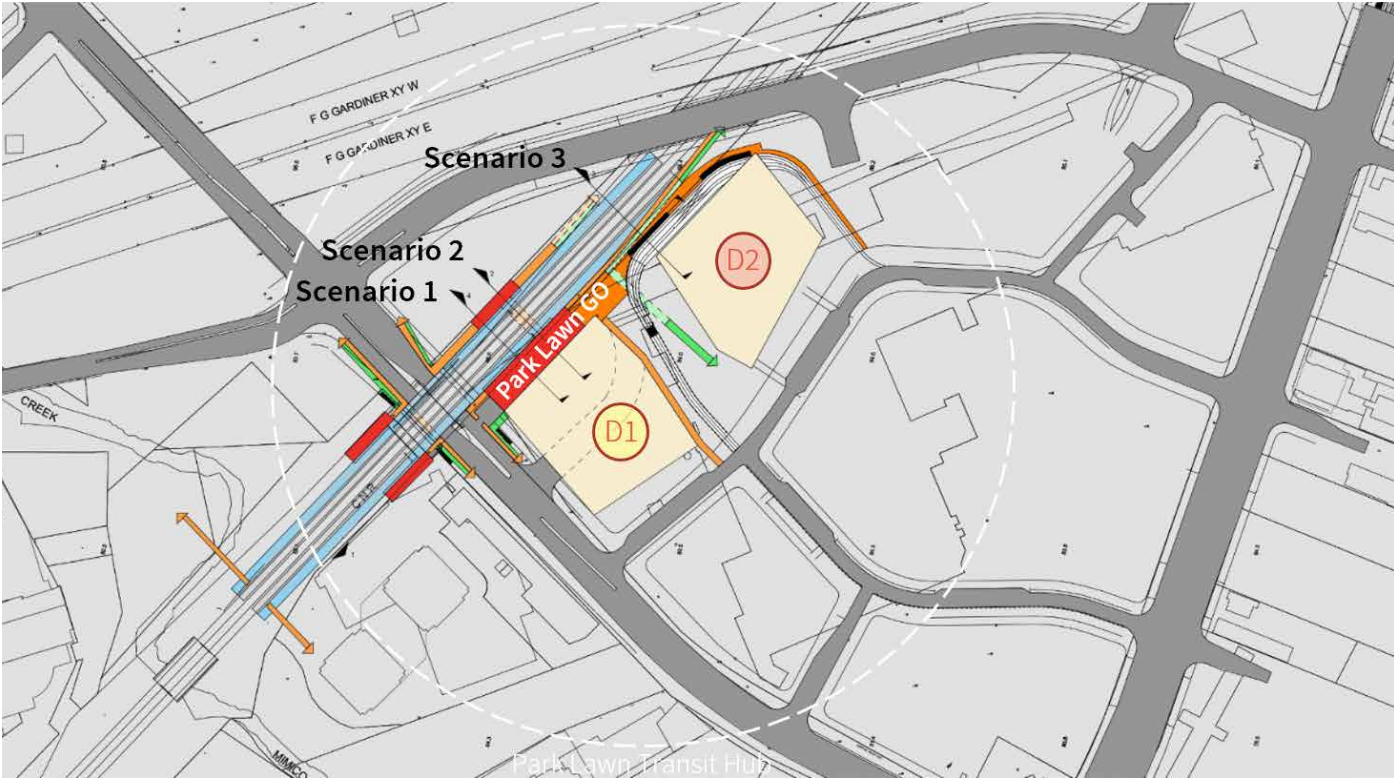


Figure 2 – Typical Rail Adjacency Scenarios between Park Lawn GO Station and Blocks D1 and D2

- structural elements outside of setback area.
- b. Scenario 2: Total setback distance is $\geq 20\text{m}$, achieved through a combination of horizontal and vertical setbacks, with structural support columns required in the setback area; and
 - c. Scenario 3: Total setback distance is $< 20\text{m}$, achieved through a combination of horizontal and vertical setbacks, with structural support columns required in the setback area. A further reduced setback recommendation is sought for Scenario 3 to enable partial/full overbuild over the rail corridor (due to the structural elements needing to be closer to the rail corridor).
2. **Extent of building envelope (overhang/overbuild)**
- a. Scenario 1: The building envelope overhangs the station but does not require structural support columns within the setback area to accommodate overhang;
 - b. Scenario 2: The building envelope further overhangs the station area and transit corridor (TTC streetcar tracks) and requires structural support columns within the setback area to accommodate overhang; and
 - c. Scenario 3: The building envelope overhangs/spans the Metrolinx-owned rail corridor (and TTC streetcar tracks) and requires structural support columns within the setback area (or possibly within the rail corridor) to accommodate building design.
3. **Location, multitude and function of safety barriers**
- a. Scenario 1: Single line of safety barriers are used and take the form of freestanding concrete caissons (or bollards). These

columns can be spaced apart at several metres (approval required for minimum spacing requirements) and must meet a minimum height of 2.135 – 7.0m, measured from the top-of-rail.¹⁵ The height of the safety barrier is dependent upon the total setback and distance of the safety barrier from track. The safety barriers closest to the rail corridor are the primary form of defense in the event of derailment and will be designed to withstand the force of a derailed train and to deflect the train away from station area back towards the rail corridor.

- b. Scenario 2: In this scenario, multiple lines of safety barriers are constructed and take the form of freestanding concrete caissons (or bollards). These columns can be spaced apart at several metres (approval required for minimum spacing requirements) and must meet a minimum height of 2.135 – 7.0m, measured from the top-of-rail. The height of the safety barrier is dependent upon the total setback and distance of the safety barrier from track.

In this scenario, the overhang of the building envelope requires structural support columns to be located within the setback area (station area/transitory/passive space). As in Scenario 1, the safety barriers closest to the rail corridor are intended to provide defense against a train derailment. The secondary line of safety barriers proposed here is intended to protect the structural support columns - located within the setback/transitory area – responsible for supporting sensitive use spaces above.

- c. Scenario 3: The primary difference between Scenario 3 and the previous scenarios is that it involves the development being built

across/over the rail corridor. This scenario requires multiple safety barriers within the setback area to protect the structural columns supporting the development overhead (which would contain sensitive/non-sensitive use or a combination of the two).

The proposed safety barriers would take the form of freestanding concrete caissons (or bollards). These columns can be spaced apart at several metres (approval required for minimum spacing requirements).

Minimum height requirements for the safety barriers will need to be confirmed with and approved by the City of Toronto, Metrolinx and their peer-review teams.

Similar to the previous scenarios, the safety barriers closest to the rail corridor will serve the function of protecting the development from a train derailment. Additional protection for all structural support columns will be necessary. It will be necessary to show that in the event of a derailment, unaffected structural elements could support the building if structural supports sustain damage.

The recommended application of the mitigation measures described above are in keeping with the FCM/RAC Guidelines and emerging Metrolinx guidance for safety protection in station areas.

¹⁵ Per the AREMA/AECOM crash wall guidelines, minimum height requirements depend on how close the safety barrier is located in relation to the closest, active track.



Park Lawn TTC Streetcar

Scenario 1 – applied to Block D1

Total 25m setback

- ❖ Combined **vertical + horizontal setbacks** to sensitive-uses
- ❖ Measured from the **edge of dynamic train envelope**, top-of-rail
- ❖ With **single safety barrier system**, isolated from structural elements
- ❖ **Retail atrium** within transitory, setback area

Key Map:

This rail adjacency scenario applies to the following locations:



Setbacks:

Combined vertical (x) + horizontal (y) setbacks:

Vertical	X = varies
Horizontal	Y = varies
X + Y ≥	25m

Permitted Uses:

Beyond setback:

Sensitive Use

Within setback:

Non-Sensitive Use
Transitory / Passive Spaces*
Station Areas*

Safety Barrier System:

Possible variants of safety barriers; located anywhere within setback area.



**Minimum requirements per the 2014 AREAMA/AECOM crash wall guidance.

*Transitory and station areas are appropriate uses within the setback area. Station users accept a level risk inherent with being in a station environment with moving trains. People being close to moving trains in station areas is considered acceptable.

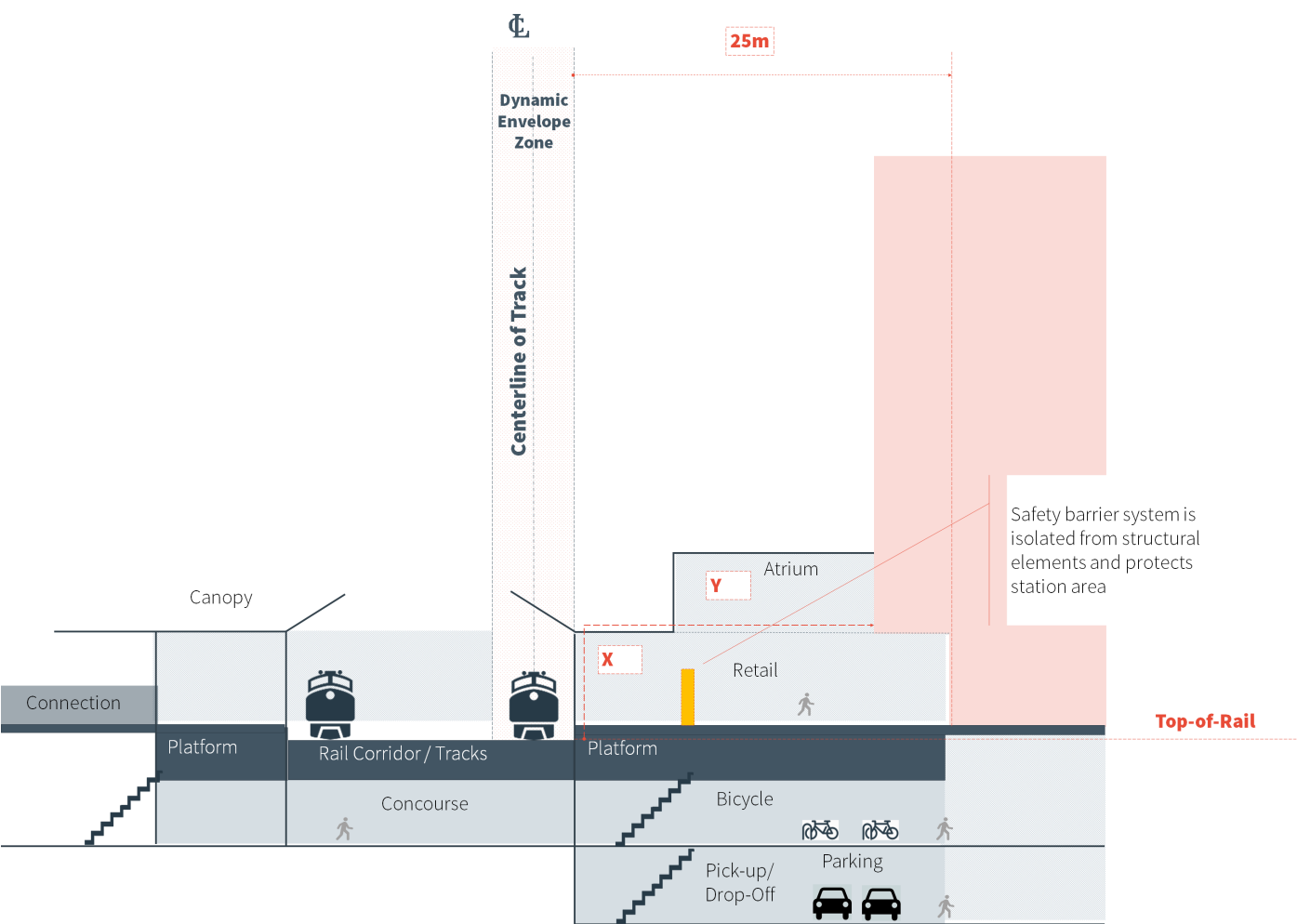


Figure 3 – Scenario 1: Total 25 m setback, with single line of safety barrier defense, and retail-atrium within transitory/setback area

Scenario 2 – applied to Block D2

Total 20m setback

- ❖ Combined **vertical + horizontal setbacks** to sensitive-uses
- ❖ Measured from the **edge of dynamic train envelope**, top-of-rail
- ❖ With **safety barrier system**, multiple lines of defence
- ❖ **Streetcar interchange** within transitory, setback area
- ❖ **Building overhang** with sensitive-uses over transit corridors

Key Map:

This rail adjacency scenario applies to the following locations:



Safety Barrier System:

Possible variants of safety barriers; located anywhere within setback area.



**Minimum requirements per the 2014 AREAMA/AECOM crash wall guidance.

Setbacks:

Combined vertical (x) + horizontal (y) setbacks:

Vertical	X ≥ 10m**
Horizontal	Y = varies
X + Y ≥	20m

Permitted Uses:

Beyond setback:

Sensitive Use

Within setback:

Non-Sensitive Use
Transitory Areas*
Station Areas*

*Transitory and station areas are appropriate uses within the setback area. Station users accept a level risk inherent with being in a station environment with moving trains. People being close to moving trains in station areas is considered acceptable.

**Minimum height clearance for streetcar electrification

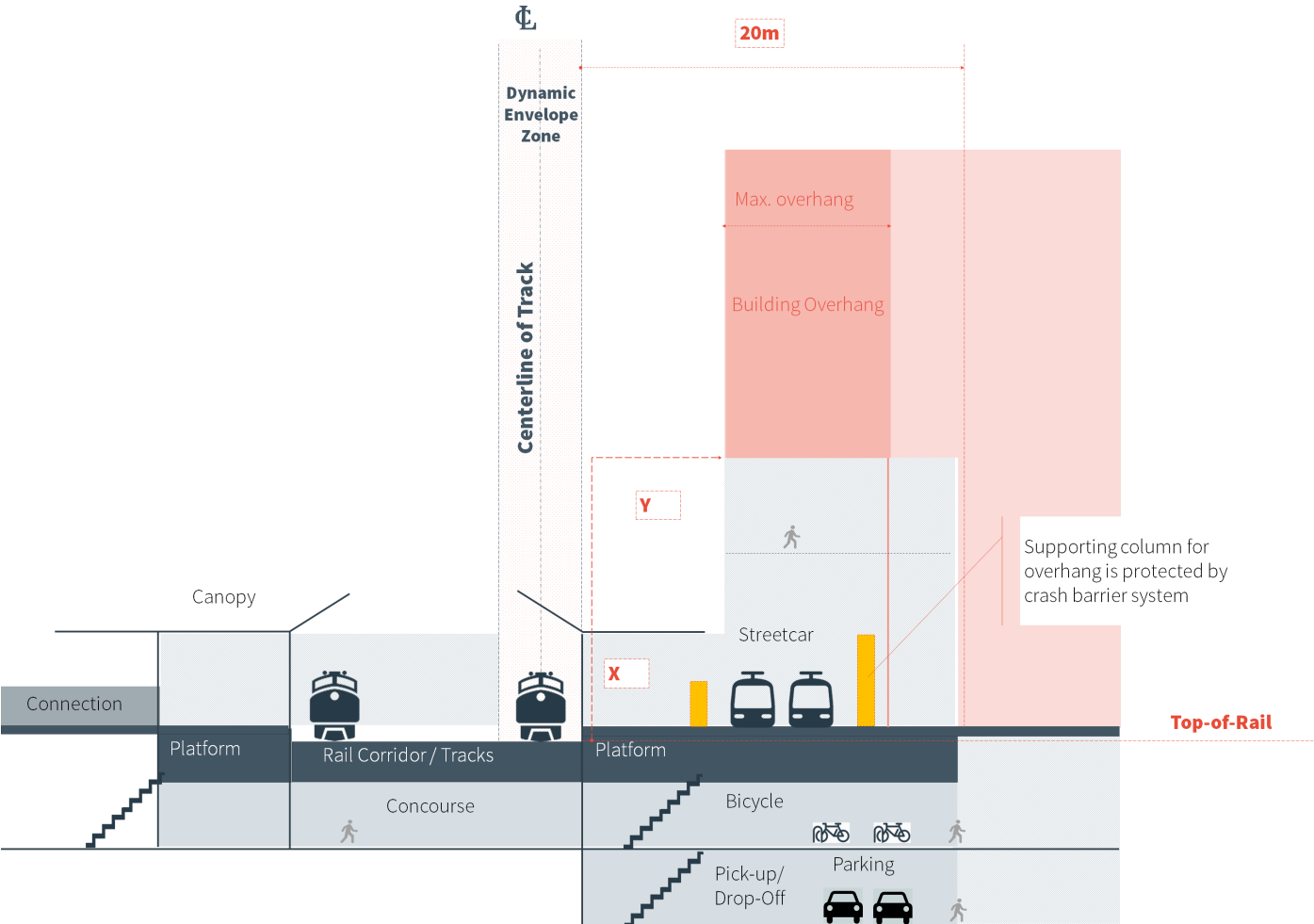


Figure 4 – Scenario 2: Total 20 m setback, with multiple lines of safety barrier defense, TTC streetcar within transitory/setback area

Scenario 3 – applied to Block D2

Total 15-20m setback

- ❖ Combined **vertical + horizontal setbacks** to sensitive-uses
- ❖ Measured from the **edge of dynamic train envelope**, top-of-rail
- ❖ With **safety barrier system**, multiple lines of defence
- ❖ **Streetcar interchange** within transitory, setback area
- ❖ **Building overhang** with sensitive-uses over transit corridors

Key Map:

This rail adjacency scenario applies to the following locations:



Setbacks:

Combined vertical (x) + horizontal (y) setbacks:

Vertical	$X \geq 7.2\text{m or }10\text{m}^{**}$
Horizontal	Y = varies
$X + Y \geq$	15-20m

Permitted Uses:

Beyond setback:

Sensitive Use

Within setback:

Non-Sensitive Use
Transitory Areas*
Station Areas*

Safety Barrier System:

Possible variants of safety barriers; located anywhere within setback area.



**Minimum requirements per the 2014 AREAMA/AECOM crash wall guidance.

*Transitory and station areas are appropriate uses within the setback area. Station users accept a level risk inherent with being in a station environment with moving trains. People being close to moving trains in station areas is considered acceptable.

**Minimum height clearance for streetcar (10m) and train (7.2m) electrification

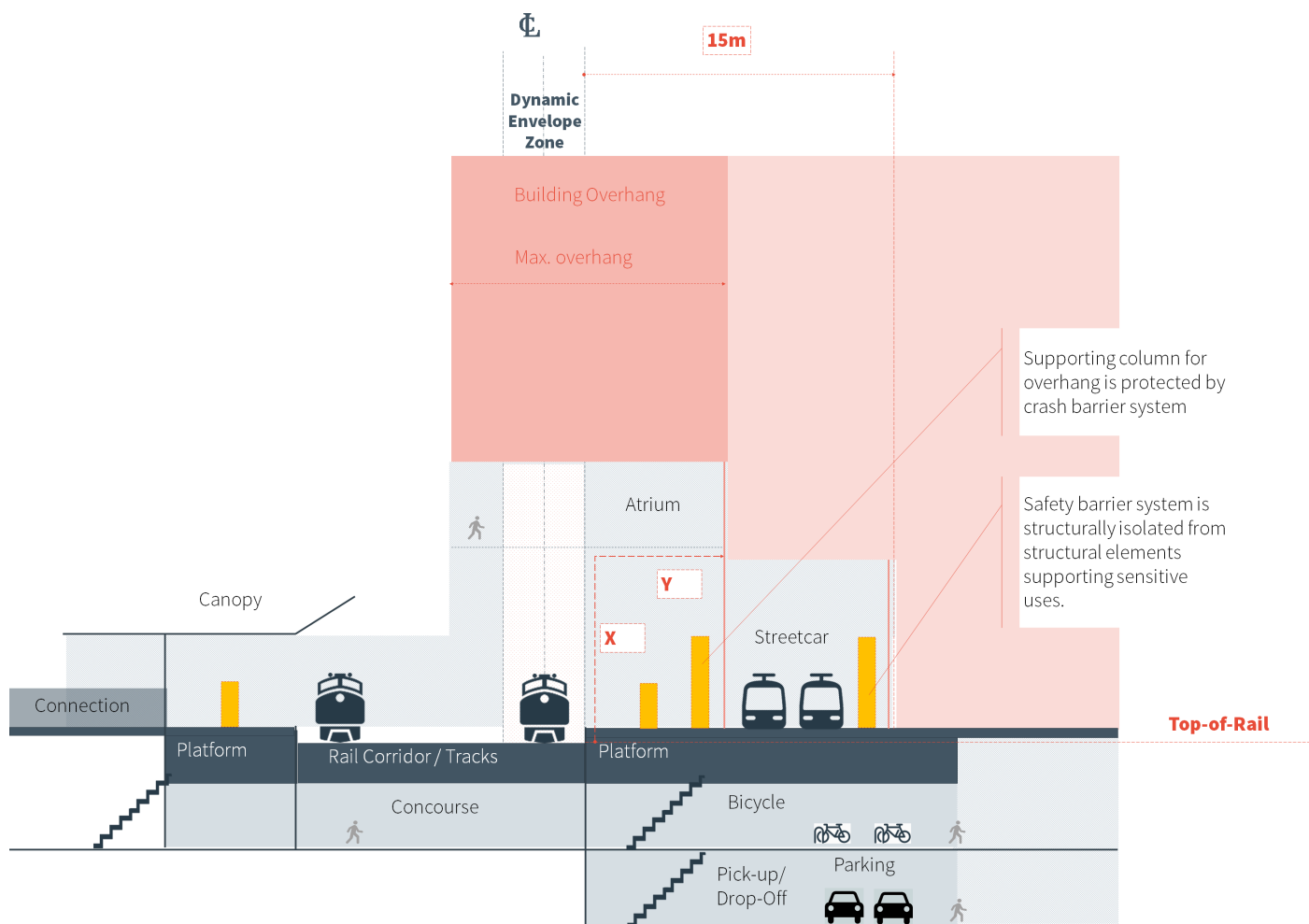


Figure 5 – Scenario 3: Total <20 m setback, with multiple lines of safety barrier defense, TTC streetcar and retail-atrium within transitory/ setback area, and partial overbuild over the rail corridor

1.5/ **PROJECT OBJECTIVES AND NEXT STEPS**

Rail safety is a key objective and critical path in the development approval process for Park Lawn GO Station and its immediately surrounding transit-oriented community, 2150 Lake Shore. The risks to people and property posed by railway operations and activities must be considered and, as appropriate, mitigated. This technical supporting strategy study responds to these requirements within the context of existing regulations, guidance and procedures. It also further takes into consideration the specific site conditions along the rail corridor, projected future infrastructure and traffic conditions of the adjacent Oakville Subdivision (the name of the Lakeshore West GO corridor in the vicinity of, and west of, planned Park Lawn GO Station). The intent needs to be to appropriately mitigate these risks, not eliminate them. The intent is to recommend risk management and safety measures that provide an equivalent or better risk mitigation measures than the standard measures. The intent is to mitigate risks as much as possible to a level that is tolerable, recognizing that absolute risk cannot always be eliminated and “zero risk” is often not achievable.

At this stage of the project's preliminary design, the main objectives of the project team’s approach to rail safety are as follows:

1. Protect for flexibility in both Metrolinx’s future rail expansion plans, and the design of Park Lawn GO Station and integrated developments of 2150 Lake Shore;
2. Determine appropriate protection against potential rail risks that would satisfy Metrolinx’s wishes for appropriate measures at their Oakville Subdivision rail corridor;
3. Respect and work within the City of Toronto’s development application process; and
4. Enabling project owners and project team to be a collaborative and efficient partner with appropriate authorities/agencies in achieving support and approvals.

CPPIB Park Lawn Canada Inc and FCR (Park Lawn) LP and Metrolinx are aligned in their interests to appropriately protect people and property at Park Lawn GO Station and 2150 Lake Shore.

