



17 Jacobs Terrace

Rail Safety Assessment Report

August 25, 2021

160560022

Prepared for:

Tonlu Holdings Ltd.

Prepared by:

Stantec Consulting Ltd

17 JACOBS TERRACE

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Introduction

1.0 INTRODUCTION

Stantec Consulting Ltd. has been retained by Tonlu Holdings Ltd. to complete a Rail Safety Assessment for the proposed development at 17 Jacobs Terrace in the City of Barrie.

The purpose of this study is to assess site specific hazards and mitigation measures relating to noise, vibration, trespass, and crash potential.

Architectural drawings completed by architectureunfolded dated August 13, 2021 shows a mixed-use development consisting of two high-rise buildings (24 and 26 storey) which will provide for approximately 565 residential units, low scale community spaces & retail spaces and amenity areas. The proposed development will also incorporate 580 parking spaces (to be situated within a 4-level above ground parking garage). A reduced copy of the Architectural Drawing set has been included in Appendix A.

2.0 SITE LOCATION AND DESCRIPTION

The subject property land is located on the southwest side of Innisfil St. and Jacobs Terrace in the City of Barrie adjacent to Barrie Collingwood Railway's (BCRY) Meaford Subdivision, approximate mile 0.4, as shown in Figure 1. This land, with an area of approximately 2.26 acres, is currently occupied with few low-rise commercial buildings. The site is bound by Jacobs Terrace to the north, Innisfil St. to the east, Anne St. to the west, and Caroline St. to the south. The current site conditions will be demolished in the near future to give way to the proposed development which includes a 24 storey tower and a 26 Storey tower consisting residential units, community and retail spaces.

The Topographical Survey Plan for the site, included in Appendix A, indicates that the existing elevations of the proposed development range between 229.11m and 230.82m.



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BACKGROUND INFORMATION



Figure 1 Site Location (Key Plan)

3.0 BACKGROUND INFORMATION

The following documentation were consulted in the preparation of this Rail Safety Assessment:

- Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC)'s Guidelines for New Development in Proximity to Railway Operations (May 2013)
- Canadian Railway Safety Act (last amended June 22 2017)
- AECOM's Submission Guidelines for Crash Walls (Revised July 29 2014)



4.0 RAIL OPERATIONS

The existing rail operations in close proximity to the north property limit of the proposed development site are part of Barrie Collingwood Railway's Meaford Subdivision, approximate mile 0.4. Stantec reached out to the Railway to determine the track classification. The Railway considers this subdivision as a Principal Branch Line.

4.1 CURRENT CONFIGURATION

Listed below are the rail operations characteristics associated with this location:

- 1 Branch Line track (BCRY)
- Maximum train speed 10 mph (approx. 16 Km/h)
- 0.57 trains per day (as per the Railway)

4.2 FUTURE CONFIGURATION

A discussion regarding the future expansion plan took place between Stantec and the Railway.

Railway does not anticipate an expansion or changes to services through this area in the near future. Therefore, this report is based on current configuration and maximum train speed.

Figure 1.0 depicts the location of Barrie Collingwood Rail R.O.W. relative to the 17 Jacobs Terrace development site.

5.0 DEVELOPMENT PROPOSAL

The drawings provided, dated August 13, 2021 by architectureunfolded indicate two high-rise: 24 & 26 Storey, mixed used towers, are proposed. A reduced copy of the Architectural Drawing set has been included in Appendix A.

6.0 HAZARDS IDENTIFICATION

Several factors or concerns should be given consideration when new developments are erected within proximity to railway operations. These include crash safety, trespass, noise pollution, vibration, and stormwater management. These will form the list of criteria for the mitigation measures to be discussed in this report.

Amongst the above listed factors, the two (2) factors the general public most commonly associates with proximity to rail operations are noise pollution and vibration. It can be argued that noise pollution and



vibration are built-in characteristics or properties of rail operations. Generally, noise pollution is generated as a result of wheel – rail interactions, locomotive engines, and whistles. Whereas vibration is produced as the wheels roll on tracks. While it may not be entirely possible to eliminate the impact of these two (2) issues onto neighboring properties, they can be mitigated.

Trespassing and crashes are by far the two (2) most severe hazards since they can lead to the greatest physical impact and could result in serious injury including instant loss of life.

7.0 ASSESSMENT CRITERIA AND METHODOLOGY

The methodology to be employed in this report will be based on comparing or assessing the technical/ engineering criteria from the existing guidelines noted in Section 3.0 of this report, which will form the basis for the selection and discussion of the required mitigation measures for the proposed development site. The most relevant set(s) of criteria will then be selected and the feasibility for the implementation of the associated mitigation measures will also be assessed.

7.1 APPLICABLE GUIDELINES:

7.1.1 The Federation of Canadian Municipalities and Railway Association of Canada Guidelines for New Development in Proximity to Railway Operations (May 2013)- “FCM-RAC”

- The FCM/RAC Guidelines recommend the use of “standard mitigation measures” which include a 15m setback for Branch lines with an earthen berm constructed to a height of 2.0m above grade for Branch lines with side slopes not steeper than 2.5 to 1
- Marginal reductions in the recommended setback of up to 5m may be achieved through a reciprocal increase in the height of the berm
- Where there are elevation differences between the railway and a subject development property, appropriate variations in the minimum setback should be determined
- No berm is required where the railway line is in a cut of equivalent depth of the standard berm height
- If applicable to the site conditions, in lieu of the recommended berm, a ditch or valley between the railway and the subject new development property that is generally equivalent to or greater than the inverse of the berm could be considered
- Notwithstanding the above, the FCM/RAC Guidelines were also written to offer alternatives where standard mitigation measures are not viable
- At a minimum all new residential developments in proximity to railway corridors must include a 1.83m high chain link fence along the entire property line to provide protection against trespassing



7.2 DERAILMENT IMPACT ANALYSIS:

In addition to the above, the following guidelines detail train derailment as they relate to protection requirements for impact.

- A separation distance of 15 m (minimum) taken horizontally from the rail corridor property line to face of building and a 2.0 m high earthen crash safety berm (sloped 2.5:1) is required (FCM/RAC)
- Minimal reductions in the recommended setback, of up to 5 metres can be achieved by a reciprocal increase in the height of the berm (FCM/RAC)
- Alternate berm designs (e.g. crash walls) may be considered for spatially constrained locations. The intent is to provide a level of energy absorption equivalent to that of a standard berm (FCM/RAC)

8.0 MITIGATION DESIGN ASSESSMENT

Stantec's assessment of the proposed conditions is based on a review of the latest Architectural Drawings which includes 2 buildings. These two buildings will be assessed individually. It has been assumed that structural elements for the residential tower are located in the parking podium levels at the limit of the tower envelope and that these will require protection.

FCM/RAC guidelines stipulate that the minimum building setback distance is measured from the mutual property line to the building face and that the mutual property line is always the reference point for building setbacks, regardless of area conditions. Therefore, all setback calculation in this report is measured from the Railway R.O.W.

FCM/RAC guidelines further measure the setback from the mutual property line and consider the combined horizontal and vertical separation in calculating the setback as shown in Figure 2 which was extracted from the FCM/RAC guidelines.



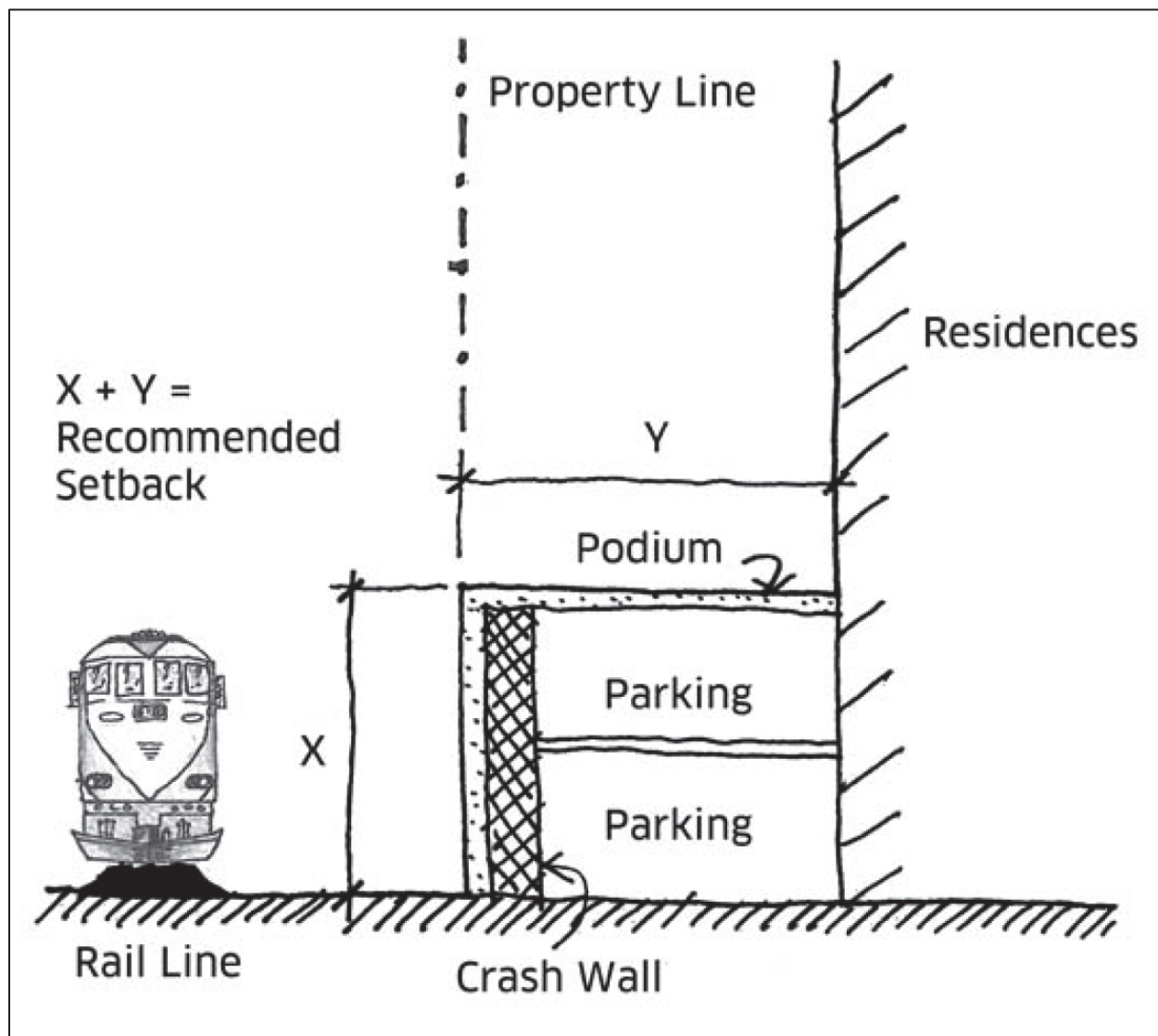


Figure 2 Combining Horizontal and Vertical Setback [Source: FCM/ RAC]

8.1 BUILDING 1

8.1.1 Setback

This proposed 26 Storey building has 4 levels of aboveground parking podium with low scale retail spaces on the ground floor. The latest architectural drawings show that the distance to the nearest structures supporting the residential units from the railway R.O.W is approximately 20m with residential units starting from the 5th floor. This exceeds the minimum setback of 15m required by the FCM/RAC guidelines for developments adjacent to Principal Branch Line.



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MITIGATION DESIGN ASSESSMENT

The tower has four levels of aboveground parking podium with low scale retail spaces on the ground floor. There is no minimum setback requirement for low occupancy uses such as parking podiums, however, the setback requirements for the structural elements supporting the 26-storey residential tower are considered the same as the residential units (15m). The lowest setback to the structural element supporting the residential units is 20 m, which also exceeds the minimum 15m setback from a Branch Line as per FCM/ RAC.

8.1.2 Safety Barriers

FCM/ RAC guidelines call for a safety barrier in the form of an earthen berm where full setbacks are provided. Safety barriers reduce the risks associated with railway incidents/ accidents by intercepting or deflecting derailed cars as well minimize the lateral spread or width in which the rail can travel. Viable and site-specific alternatives can be proposed such as crash berms, crash walls, reverse ditches etc. in lieu of earthen berm.

Given the low train speed in the subject area, structural calculations were completed by 'Jablonsky, Ast and Partners' to determine the furthest distance a train could potentially travel in the incident of a train derailment at a speed of 10mph. It was established that a derailed train has the potential to travel as far as 1.4m from track centreline, refer to Structural Report in Appendix B. On this basis, no crash wall or safety barrier is required.

8.2 BUILDING 2

8.2.1 Setback

This proposed 24 Storey tower has 4 levels of aboveground parking podium with low scale community spaces on the ground floor. The latest architectural drawings show that the distance to the nearest structures supporting the residential units from the railway R.O.W is approximately 20 m with residential units starting from the 5th floor. This exceeds the minimum setback of 15m required by the FCM/RAC guidelines for developments adjacent to Principal Branch Line.

The tower has four levels of aboveground parking podium with low scale community spaces on the ground floor. There is no minimum setback requirement for low occupancy uses such as parking podiums, however, the setback requirements for the structural elements supporting the 24-storey residential tower are considered the same as the residential units (15m). The lowest setback to the structural element supporting the residential units is 20 m, which also exceeds the minimum 15m setback from a Branch Line as per FCM/ RAC.

8.2.2 Safety Barriers

FCM/ RAC guidelines call for a safety barrier in the form of an earthen berm where full setbacks are provided. Safety barriers reduce the risks associated with railway incidents/ accidents by intercepting or deflecting derailed cars as well minimize the lateral spread or width in which the rail can travel. Viable and



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Risk Analysis

site-specific alternatives can be proposed such as crash berms, crash walls, reverse ditches etc. in lieu of earthen berm.

Given the low train speed in the subject area, structural calculations were completed by 'Jablonsky, Ast and Partners' to determine the furthest distance a train could potentially travel in the incident of a train derailment at a speed of 10mph. It was established that a derailed train has the potential to travel as far as 1.4m from track centreline, refer to Structural Report in Appendix B. On this basis, no crash wall or safety barrier is required.

9.0 RISK ANALYSIS

9.1 HISTORIC RAIL OCCURRENCES

Dataset on Transportation Safety Board (TSB) records and publishes data from Rail Occurrence Database System (RODs) on reportable accidents and incidents since January 1983. According to this dataset there has not been a TSB reportable accident or injury reported within ½ km of the subject property on the Meaford Subdivision since 1983.

9.2 CRASH IMPACT – FREQUENCY & SEVERITY MATRIX

A 5x5 standard matrix of frequency vs. severity has been constructed based on the following criteria to assess the potential impact of a crash upon completion of the proposed development. The frequency/severity matrix provided is intended to present only the anticipated level of impact on life safety in the unlikely event of a derailment.

The following definitions were used to access the frequency and severity for Table 3.

Frequency:

- Minimal (1) - First aid or minor medical treatment
- Marginal (2) - Reportable injury/occupational illness, lost workday
- Serious (3) - Serious injury, multiple injuries
- Critical (4) - Permanent partial disability
- Catastrophic (5) - Death or permanent total disability

Probability:

- Improbable (1) - So unlikely it can be assumed that an occurrence may not be experienced in a lifetime.
- Remote (2) - Unlikely, but possible to occur in the lifetime of a person or item.
- Occasional (3) - Likely to occur sometime in the life of a person or item.
- Probable (4) - Will occur several times in the life of a person or item.



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Recommended Mitigation Measures

- Frequent (5) - Likely to occur frequently in the life of a person or item

Table 1 - Frequency/Severity Matrix

Frequency	Frequent (5)	-	-	-	-	-
	Probable (4)	-	-	-	-	-
	Occasional (3)	-	-	-	-	-
	Remote (2)	2	-	-	-	-
	Improbable (1)	-	-	-	-	-
Legend: 01-03 Very Low; 04-06 Low; 07-11 Medium; 12-18 High; 19-25 Very High		Minimal (1)	Marginal (2)	Serious (3)	Critical (4)	Catastrophic (5)
		Severity				

Considering the low train speed and light train traffic, it can be anticipated that the severity of impact in the event of a train derailment would be minimal within the development lands, however, the rating above accounts for the overall severity of the potential derailment which includes the impacts within the corridor (trains, track infrastructure, rail passengers/staff).

10.0 RECOMMENDED MITIGATION MEASURES

From this Rail Safety Assessment study, it is our opinion that the proposed development is compliant with FCM/ RAC guidelines for development adjacent to rail corridor.

General Site

- Entire site meets the recommended setback as per FCM/ RAC Guidelines. No supplementary safety barrier (mitigation measure against crash protection) is required due to the low train speed as established in the structural report.
- As per FCM/ RAC guidelines, at a minimum all new residential developments in proximity to railway corridors must include a 1.83m high chain link fence along the entire property line to provide protection against trespassing. Therefore, a 1.83m high trespass mitigation fence should be installed along the Railway R.O.W. to create a barrier between the municipal ROW and the corridor providing



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CONSIDERATIONS DURING CONSTRUCTION

added protection against trespassing onto the existing railway corridor by way of traversing across the Jacobs Terrace roadway from the development property. An agreement between the Municipality and the Railway Authority may be required to facilitate this installation.

- Considerations for noise pollution should be assessed by a qualified noise consultant.
- Considerations for vibration during and post construction are to be assessed by a qualified vibration consultant.
- It is expected that Drainage and Stormwater Management programs for the proposed development conditions within the site will need to be based on appropriate standards. Drainage and Stormwater management matters are to be further investigated and addressed by the project's civil engineering consultant.

11.0 CONSIDERATIONS DURING CONSTRUCTION

The following matters should be given consideration during construction:

- Crane swing agreement
- Impact of railway loading onto shoring
- Trespass
- Railway personnel for flagging
- Vibration to and from the railway corridor during excavation and construction
- Erosion and Sediment Control

12.0 CONCLUSION

Based on the discussion in this report, the proposed measures put forth can be safely implemented on-site to adequately address crash, trespass, noise pollution, vibration, and drainage considerations.



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CONCLUSION

We trust that the above report meets your requirements. Please contact us should you have any questions.

Regards,

Stantec Consulting Ltd.



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Sonia.rahman@stantec.com

A handwritten signature in black ink, appearing to read 'Jeff Kingston'.

Jeff Kingston
Senior Technical Advisor
Phone: 905 944 6216
Jeff.kingston@stantec.com



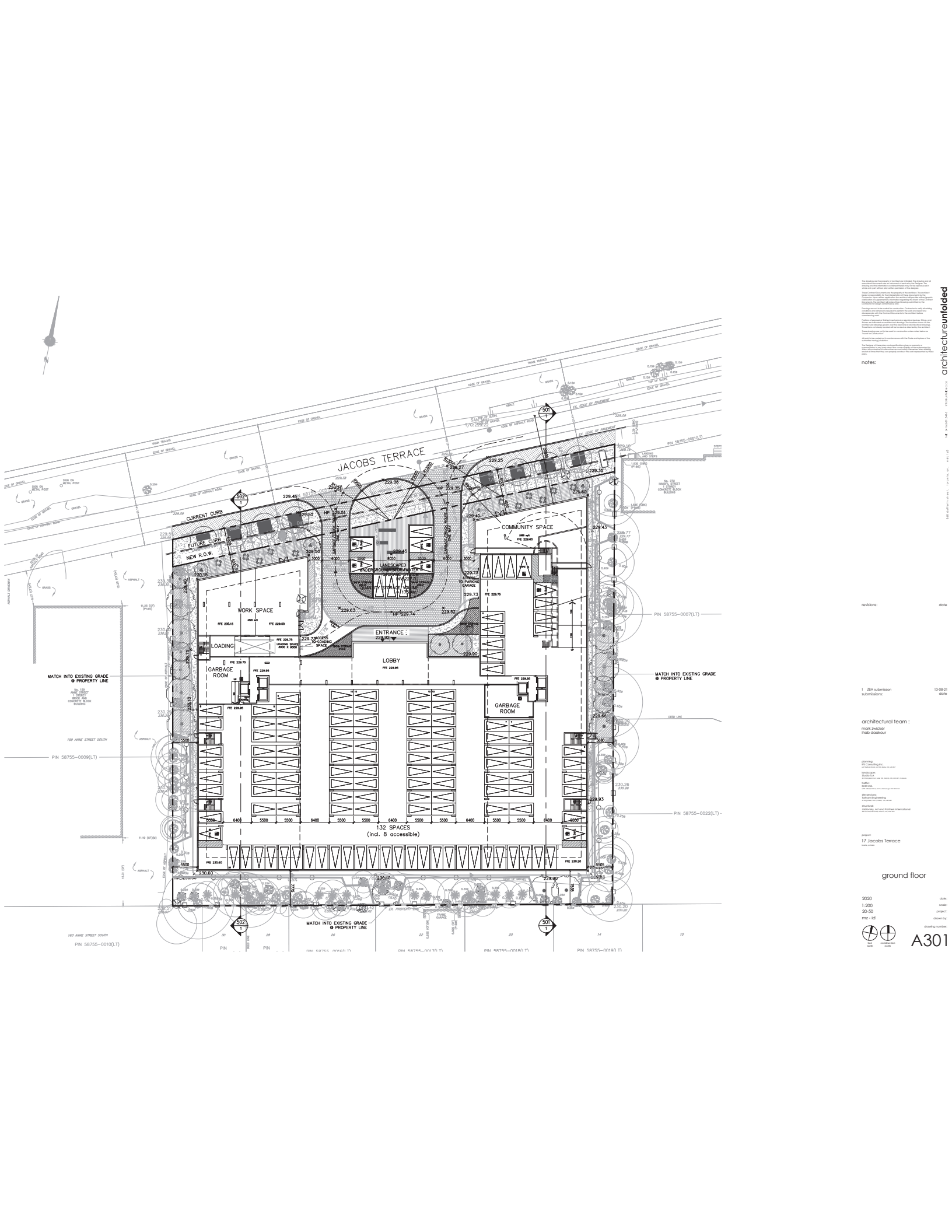
APPENDIX/DIVIDER TITLE

Appendix Subtitle

Appendix A ARCHITECTURAL PLANS

TOPOGRAPHICAL SURVEY PLAN





notes:

revisions:

1 2BA submission

architectural team:

pinning

project

ground floor

2020

1/25/20

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m2 - 1d

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architectunfolding

notes:

revisions

date

1 ZBA submission
submissions:

13-08-21
date

architectural team :
mark zwicker
johannes kloppsch

[illegible]

project.
17 Jacobs Terrace

5th floor

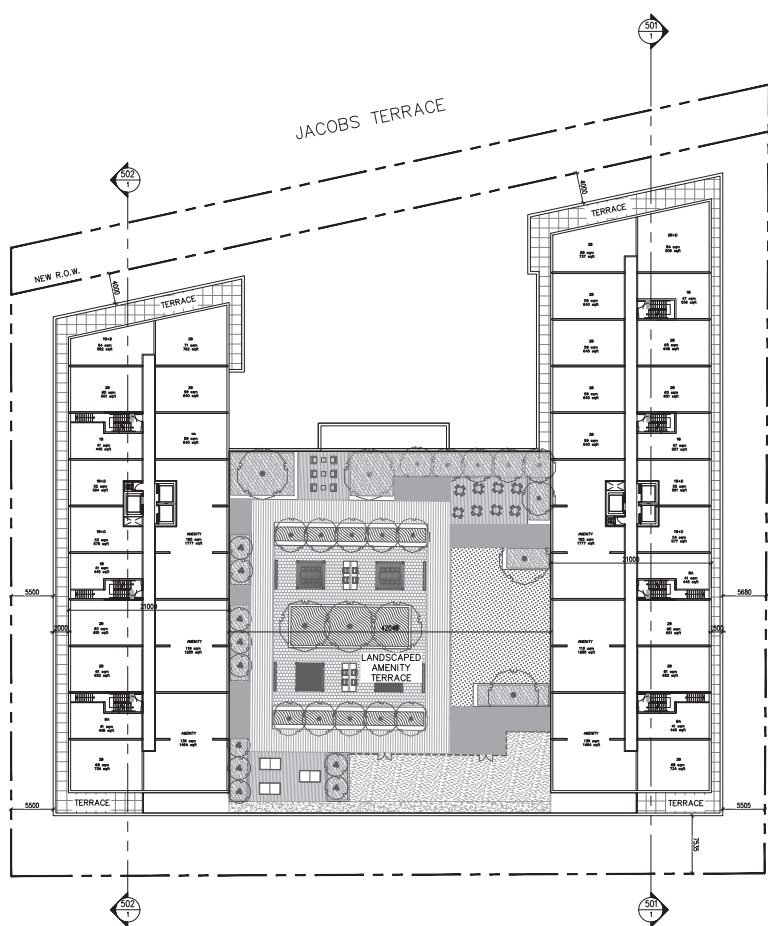
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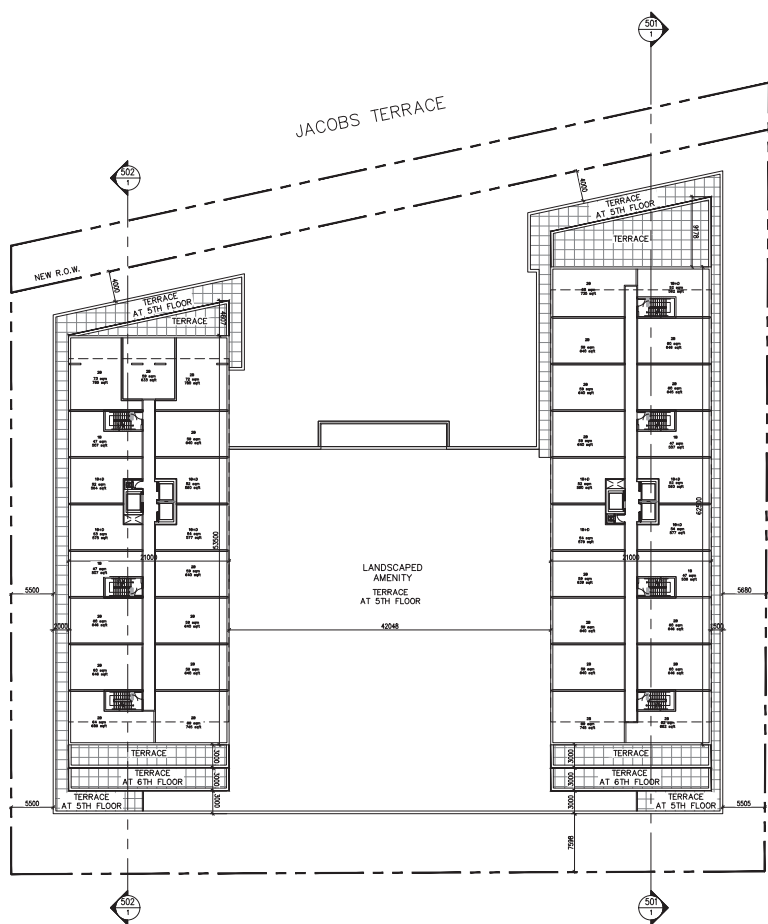
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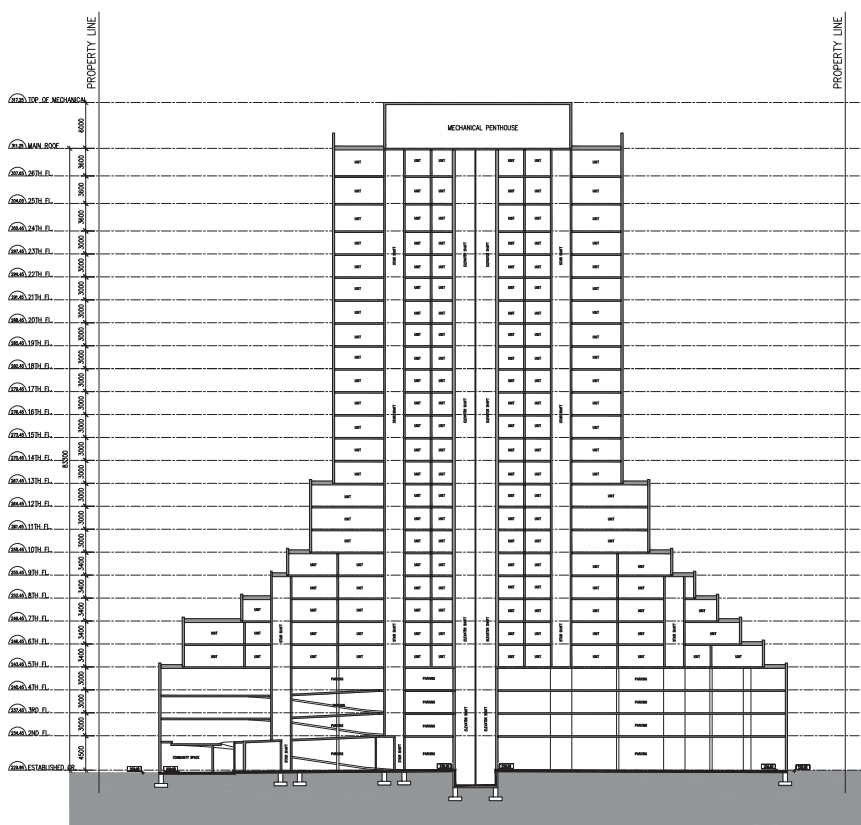
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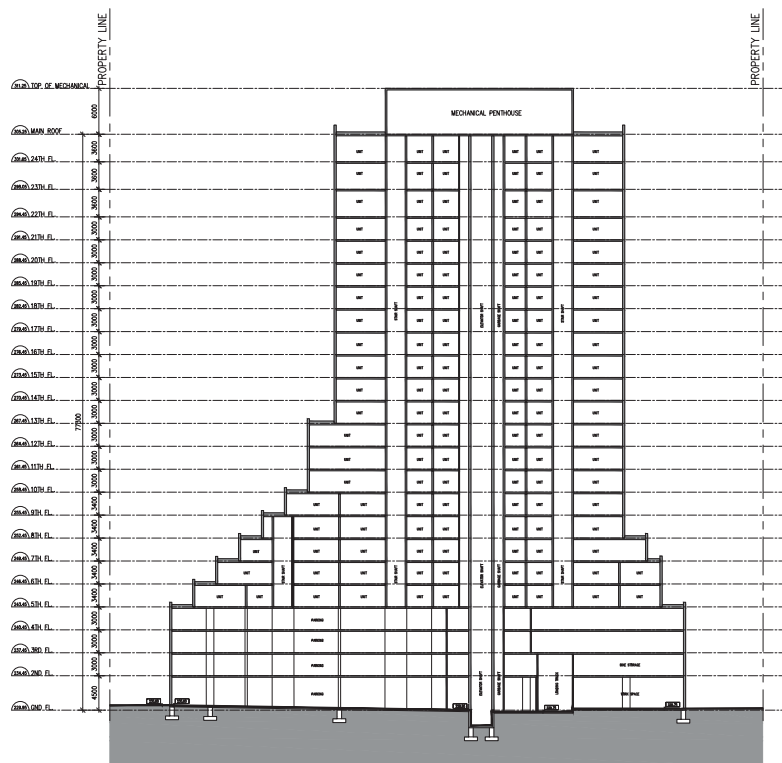


notes:

section 1
(26th floors)



notes:



section 2

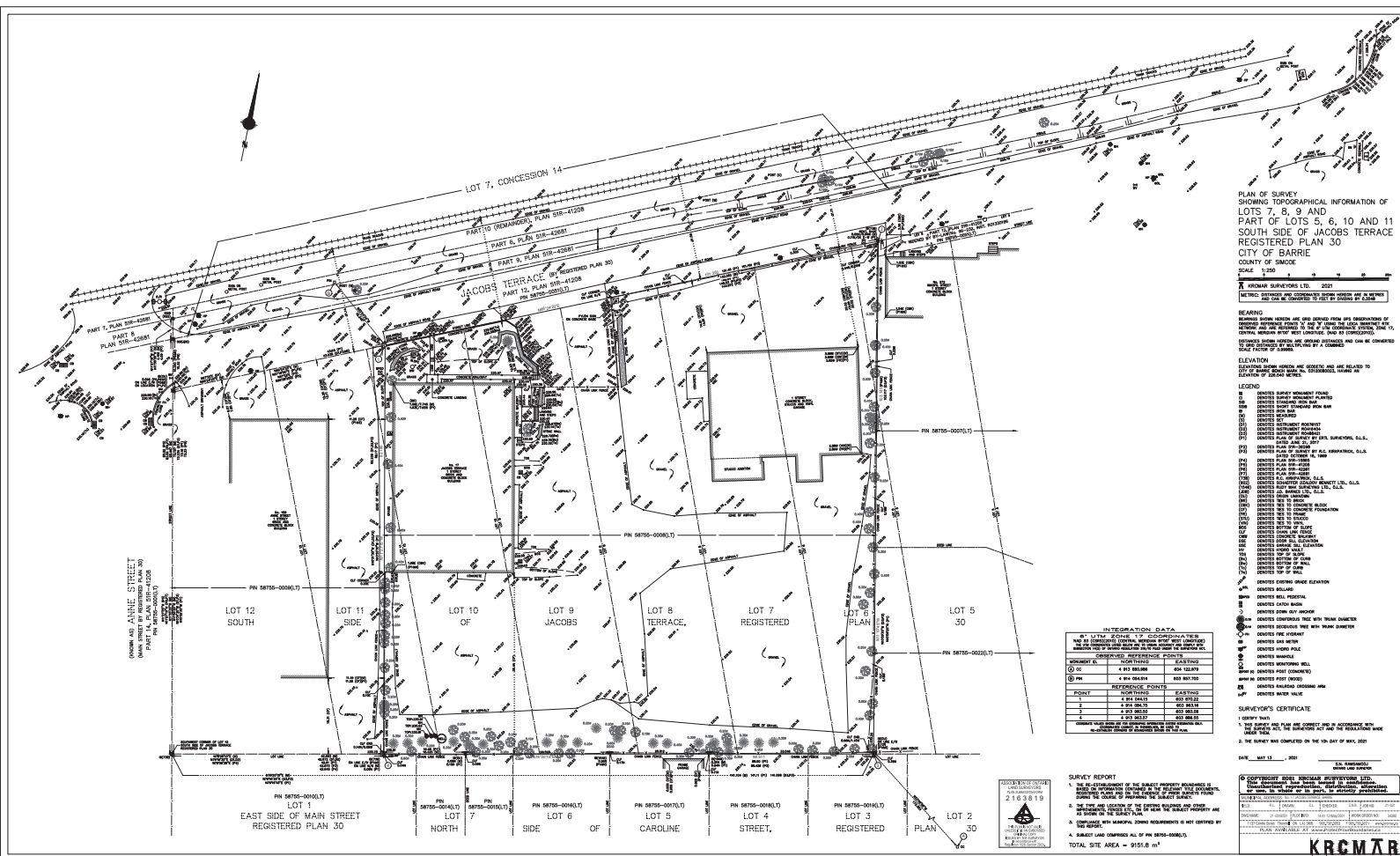
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project:
drawn by:

02



A502



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Appendix B Structural Calculation for 17 Jacobs Terrace

Appendix B STRUCTURAL CALCULATION FOR 17 JACOBS TERRACE





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July 27, 2021
Revised July 29, 2021

Tonlu Holdings Limited
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Vaughan, ON L4L 5V9

Attn: Ms. Isabel Bercasio

Re: 17 Jacobs Terrace, Barrie, ON
Structural Train Derailment Review
Our Project No 21119

Dear Ms. Bercasio,

As per your recent request, we are providing the following design brief regarding the structural impact of a train derailment, on the site of 17 Jacobs Terrace, adjacent to the Barrie line. The proposed development consists of an above grade, reinforced cast-in-place concrete structure which terraces to a height of 26 stories above grade. The development is located adjacent to the Barrie Rail Line separated by Jacobs Terrace.

The approach typically taken to design a crash barrier is to equate the momentum of the moving body to the work done or energy absorbed in reducing the momentum of that moving body to zero. Current guidelines produced by AECOM (last amended in 2014) provide information with respect to train mass, direction and impact and train velocity. As well, recommendations are made with respect to how much energy is absorbed by the plastic deformation of the locomotives and rail cars. This site is unique in that the rail speeds are quite low and so the potential impact of a derailment is significantly reduced. Based on the track speeds of this line, we have chosen to use Method Two in which the following four cases are to be considered:

1. Freight Train Glancing Blow: nine cars weighing 143 tons (129,700 kg) each, impacting the wall at an angle, θ_G . The angle of impact will be a function of track curvature, and for tangent track may be taken as 3.5 degrees.
2. Freight Train Single Car Impact: a single car weighing 143 tons (129,700kg) impacting the wall as it undergoes rotation about its center. The angle of rotation at impact is θ_F .
3. Passenger Train Glancing Blow: eight cars weighing 74 tons (67,120kg) each impacting the wall at an angle, θ_G . The angle of impact will be a function of track curvature and for a tangent track may be taken as 3.5 degrees.
4. Passenger Train Single Car Impact: a single car weighing 74 tons (67,120kg) impacting the wall as it undergoes rotation about its center. The angle of rotation at impact is θ_F .

P.F. Ast, P.ENG D. Tari., P.ENG M. Shiu, P.ENG R. Asman, P.ENG
J.N. Vivian, P.ENG R.J. Watson, P.ENG C.J. Slama, P.ENG R. Martinez, P.ENG

Based on information provided to us, the track design speed for freight trains is 10 mph (4.47m/s) and there is no passenger traffic. Based on these speeds, we can report the following (see enclosed diagram and calculations):

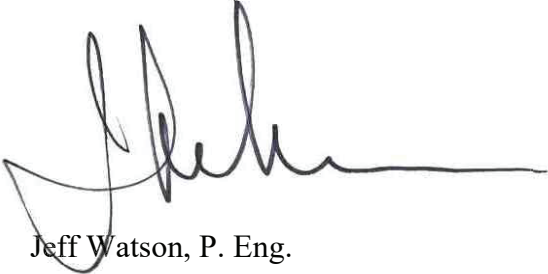
1. Based on the deceleration parameters included in the guidelines, beyond 1.4m from the centerline of track, the train will have reached zero velocity and therefore would impose no load.
2. Based on the guidelines, this load case does not need to be considered where the distance from the centerline of track is greater than 8.5m.
3. As there is no passenger traffic, this load case does not apply.
4. As there is no passenger traffic, this load case does not apply.

As the subject site is greater 8.5m from the centerline of track, any crash barrier required would not experience any loading associated with a potential derailment and would be of no benefit structurally.

We trust the foregoing will be sufficient, however, should you have any further questions, please do not hesitate to contact our office.

Yours very truly,

JABLONSKY, AST AND PARTNERS
CONSULTING ENGINEERS



Jeff Watson, P. Eng.



Enclosure

cc: Gordon Tattle, JAP

