HGC ENGINEERING

Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044

Noise and Vibration Feasibility Study
51, 57 Tannery Street and 208 Emby Drive
City of Mississauga, Ontario

Prepared for:

Nyx Tannery LP
1131A Leslie St, Suite 201
North York, Ontario
M3C 3L8

Prepared by

Victor Garcia, PEng

Reviewed by

Sheeba Paul, MEng, PEng

June 13, 2018

Project Number: 01700190

Table of Contents

1 Introduction and Summary

HGC Engineering was retained by Nyx Tannery LP to conduct a noise and vibration feasibility study for their proposed residential development to be located at 51, 57 Tannery Street and 208 Emby Drive in the City of Mississauga, Ontario. There is a railway line located to the northeast of the site. The study is required by the municipality as part of their planning and approvals process.

Rail traffic data was obtained from HGC Engineering projects files and originally obtained from Canadian Pacific (CP) railway and Metrolinx personnel. The data was used to predict future traffic sound levels at the locations of the proposed dwelling facades and in the interior amenity area. The predicted sound levels were compared to the guidelines of the Ministry of Environment and Climate Change (MOECC), CP and the municipality.

The sound level predictions indicate that the future rail traffic sound levels will exceed MOECC guidelines at the dwelling units in the proposed development. A 6.0 m high crash wall is proposed along and in parallel to a portion of the railway line. Central air conditioning is required for the townhouse blocks closest to the railway. Brick exterior construction or an acoustical equivalent is required for all of the townhouse blocks closest to the railway. Upgraded glazing constructions are required for the townhouse blocks in the development. When detailed floor plans and building elevations are available, the glazing constructions should be revised based on actual window to floor area ratios and the exterior wall constructions should be reviewed at the site plan approval stage. Warning clauses are recommended to inform future residents of the traffic noise impacts and the surrounding commercial/industrial uses.

Ground-borne vibration measurements were performed and measured vibration levels were below CP railway guidelines for train passbys at the location of the closest residential dwelling facades. Vibration mitigation is not required for this residential development.

2 Site Description and Sources of Sound

Figure 1 is a key plan showing the location of the site. The site is located at 51, 57 Tannery Street and 208 Emby Drive in the City of Mississauga, Ontario. Figure 2a is a proposed site plan prepared by Kirkor Architects + Planners dated May 31, 2018 and shows prediction locations. A preliminary derailment protection plan and sections prepared by JSW + Associates dated February 2018 were also used in the analysis and is attached as Figures 2b and 2c.

The proposed residential development will consist of seven blocks of townhouses, totaling 155 back to back townhouse units with a central amenity area/play area and underground parking. A site visit was made by HGC Engineering personnel on May 3, 10 and 12, 2017, to make observations of the acoustical environment and to perform ground-borne vibration measurements. During the site visits, it was observed that the railway is the dominant source of noise.

The railway is located directly to the northeast of the site. The closest dwelling façade is approximately 21 m from the railway right-of-way. Lands to the north and east are primarily residential. To the northwest of the site is the Credit River Retirement Residence. Further to the northwest is the Streetsville Secondary School. On the northeast side of the railway and to the southeast are commercial uses including: Natalie's Hairstylist; Canine Coiffur; JJ's Auto; Hertz Truck Rental; and a Krown facility among other facilities to the south of the subject site. Garage doors for Krown are facing away from the development. To the west of the subject site are auto repair facilities with services for salt and landscaping equipment. These facilities are open during the daytime hours only and there are existing homes in close proximity to these uses. Sound from these sources were not audible during the time of the site visit. These lands to the west of the subject site are proposed to be converted to residential uses consistent with the Official Plan. There are no other significant sources of stationary noise within 500 m of the subject site. Nevertheless, due to the proximity of the current existing commercial uses, a noise warning clause is recommended in Section 5.5. Since the proposed development is located within 75 m of the railway right-of-way, a vibration study has been conducted.

3 Criteria for Acceptable Sound Levels

Guidelines for acceptable levels of rail traffic noise impacting residential developments are given in the MOECC publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013 and are listed in Table 1 below. The values in Table 1 are energy equivalent (average) sound levels [L_{EQ}] in units of A weighted decibels [dBA].

Table 1: MOECC Rail Traffic Noise Criteria

	Daytime L_{EQ} (16 hour) Rail	**Nighttime L_{EQ} (8 hour) Rail**
Outside Bedroom Windows	55 dBA	50 dBA
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA	40 dBA
Inside Bedrooms	40 dBA	35 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MOECC guidelines.

The guidelines in the MOECC publication allow the sound level in an Outdoor Living Area to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

Indoor guidelines are 5 dBA more stringent for rail noise than for road noise, to account for the low frequency (rumbling) character of locomotive sound, and its greater potential to transmit through exterior wall/window assemblies.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels outside bedroom windows exceed 60 dBA or daytime

sound levels outside living/dining room windows exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at bedroom windows are in the range of 51 to 60 dBA or when daytime sound levels at living/dining room windows are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of bedroom window sound level is greater than 55 dBA due to nighttime and greater than 60 dBA during the daytime hours due to rail traffic noise.

Warning clauses are required to notify future residents of possible excesses when nighttime sound levels exceed 50 dBA at the plane of the bedroom window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the living/dining room window due to rail traffic.

Railway guidelines recommend brick exterior walls from foundation to rafters or an acoustical equivalent as a minimum construction for any dwellings with a 24 hour L_{EQ} that is greater than 60 dBA, and which are within 100 m of the right of way of the railway.

The railways also provide minimum requirements for safety as well as sound and vibration for proposed residential developments located adjacent to their rights-of-way. These refer to minimum required setbacks, berms, fencing and warning clauses. The reader is referred to a copy of CP requirements for a new development adjacent to a principal main rail line, which is located in Appendix A.

3.1 Ground-borne Vibration from Rail Traffic

CP and GO Transit guidelines require measurements of ground-borne vibration when dwelling units are to be located within 75 metres of a principal mainline such as the Galt Subdivision.

Vibration is typically measured in terms of oscillatory velocity or acceleration. The limits for acceptable ground-borne vibration are frequency dependent and are presented as a curve of maximum allowable vibratory acceleration versus frequency. The criterion has been overlaid on the graphs of measured vibration for easy reference (Figures 4 to 8).

4 Rail Traffic Assessment

4.1 Rail Traffic Data

Rail traffic data for typical operations of the railway, was obtained from CP and GO Transit personnel and are provided in Appendix B. The Galt Subdivision is used for freight and passenger operations. The maximum train speed of 80 kph (50 mph) for freight trains, a maximum of 86 kph (55 mph) for GO trains was used in the analysis. In conformance with CP railway assessment requirements, these maximum speeds, number of cars and maximum locomotives per train were used in the traffic noise analysis to yield a worst case estimate of train noise. The data was projected to the year 2028 using a 2.5% per year growth rate. Table 2 summarises the rail traffic data used in the analysis.

Table 2: Rail Traffic Data Projected to Year 2028

Type of Train	Number of Trains Day/ Night	Number of locomotives	Number of cars	Max Speed (KPH)
Freight	32.3 / 12.1	4	160	80
GO	67.8 / 15.5	1	12	86

4.2 Rail Traffic Noise Predictions

To assess the levels of rail traffic noise which will impact the study area in the future, sound level predictions were made using STAMSON version 5.04. A sample STAMSON output is included in Appendix C.

Sound levels were predicted at the plane of the top storey bedroom and/or living/dining room windows during daytime and nighttime hours to investigate ventilation requirements. Prediction locations were chosen around the residential site to obtain a representation of the future sound levels at various dwellings as shown in Figure 2a. The results of these predictions are summarized in Table 3.

The distance setbacks of the dwellings indicated on the site plan were used in the analysis, along with an aerial photo to determine the distance of the blocks to the railway. The acoustic recommendations may be subject to modifications if the site plan is changed significantly.

Table 3: Future Rail Traffic Sound Levels, [dBA], Without Mitigation

Prediction Location	Block No.	Description	Daytime in OLA $L_{EQ\text{-}16\ hr}$	Daytime at Façade $L_{EQ\text{-}16\ hr}$	Nighttime at Façade $L_{EQ\text{-}8\ hr}$
[A]	C, D	Townhouses with flanking exposure to railway	--	73	71
[B]	A, B	Townhouses with fronting exposure to railway	--	74	73
[C]	E	2nd row of townhouses with exposure to railway	--	63	62
[D]	G, F	2nd row of townhouses with exposure to railway	--	62	61
[E]	--	Interior Amenity area	58*	--	--

Note: * includes 6.0 m crash wall along the property line

5 Recommendations

With no mitigation, there are sound level excesses at the facades of the proposed dwellings and amenity area with exposure to the railway line. Recommendations to meet MOECC and CP railway guidelines are described.

5.1 Outdoor Living Areas

Typically for residential developments adjacent to CP principal mainlines, a 5.5 m barrier (2.5 m berm and 3.0 m acoustic wall on top) is required as a minimum. The total height of the barrier is taken in reference to the top of rail elevation in the area.

A crash wall is proposed along the railway right of way as indicated in the site grading plan and the derailment plan and sections attached as Figure 2b and 2c. There are no outdoor amenity areas directly adjacent to the railway line and therefore an acoustical wall on top of the crash wall is not required.

The predicted sound level in the play area located in the middle of the development is expected to be 58 dBA. The 3 dBA sound level excess is acceptable to the MOECC.

Any rooftop terraces or amenity areas should be kept to less than 4 m in depth to reduce the need for high acoustic barriers. Alternatively, the stairwell may be used as a partial barrier with the amenity on the shielded side, for example. The requirements for the acoustic barriers or parapets on rooftop terraces should be investigated further at the time of site plan approval.

5.2 Indoor Living Areas

Central Air Conditioning

The predicted sound levels outside the top storey windows of the dwellings closest to and with exposure to the railway will be greater than 65 dBA during the daytime hours and greater than 60 dBA during nighttime hours. Central air conditioning systems are required for these dwellings so that windows may remain closed. The guidelines also recommend warning clauses for these units. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOECC publication NPC-300, as applicable.

Provision for the Future Installation of Air Conditioning

The predicted sound levels at the plane of the bedroom windows of the future dwellings further from the railway will be between 51 and 60 dBA during the nighttime hours. To address these excesses, the MOECC guidelines recommend that these dwelling units be equipped with a forced air ventilation systems with ducts sized to accommodate the future installation of air conditioning by the occupant. The guidelines also recommend warning clauses for these lots. Window or through-the-wall air conditioning units are not recommended for any residential units because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall noise insulating properties of the envelope. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MOECC publication NPC-300, as applicable.

Figure 3 shows the ventilation requirements for the proposed development.

5.3 Building Façade Constructions

Future traffic sound levels at the façades of the closest dwelling units with exposure to the railway will exceed 60 dBA during the day and 55 dBA at night. MOECC guidelines recommend that the windows and walls be designed so that the indoor sound levels comply with MOECC noise criteria.

Preliminary calculations have been performed to determine the building envelope constructions likely to be required to maintain indoor sound levels within MOECC guidelines. The required building components are selected based on the AIF value for rail traffic. To do so, calculations were performed to determine the acoustical insulation factors to maintain indoor sound levels within MOECC guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the predicted future sound levels at the building facades, and the anticipated area ratios of the facade components and the floor area of the adjacent room.

Based on preliminary calculations, windows and walls can be designed such that indoor sound levels comply with MOECC requirements. These details are to be verified at the site plan approval stage.

5.3.1 Exterior Wall Construction

According to CP railway guidelines, the dwellings in the first row will require brick or masonry exterior walls and will have sound levels exceeding 60 dBA during daytime hours and exceeding 55 dBA during nighttime hours.

5.3.2 Glazing Construction

Window to floor area ratios calculated were assumed to be up to 40% for the living/dining rooms (10% operable) and 20% for bedrooms (5% operable). The minimum acoustical requirement for the basic window glazing, including glass in fixed sections, sliding doors, and operable windows, is shown in Table 4 for the townhouses.

Table 4: STC Requirements

Prediction Location	Space	Glazing STC*
[A]	Living/Dining	STC-38
	Bedroom	STC-38
[B]	Living/Dining	STC-38
	Bedroom	STC-40
[C]	Living/Dining	OBC
	Bedroom	OBC
[D]	Living/Dining	OBC
	Bedroom	OBC

Note: * Based on window to floor area ratios of 40% for living/dining rooms and 20% for bedrooms

It is recommended that windows to bedrooms facing the railway be kept to small sizes to reduce the STC requirements to reasonable values. Sliding patio doors to bedrooms are not recommended.

Sample window assemblies which may achieve the STC requirements are summarized in Table 5 below. Note that acoustic performance varies with manufacturer's construction details, and these are only guidelines to provide some indication of the type of glazing likely to be required. Acoustical test data for the selected assemblies should be requested from the supplier, to ensure that the stated acoustic performance levels will be achieved by their assemblies.

Table 5: Window Constructions Satisfying STC Requirements

STC Requirement	Sample Glazing Configuration (STC)
28 – 29	Any double glazed unit
30 – 31	3(13)3
32 – 33	4(10)4
34	4(19)4
35 – 36	6(10)4, 5(16)4
37	6(13)4, 6(20)5
38/39	6L(13)6, 6/25/6

In Table 5, the numbers outside the parentheses indicate minimum pane thicknesses in millimetres and the number in parentheses indicates the minimum inter-pane gap in millimetres. OBC indicates any glazing construction meeting the minimum requirements of the Ontario Building Code.

Operable sections include sliding glass doors and operable windows, and provided that they include a good seal, will not significantly affect overall performance. Operable windows and sliding glass doors must be well-fitted and weather-stripped.

5.4 Vibration Measurements

CP requires an assessment of ground-borne vibration through measurement if building foundations are to be located within 75 metres of the right-of-way. Measurements were performed at the anticipated location of the closest dwelling, approximately 21 m from the railway right of way. The results of the measurements are presented in Figures 4 to 8. Table 6 shows the maximum RMS vibration velocity measurements during each of the train pass-bys.

Table 6: Peak Vibration Measurements of Train Pass-bys

Train Pass-by	Type of Train	Measured Vibration Level (mm/s)	Criteria (mm/s)
1	Freight	0.12	0.14
2	Freight	0.11	0.14
3	Passenger	0.06	0.14
4	Freight	0.11	0.14
5	Passenger	0.06	0.14

Vibration levels are below the CP limit of 0.14 mm/s. Vibration mitigation measures are not required for the proposed development.

5.5 Warning Clauses

The MOECC guidelines recommend that warning clauses be included in the property and tenancy agreements for all units with anticipated traffic sound level excess. Examples are provided below.

Suggested wording for buildings with sound level excesses the MOECC criteria is given below:

Type A:

> Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the noise criteria of the Municipality and the Ministry of the Environment and Climate Change.

A suggested wording for future dwellings requiring central air conditioning systems is given below.

Type B:

> This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of Environment and Climate Change.

Suitable wording for future dwellings requiring forced air ventilation systems is given below.

Type C:

> This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the noise criteria of the Municipality and the Ministry of the Environment and Climate Change. (Note: The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MOECC publication NPC-300, as applicable.)

These sample clauses are provided by the MOECC as examples, and can be modified by the Municipality as required.

CP's standard warning clause for residential developments located near a principal branch line is provided below. The following sample clause is typical of those included in agreements of purchase and sale or lease on the Lands that are within 300 meters of the railway right-of-way.

Type D:

> Warning: Canadian Pacific Railways Company or its assigns or successors in interest has or have a rights-of-way within 300 meters from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. CPR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way.

GO Transit's standard warning clause for residential developments located within 300 m of a railway right-of-way (principal main line) is given below.

Type E:

> Warning: Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest are the owners of lands within 300 metres from the land which is the subject hereof. In addition to the current use of the lands owned by Metrolinx, there may be alterations to or expansions of the rail and other facilities on such lands in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the Metrolinx lands or Metrolinx and their respective assigns or successors as aforesaid may expand their operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under its lands.

Suggested wording for dwelling units near existing commercial facilities is as follows:

Type E:

> Purchasers/tenants are advised that due to the proximity of the adjacent existing commercial uses, noise from these facilities at times be audible.

6 Impact of the Development on the Environment

It is expected that any increase in local traffic associated with the development will not be substantial enough to affect noise levels significantly.

MOECC Publication NPC-300 stipulate sound level limits for new stationary (non-traffic) sources of noise. The sound level limit for a stationary source which operates in a Class 1 urban environment is related to the minimum one-hour L_{EQ} ambient (background) sound level, at any potentially impacted residential point of reception. HGC Engineering has not performed monitoring of the background sound levels in the area during all daytime and nighttime hours, but experience indicates that, for a typical urban environment, a minimum daytime sound level of 50 dBA and a minimum nighttime sound level of 45 dBA can be assumed during the quietest hours. These criteria apply to equipment such as rooftop air-conditioners, cooling towers, exhaust fans, standby generators, etc.

Provided that air-conditioning equipment is selected and placed appropriately so as not to impact the existing residential and proposed residential dwellings, noise impacts are not expected. An acoustical consultant should review the design of the mechanical building systems and the equipment selections when they have been determined, to help ensure that the noise levels emitted by the development to the environment are likely to meet the bylaw requirements.

7 Impact of the Development on Itself

The impact of the development on itself can be categorized into noise intrusions transmitted between adjacent spaces, and noise generated by mechanical systems or other equipment within the buildings.

Section 9.11.1 of the Ontario Building Code (OBC) specifies the minimum required sound insulation characteristics for demising partitions, in terms of Sound Transmission Class (STC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls should meet or exceed STC-50. Walls separating a suite from a noisy space such as a refuse chute, or elevator shaft, should meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements. It is recommended that partitions be selected 3 to 4 points above the STC listed in Tables 1 and 2 so that performance in the field meets these minimum specifications.

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services of the buildings on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

8 Summary and Recommendations

The results of the study indicate that the proposed residential development is feasible. Future rail traffic sound levels will exceed CP railway guidelines, but feasible means exist to reduce the impact to within acceptable limits. The following recommendations are provided in regard to noise mitigation.

1. A 6.0 m high crash wall is proposed along and in parallel to a portion of the railway right-of-way.

2. Central air conditioning is required for the majority of townhouse blocks. The location installation and sound rating of the air conditioning devices should comply with NPC-300, as applicable. Forced air ventilation systems with ductwork sized for the future installation of central air conditioning by the occupant is required for the furthest shielded block as shown on Figure 3.

3. Brick exterior walls or an acoustical equivalent are required for the townhouse blocks closest to the railway. When the exterior wall details are available, an acoustical consultant should review the details for compliance with this noise report.

4. Upgraded glazing constructions are required for all dwellings in the development. When detailed floor plans and building elevations are available, an acoustical consultant should provide revised recommendations based on actual window to floor area ratios.

5. Noise warning clauses should be included in the Development Agreements registered on titles, and in purchase, sale and lease agreements, to inform future owners of noise concerns and the proximity to existing commercial uses.

The reader is referred to the above sections of the report where these recommendations are discussed in more detail.

Table 7, below, summarizes the recommendations for the buildings in the proposed development.

Table 7: Summary of Noise Control Requirements and Noise Warning Clauses

Prediction Location	Block No.	+Acoustic Barrier	Ventilation Requirements	Type of Warning Clause	Exterior Wall Construction	Upgraded Glazing Construction
[A]	C, D	--	Central A/C	A, B, D, E, F	*Brick or acoustic equivalent	LRDR: STC-38 BR: STC-38
[B]	A, B	--	Central A/C	A, B, D, E, F	*Brick or acoustic equivalent	LRDR: STC-38 BR: STC-40
[C]	E	--	Central A/C	A, B, D, E, F	OBC	LRDR: OBC BR: OBC
[D]	G	--	Central A/C	A, B, D, E, F	OBC	LRDR: OBC BR: OBC
	F	--	Forced Air	A, B, D, E, F	OBC	LRDR: OBC BR: OBC

Notes:
-- no specific requirement
+ When grading information is available the acoustic barrier heights should be refined
OBC – meeting the minimum requirements of the Ontario Building Code
* Brick exterior construction required for south, east and west façades. When detailed floor plans and building elevations are available, an acoustical consultant should provide revised glazing constructions based on actual window to floor area ratios and review the exterior wall details for acoustical equivalency.
LRDR – Living room/dining room
BR – Bedroom

8.1 Implementation

To ensure that the sound control recommendations outlined above are properly implemented in the site design, it is recommended that:

1. A detailed noise study is required at the SPA stage to refine the acoustic requirements.

2. Prior to an application for a building permit, the Municipality's Building Department or a Professional Engineer qualified to provide acoustical engineering services in Ontario shall

review the unit plans (floor plans and building elevations) for future dwellings directly adjacent to the CP railway to ensure that the windows and building constructions are adequately designed to ensure acceptable indoor noise levels.

3. Prior to subdivision approval, the municipality requires a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario to review the grading plans of lots adjacent to the railway to certify that the noise control barriers as approved have been incorporated.

4. Prior to assumption for this development, the Municipality's building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario to shall certify that the noise control measures for the dwellings units have been properly installed and constructed.

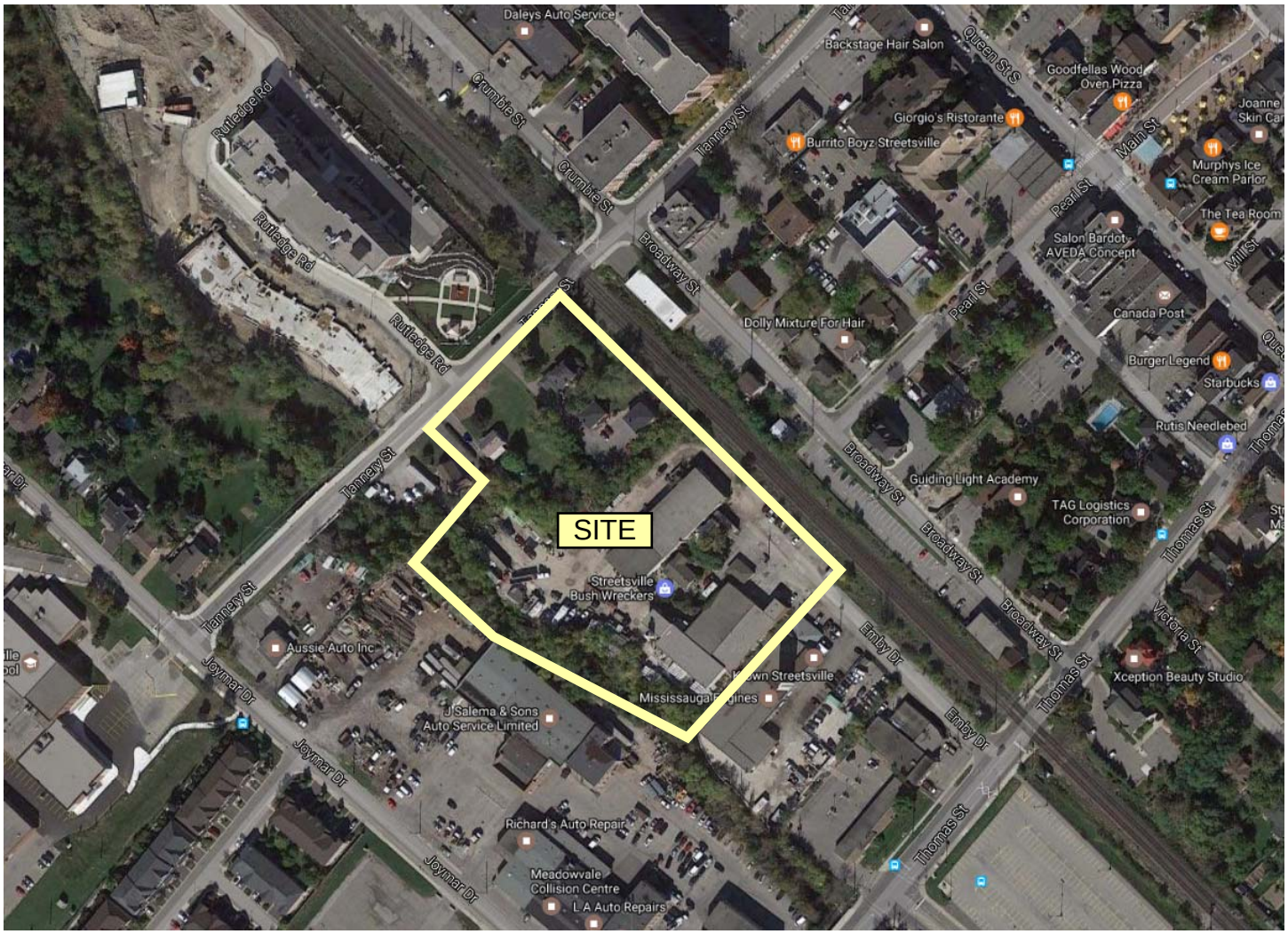
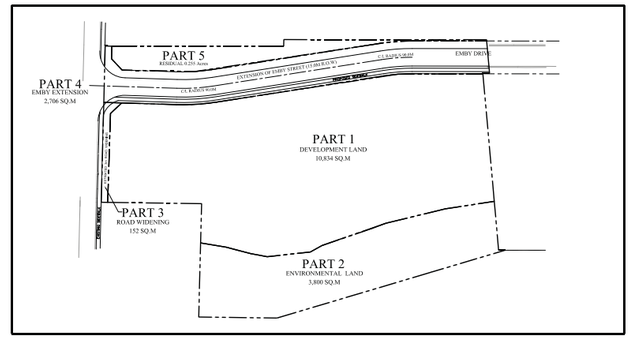


Figure 1 - Key Plan



Context Area Plan 1:1000 — 4 RZ-01

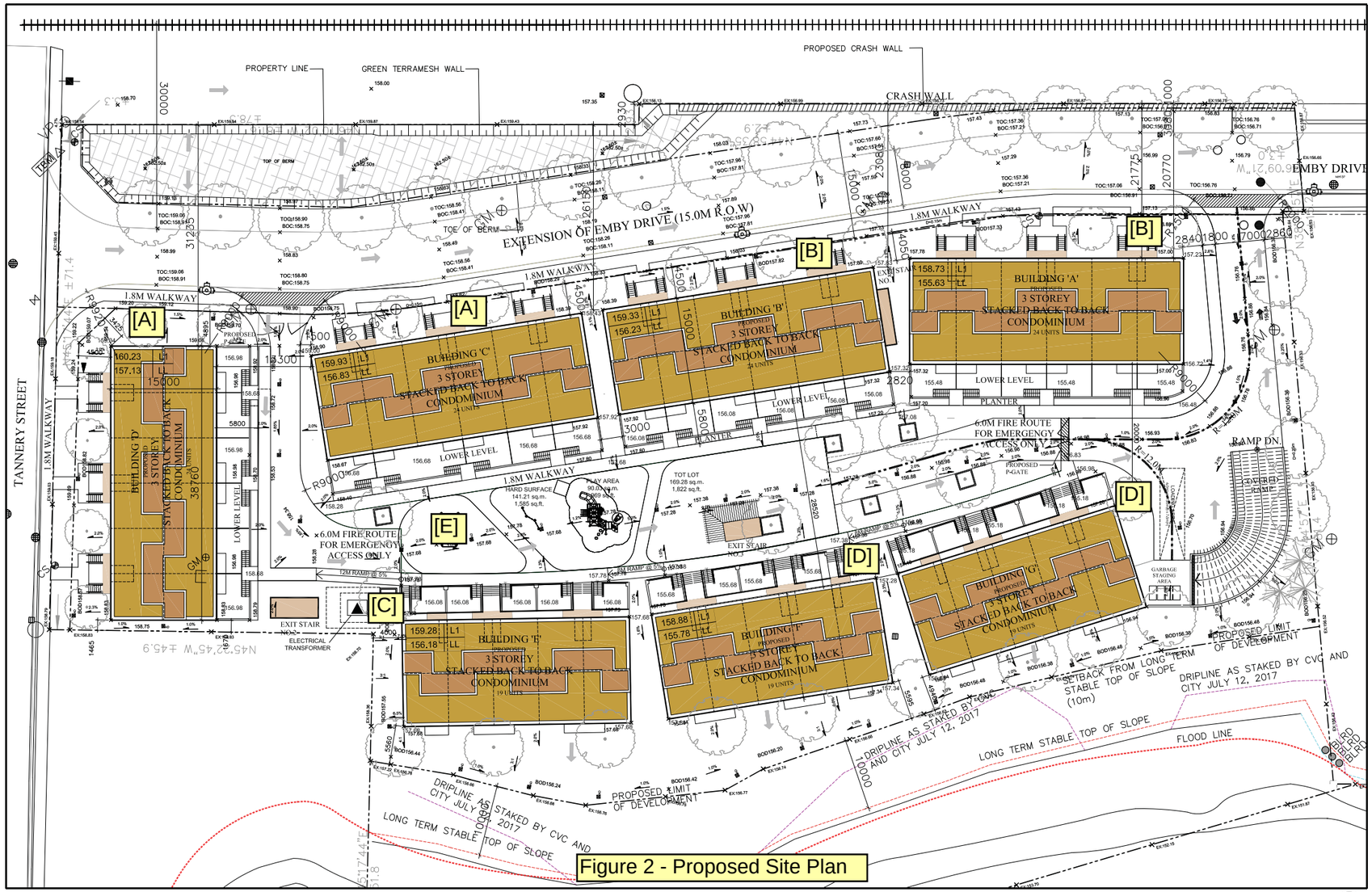


Figure 2 - Proposed Site Plan

Site Plan 1:250 — 3 RZ-01

Context Plan N,T,S — 2 RZ-01

Project Statistics — 1 RZ-01

FILENAME: 17145-Tannery Townhomes

Contractor Must Check And Verify All Dimensions On The Job.

Do Not Scale The Drawings.

All Drawings, Specifications And Related Documents Are The Copyright Of The Architect And Must Be Returned Upon Request.

Reproduction Of Drawings, Specifications And Related Documents In Part Or Whole Is Forbidden Without The Architects Written Permission.

This Drawing Is Not To Be Used For Construction Until Signed By The Architect.

Date:

KIRKOR ARCHITECTS + PLANNERS
20 De Boers Dr. Suite #400 Toronto ON M3J 0H1
T(416) 665-6060, F(416) 665-1234, www.kirkorarchitects.com

No.	Revision	Date

No.	ISSUED	DATE
01	OPA / ZBA	MAY 31,18

Drawing Title:

Site Plan Statistics & Context Plan

Project: Phase 12

NYX CAPITAL

Proposed

Townhouse Residential Development

TANNERY TOWNHOMES
MISSISSAUGA ,ONTARIO

Scale: AS NOTED

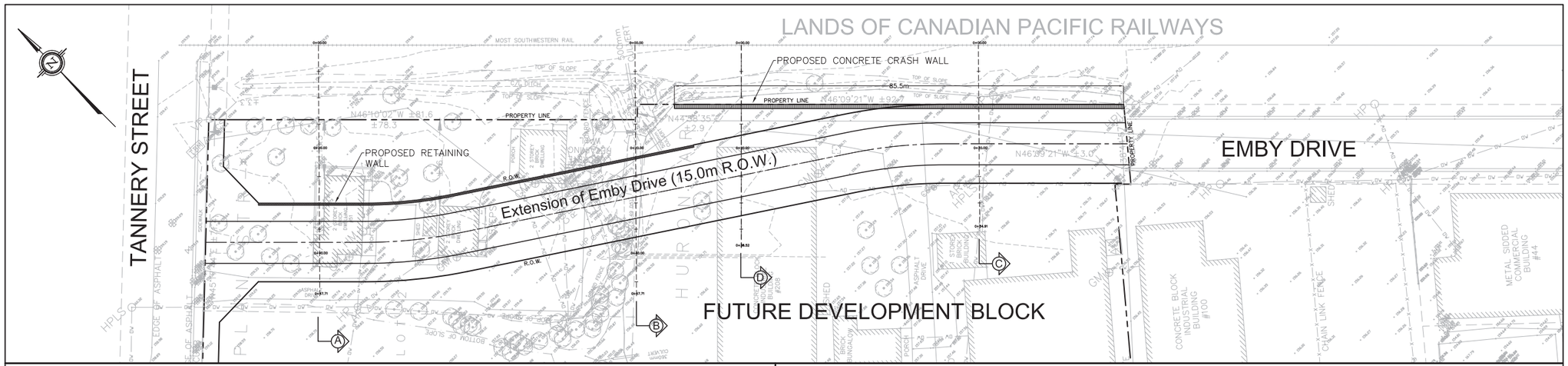
Drawn by: T.S

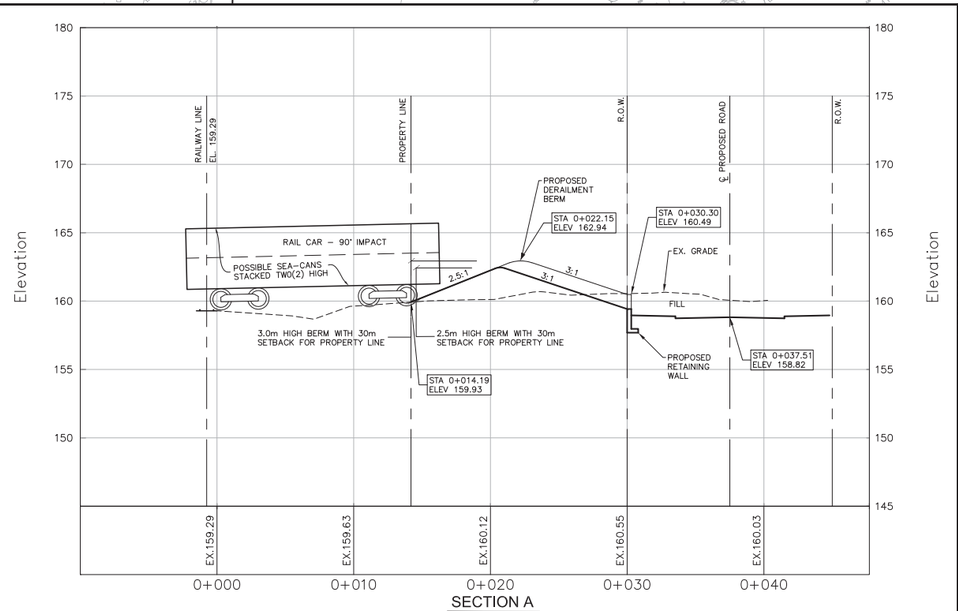
Checked by: S.M

File No.: 17-145

Plot Date: June 8, 2018

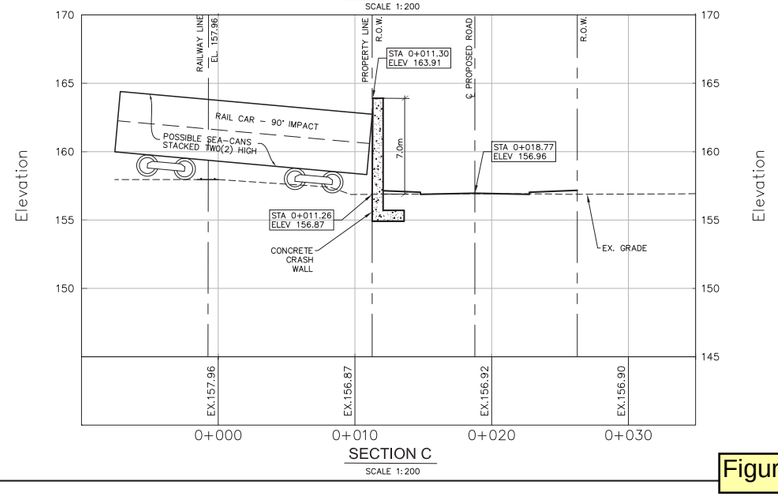
RZ-01





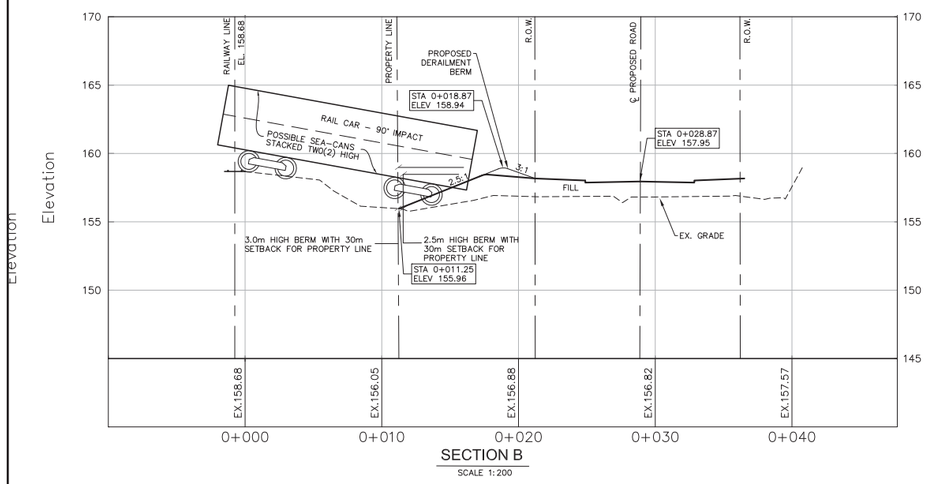
SECTION A

SCALE 1:200



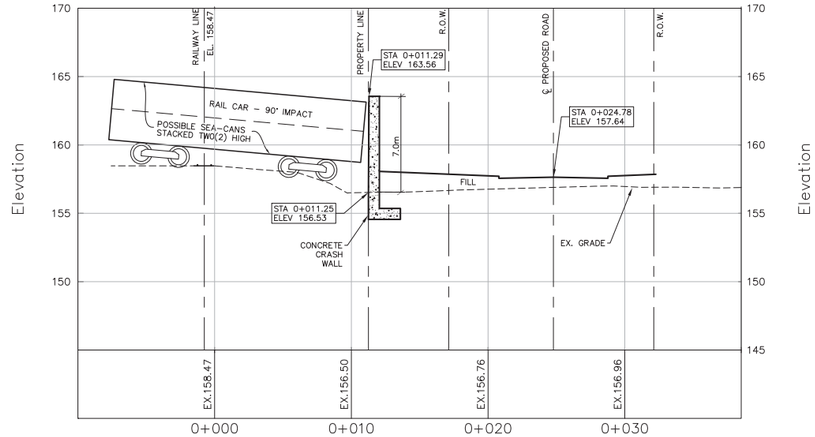
SECTION C

SCALE 1:200



SECTION B

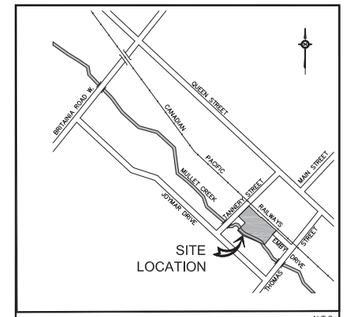
SCALE 1:200



SECTION D

SCALE 1:200

Figure 2b - Proposed Derailment Protection Plan and Sections



KEY PLAN N.T.S.

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION MEASURED 19 MAY 2017. BOUNDARY IS APPROXIMATE. THIS IS NOT A PLAN OF SURVEY.

TEMPORARY BENCHMARK

ELEVATION 159.56

CUT CROSS ON THE SIDEWALK OPPOSITE #51 TANNERY STREET. CUT CROSS IS LOCATED 18.1m SOUTHWESTERLY FROM THE MOST WESTERLY RAIL OF CANADIAN PACIFIC RAILWAYS LINE, 4.3m SOUTHWESTERLY FROM THE GAS VENT PIPE AND 21.2m NORTHEASTERLY FROM THE WATER VALVE IN TANNERY STREET.

The location and extent of all existing utilities are not necessarily shown on this plan, and where shown, are to be considered approximate only. All Contractors shall inform themselves of the exact location and extent of all existing services prior to the start of construction, and shall assume all liabilities for damage to them or delays resulting from their actual extent and location.

No.	Date	Description	By	Ck.

REVISIONS

PRELIMINARY

JSW+ associates
CONSULTING ENGINEERS
LANDSCAPE ARCHITECTS
PLANNERS
Tel: (905)889-8100 Fax: (905)889-6616

Client:

NYX CAPITAL CORP.
201-1131A LESLIE STREET
TORONTO, ON

CITY OF MISSISSAUGA

51, 57 TANNERY STREET AND 208 EMBY DRIVE

REGION OF PEEL

DERAILMENT PROTECTION PLAN AND SECTIONS

Scale: 1:400 (PLAN)	
Designed: L.R.	Checked: L.R.
Drawn: W.G.	Date: NOVEMBER 2017
Job No. 17-68	Drawing No. DP-1

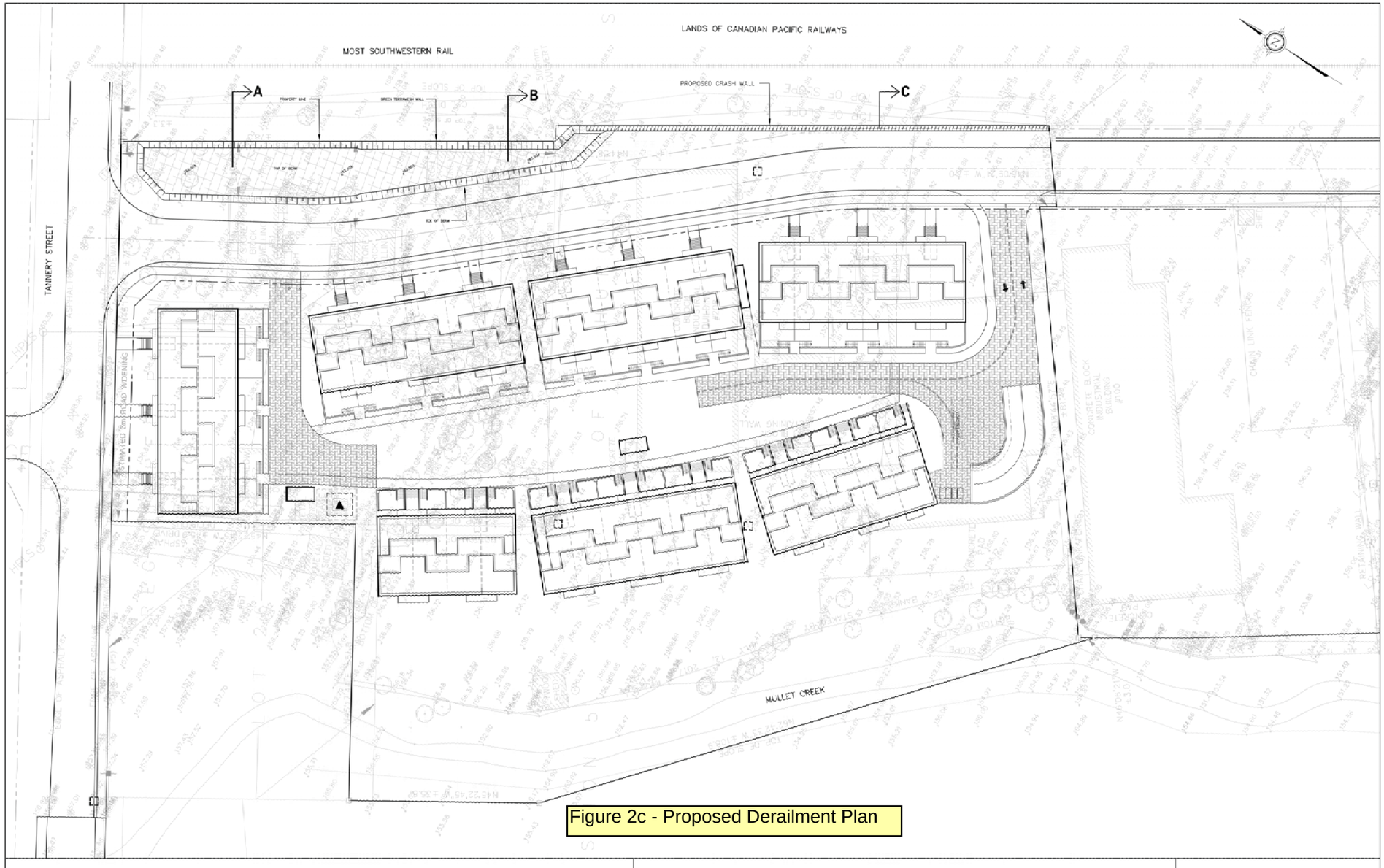
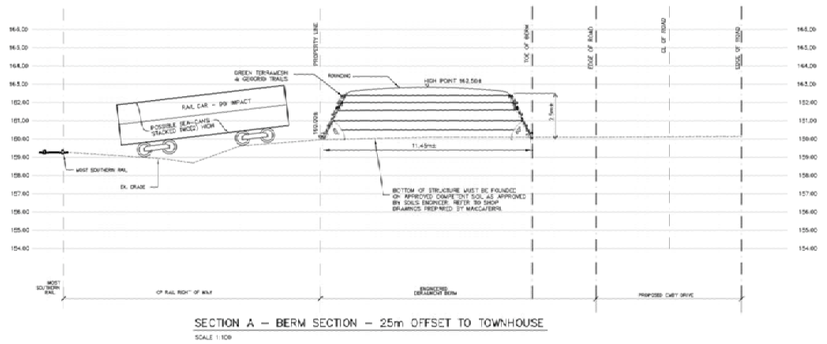
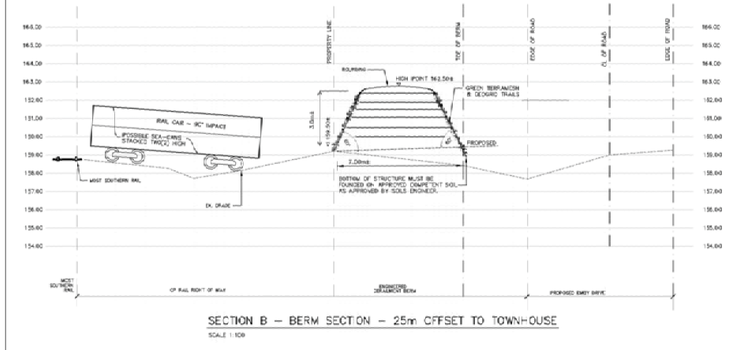


Figure 2c - Proposed Derailment Plan



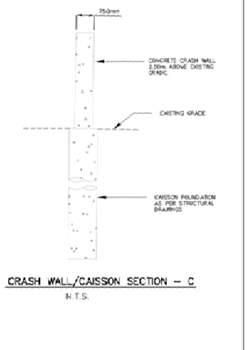
SECTION A – BERM SECTION – 25m OFFSET TO TOWNHOUSE

SCALE 1:100



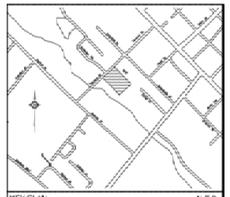
SECTION B – BERM SECTION – 25m OFFSET TO TOWNHOUSE

SCALE 1:100



CRASH WALL/CAISSON SECTION – C

N.T.S.



KEY PLAN N.T.S.

No.	Date	Description	by	Chk.
Revisions				

JSW+ associates
CONSULTING ENGINEERS LANDSCAPE ARCHITECTS

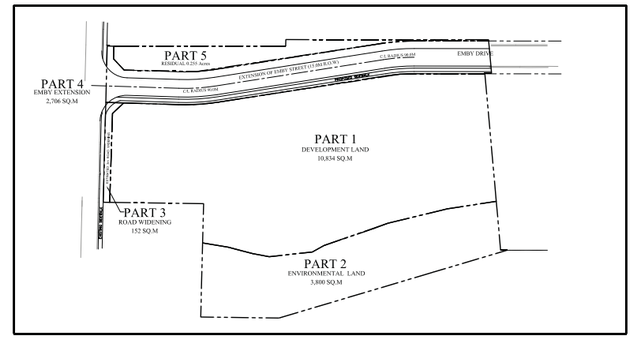
Tannery Developments

TANNERY DEVELOPMENT

Mississauga, Ontario

Title: PRELIMINARY DERAILMENT PROTECTION PLAN

Scale: 1:400	
Designed: L.R.	Checked: T.G.
Drawn: K.P.	Date: FEB 2018
Job No. 17-68	Drawing No.



Context Area Plan 1:1000 — 4 RZ-01

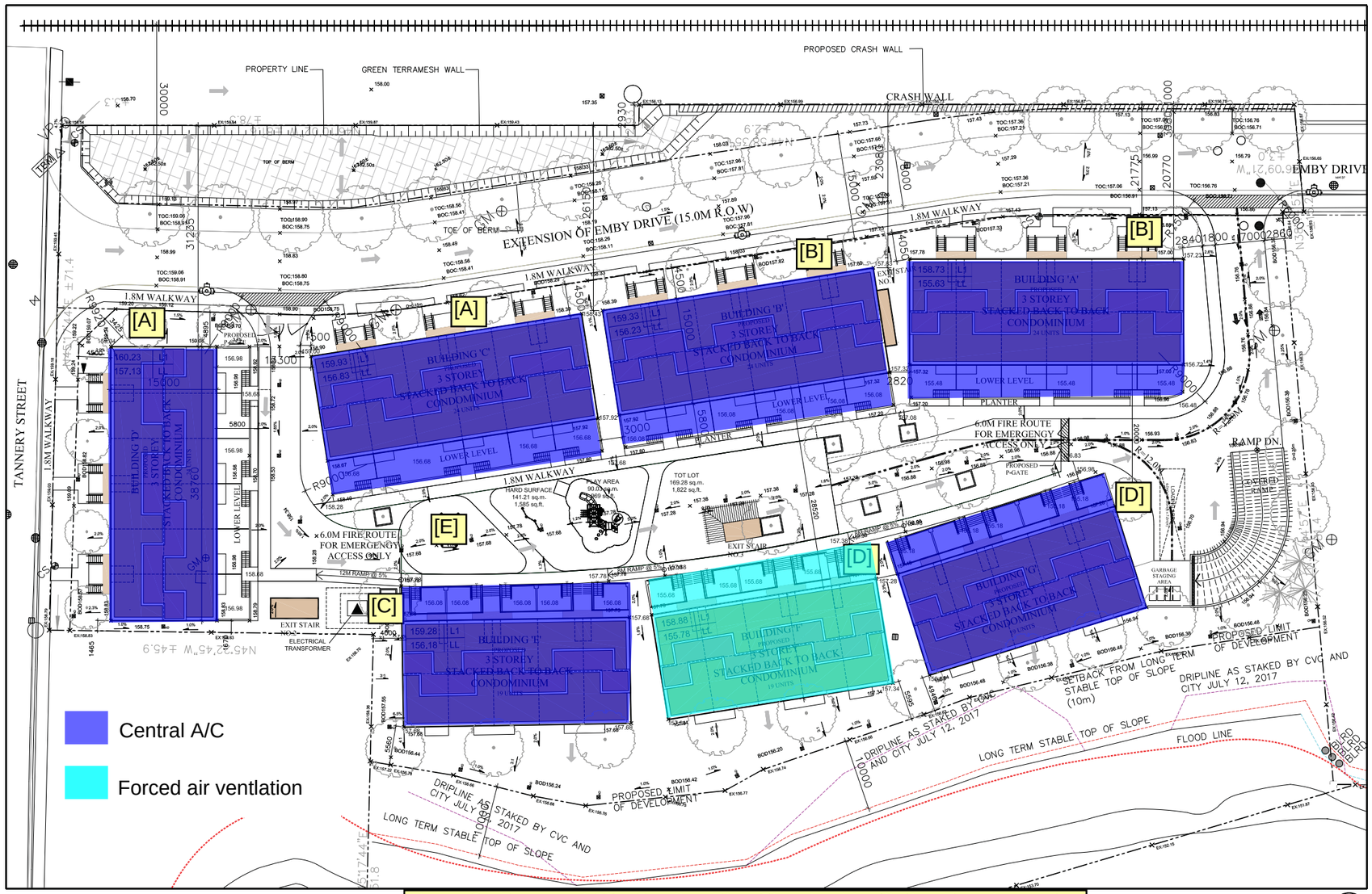
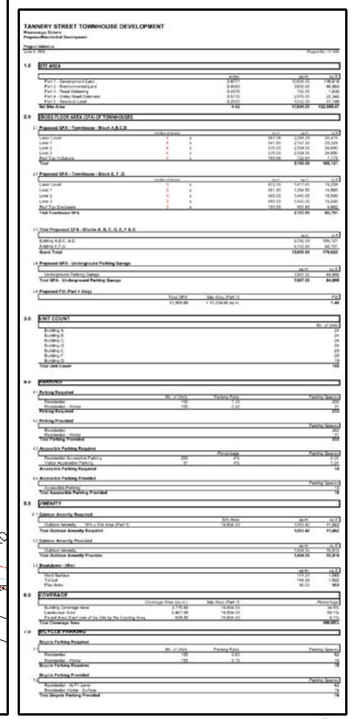


Figure 3 - Proposed Site Grading Plan Showing Ventilation Requirements

Site Plan 1:250 — 3 RZ-01

Context Plan N,T,S — 2 RZ-01



Project Statistics — 1 RZ-01

Date:

KIRKOR ARCHITECTS + PLANNERS
20 De Boers Dr. Suite #400 Toronto ON M3J 0H1
T(416) 665-6060, F(416) 665-1234, www.kirkorarchitects.com

No.	Revision	Date

No.	ISSUED	DATE
01	OPA / ZBA	MAY 31,18

Drawing Title:

Site Plan
Statistics & Context Plan

Project:

Phase 12

NYX CAPITAL

Proposed

Townhouse
Residential
Development

TANNERY TOWNHOMES
MISSISSAUGA ,ONTARIO

Scale:

AS NOTED

Drawn by:

T.S

Checked by:

S.M

File No.:

17-145

Plot Date:

June 8, 2018

RZ-01

FILENAME: 17145-Tannery Townhomes

Figure 4a: Pass-by 1
Measured Vibratory Velocity Level

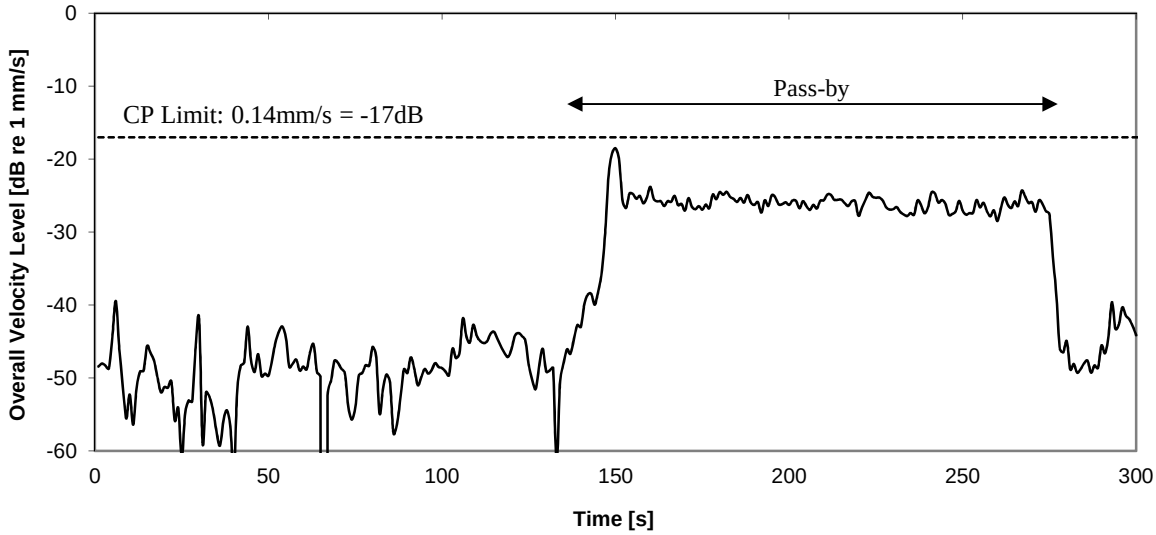


Figure 4b: Pass-by 1
Acceleration Spectrum @ Peak Level (1 sec. Duration)

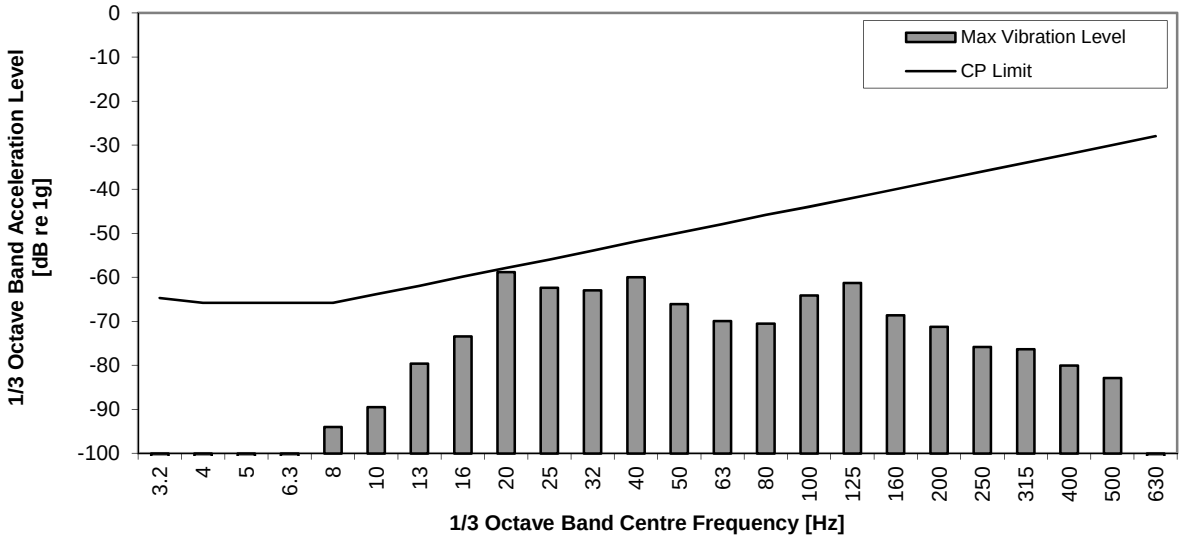


Figure 5a: Pass-by 2
Measured Vibratory Velocity Level

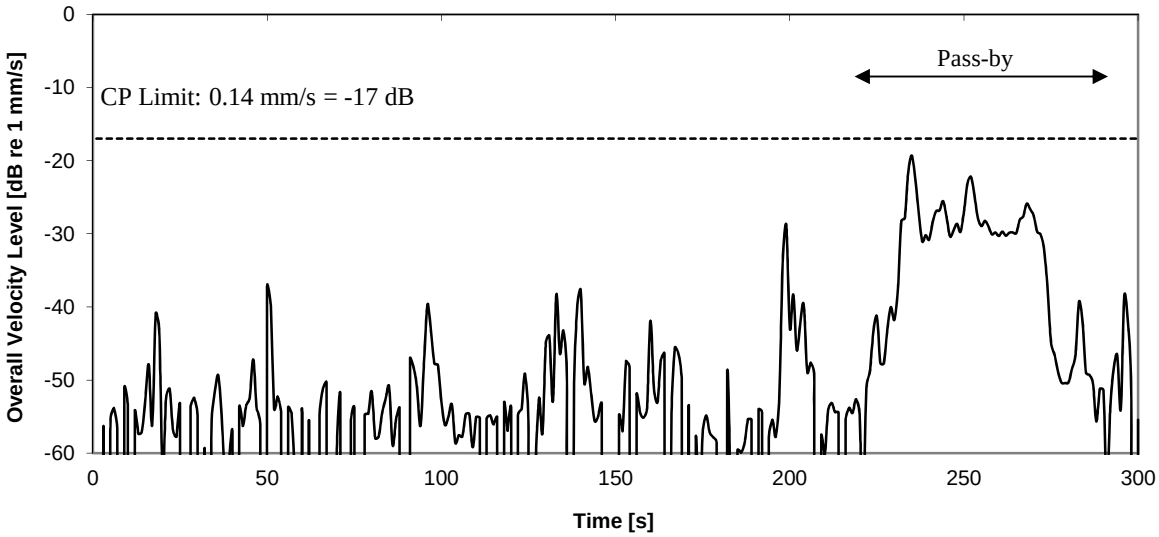


Figure 5b: Pass-by 2
Acceleration Spectrum @ Peak Level (1 sec. Duration)

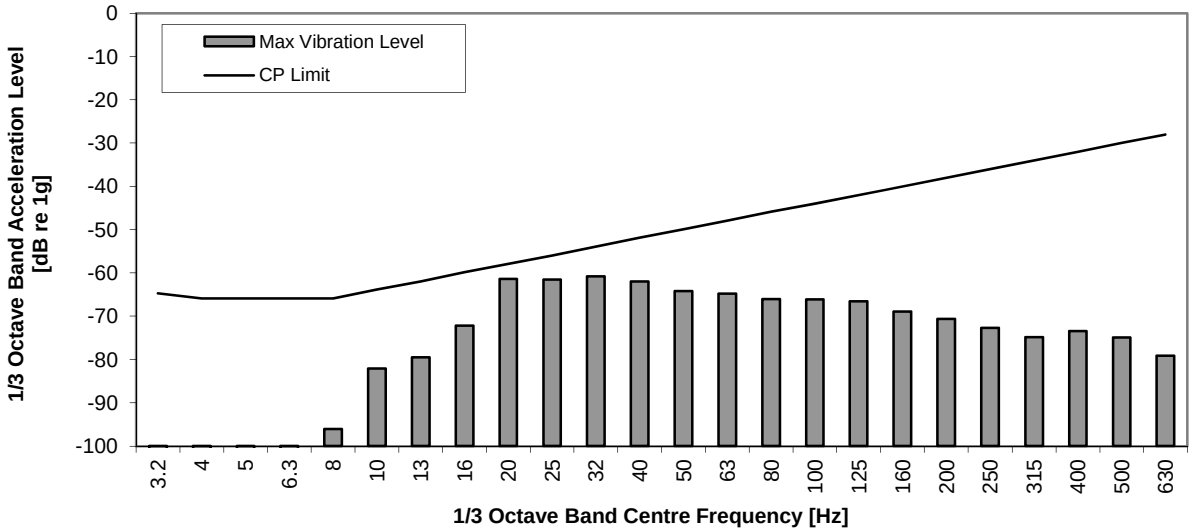


Figure 6a: Pass-by 3
Measured Vibratory Velocity Level

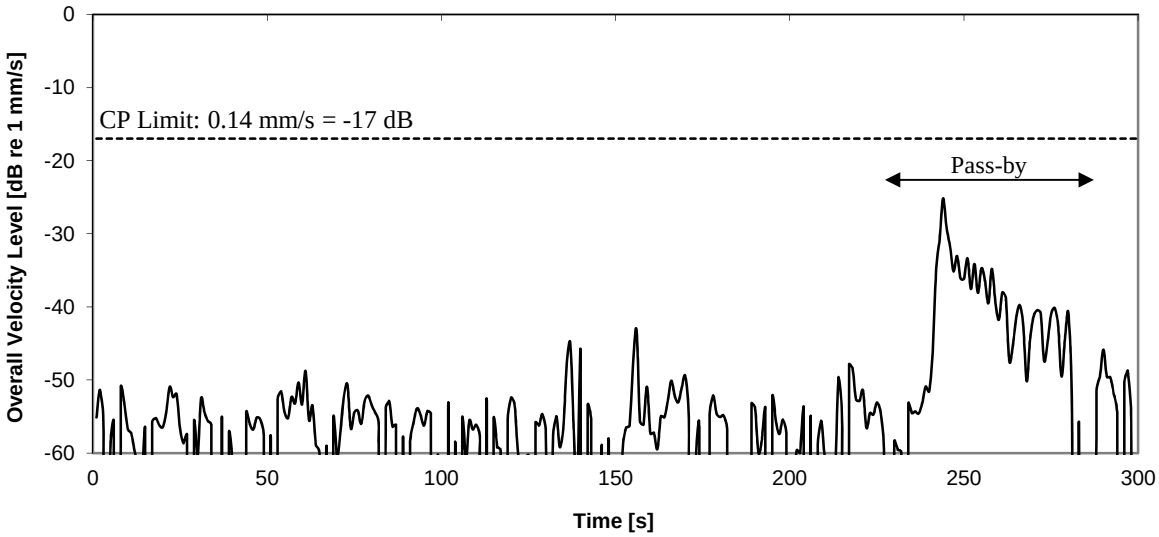


Figure 6b: Pass-by 3
Acceleration Spectrum @ Peak Level (1 sec. Duration)

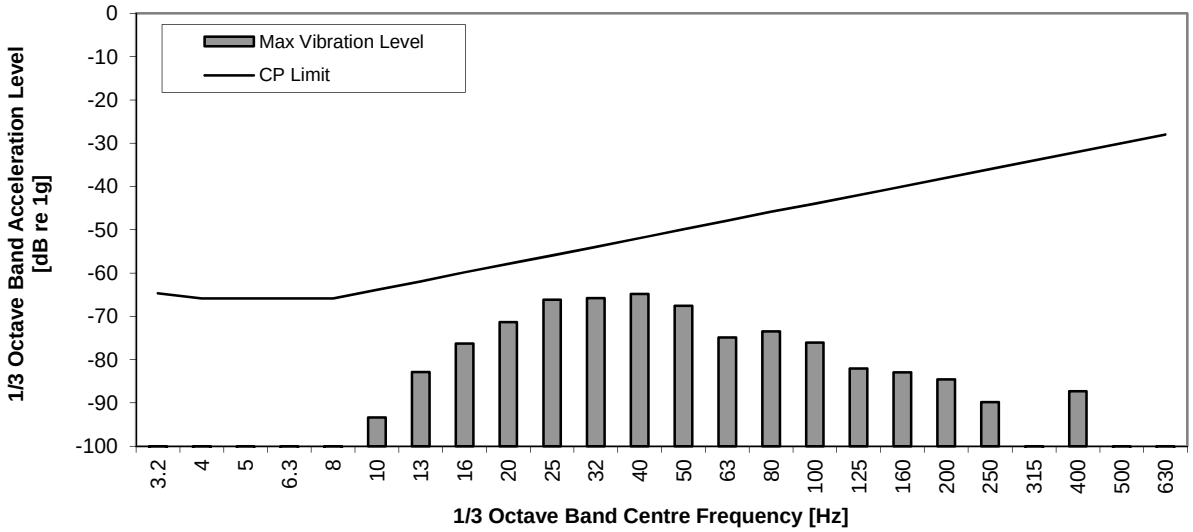


Figure 7a: Pass-by 4
Measured Vibratory Velocity Level

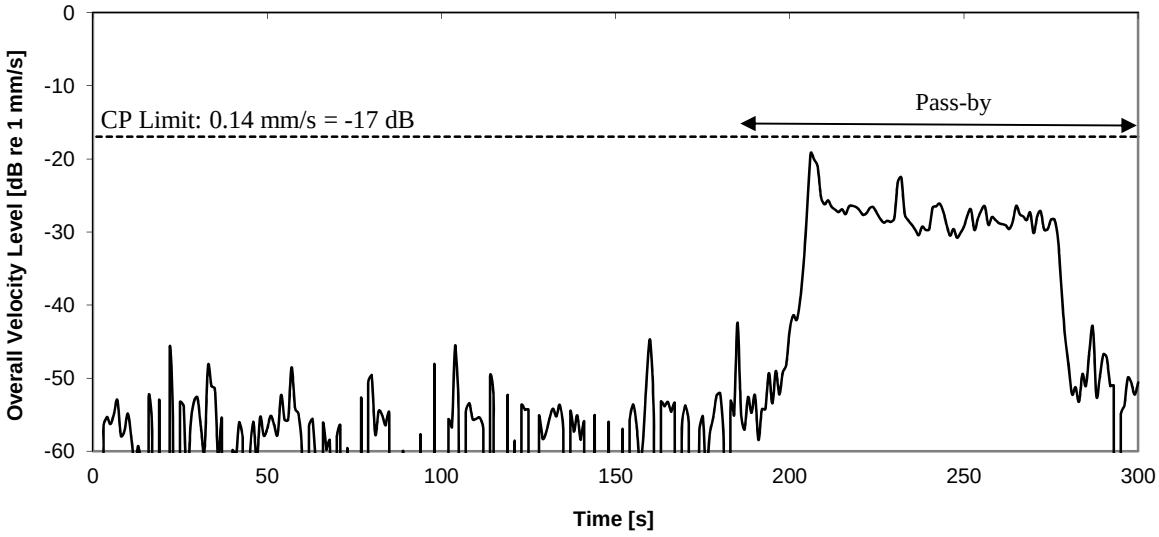


Figure 7b: Pass-by 4
Acceleration Spectrum @ Peak Level (1 sec. Duration)

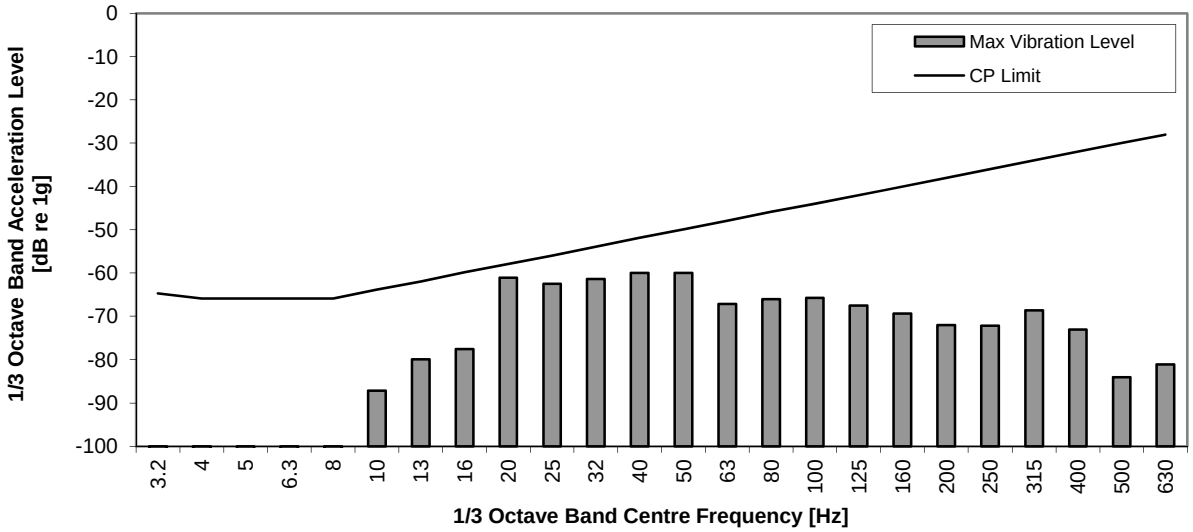


Figure 8a: Pass-by 5
Measured Vibratory Velocity Level

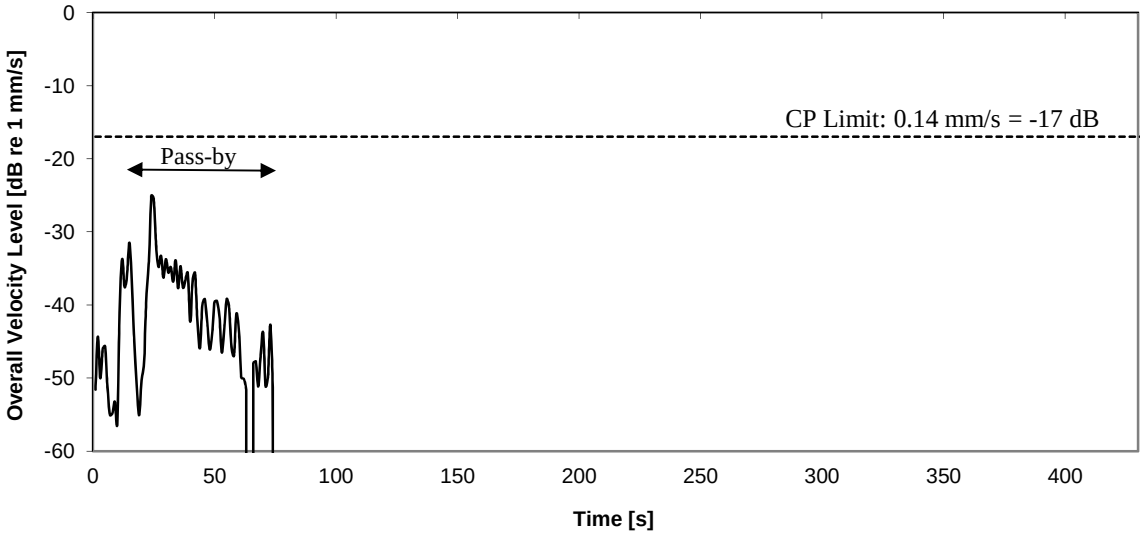
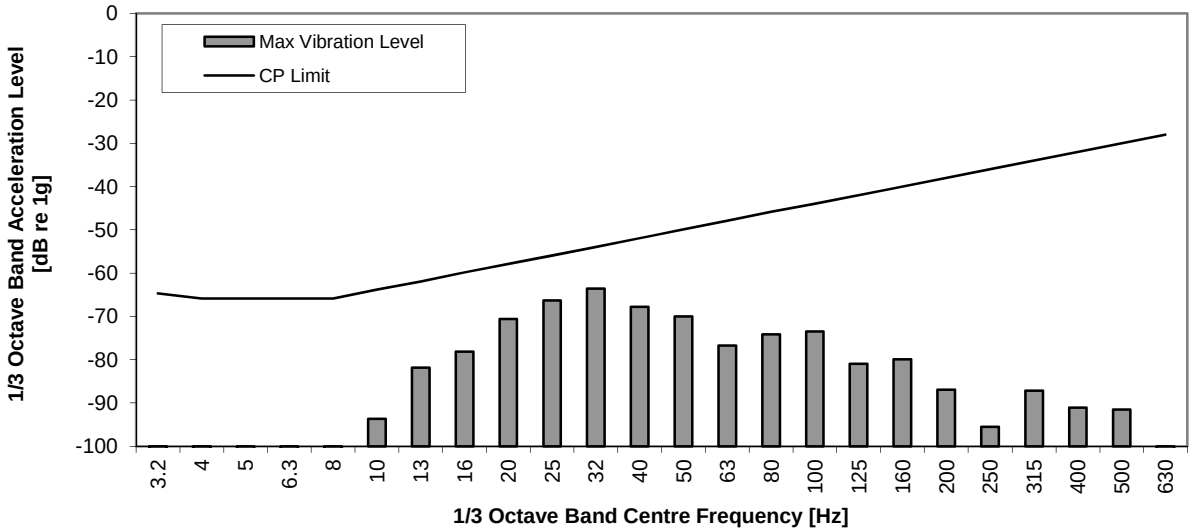


Figure 8b: Pass-by 5
Acceleration Spectrum @ Peak Level (1 sec. Duration)



APPENDIX A

CP Principal Mainline Requirements

CANADIAN PACIFIC RAILWAY

PRINCIPAL MAIN LINE REQUIREMENTS

1. Berm, or combination berm and noise attenuation fence, having extensions or returns at the ends, to be erected on adjoining property, parallel to the railway right-of-way with construction according to the following:

   a) Minimum total height 5.5 metres above top-of-rail;
   b) Berm minimum height 2.5 metres and side slopes not steeper than 2.5 to 1.
   c) Fence, or wall, to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre (4 lb/sq.ft.) of surface area.

   No part of the berm/noise barrier is to be constructed on railway property.

   A clause should be inserted in all offers of purchase and sale or lease, and be registered on title or included in the lease for each dwelling affected by any noise and vibration attenuation measures, advising that any berm, fencing, or vibration isolation features implemented are not to be tampered with or altered, and further that the owner shall have the sole responsibility for and shall maintain these features.

   Dwellings must be constructed such that the interior noise levels meet the criteria of the appropriate Ministry. A noise study should be carried out by a professional noise consultant to determine what impact, if any, railway noise would have on residents of proposed subdivisions and to recommend mitigation measures, if required. The Railway may consider other measures recommended by the study.

2. Setback of dwellings from the railway right-of-way to be a minimum of 30 metres. While no dwelling should be closer to the right-of-way than the specified setback, an unoccupied building, such as a garage, may be built closer. The 2.5 metre high earth berm adjacent to the right-of-way must be provided in all instances.

3. Ground vibration transmission to be estimated through site tests. If in excess of the acceptable levels, all dwellings within 75 metres of the nearest track should be protected. The measures employed may be:

   a) Support the building on rubber pads between the foundation and the occupied structure so that the maximum vertical natural frequency of the structure on the pads is 12 Hz;
   b) Insulate the building from the vibration originating at the railway tracks by an intervening discontinuity or by installing adequate insulation outside the building, protected from the compaction that would reduce its effectiveness so that vibration in the building became unacceptable; or
   c) Other suitable measures that will retain their effectiveness over time.

4. A clause should be inserted in all offers of purchase and sale or lease and in the title deed or lease of each dwelling within 300m of the railway right-of-way, warning prospective purchasers or tenants of the existence of the Railway's operating right-of-way; the possibility of alterations including the possibility that the Railway may expand its operations, which expansion may affect the living environment of the residents notwithstanding the inclusion of noise and vibration attenuating measures in the design of the subdivision and individual units, and that the Railway will not be responsible for complaints or claims arising from the use of its facilities and/or operations.

5. Any proposed alterations to the existing drainage pattern affecting railway property must receive prior concurrence from the Railway, and be substantiated by a drainage report to be reviewed by the Railway.

6. A 1.83 metre high chain link security fence be constructed and maintained along the common property line of the Railway and the development by the developer at his expense, and the developer is made aware of the necessity of including a covenant running with the lands, in all deeds, obliging the purchasers of the land to maintain the fence in a satisfactory condition at their expense.

7. Any proposed utilities under or over railway property to serve the development must be approved prior to their installation and be covered by the Railway's standard agreement.

APPENDIX B

Rail Traffic Information

Real Estate and Facility Management
800 – 1290 Central Parkway West
Mississauga, ON, L5C 4R3
www.cpr.ca

June 24, 2016

Via e-mail: spaul@hgcengineering.com

Sheeba Paul, MEng, PEng
HGC Engineering
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario L5N 1P7

Dear Sheeba:

Re: Rail Traffic Volumes, CP Mileage 20.65 Galt Subdivision, Streetsville Station
278 Victoria St, Mississauga, ON

This is in reference to your request for rail traffic data for a noise study for the lands located at 278 Victoria Street located in the vicinity of CP's Streetsville Station at mile 20.65 of our Galt Subdivision. This corridor is classified as a Principal Main Line.

The information requested is as follows:

1. Number of freight trains 0700 to 2300: 24
   Number of freight trains 2300 to 0700: 9
   Number of passenger trains (GO Transit*): 18
   **GO Transit passenger service runs weekdays between 0640 & 0845 and then between 1630 & 1930.*
2. Average number of cars per train freight: 60
   Maximum cars per train freight: 160
   Number of cars per train passenger: 13
3. Number of Locomotives per train: 2 (4 max) freight, 1 passenger
4. Maximum permissible speed: 50 mph (freight), 55 mph (passenger)
5. Whistle signal is prohibited approaching public grade crossings through the study area. However, the whistle may be sounded if deemed necessary by the train crew for safety reasons.
6. The subject site is located in the vicinity of CP's Streetsville Station which is a passenger rail station. GO Trains ring their bells when they approach and leave the station.

The information provided is based on rail traffic over the past month to date. Variations of the above may exist on a day-to-day basis. Specific measurements may also vary significantly depending on customer needs.

Yours truly,

Josie Tomei
Specialist Real Estate Sales
& Acquisitions – Ontario
905-803-3429. josie_tomei@cpr.ca

Sheeba Paul

From: Adam Snow <Adam.Snow@gotransit.com>
Sent: December-20-11 3:53 PM
To: Sheeba Paul
Subject: RE: Rail Data Request/verification - Streetsville

Hello Sheeba – Further to your message below, the rail traffic forecasts for this area have changed since the 2009 letter (as you attached to your original email) was issued. Preliminary midterm (2021 +/-) weekday commuter train volumes at this location are in the order of 70 trains (57 day, 13 night). I note that these numbers are subject to change and may be influenced by passenger demand and funding availability.

All other parameters as set out in the 2009 correspondence remain relevant.

Best regards,

Adam

From: Sheeba Paul [mailto:spaul@hgcengineering.com]
Sent: Wednesday, December 14, 2011 1:54 PM
To: Adam Snow; Adam Snow
Subject: re: Rail Data Request/verification - Streetsville

Hello Adam,

HGC Engineering is performing a noise study for a residential development (land severance) in Streetsville, Ontario.

Please find attached a Google link for your reference.

http://maps.google.ca/maps?q=melody+drive,+streetsville,+on&hl=en&hnear=Melody+Dr,+Mississauga,+Peel+Regional+Municipality,+Ontario&gl=ca&t=m&z=16&vpsrc=0

We would like to request rail traffic data for the railway line to the north of the site. Typically we need daytime volumes, night-time volumes, number of locomotives, number of cars, speed of trains, speed and whistle information.

I have attached the rail data in our files for this railway line. Can you let me know if we can go ahead and use this data as if it was current data?

Thanks,

Ms. Sheeba Paul, MEng. PEng.
HGC Engineering
Howe Gastmeier Chapnik Limited
2000 Argentia Road
Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
Phone (905) 826-4044
Fax (905) 826-4940

Transit

20 Bay Street • Suite 600
Toronto, Ontario, Canada M5J 2W3
20 rue Bay, bureau 600
Toronto (Ontario) Canada M5J 2W3

Phone: (416) 869-3600 ext. 5408
Fax: (416) 869-1563
Email: Adam.Snow@gotransit.com

February 9, 2009

Mandy Chan
HGC Engineering
2000 Argentia Road
Plaza One, Suite 203,
Mississauga, Ontario
L5N 1P7

Dear Mandy:

Subject: Request For Information - GO Transit Train Activity
Proposed Development - Vicinity of Tannery Street, Mississauga

Further to your request of February 6 2009, we are pleased to provide you with information pertaining to GO Transit commuter rail operations in the vicinity of the above-noted development site.

Currently commuter rail service on the Milton line is limited to peak periods, with 11 trains running during the daytime (07:00 to 23:00) and 1 train operating during night time (23:00 to 07:00) hours in the vicinity of the subject site. For the purposes of your analysis, we suggest that you consider total future train traffic volumes. We are currently planning for a future level of service that includes all-day train operations along this line. This would include up to 54 trains per day (48 trains daytime; 6 trains night time). It is anticipated that these trains will be comprised of a single locomotive and up to 12 passenger cars.

Please note that, since the Milton line (Galt Subdivision) is owned by CP Rail, information regarding other (i.e., freight) rail operations, track configurations and train speeds will need to be obtained from Orest Rojik of CP Rail at 905-803-3425.

Please do not hesitate to contact the undersigned should you wish to discuss these matters in greater detail.

Sincerely,

Adam Snow
Transportation Planner

cc: Orest Rojik - CP
Jeff Bateman - GO Transit

APPENDIX D

STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 13-06-2018 14:36:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: a.te Time Period: Day/Night 16/8 hours
Description: ***Daytime and nighttime sound levels at prediction location [A], Blocks C, D, Townhouses with flanking exposure to railway***

Rail data, segment # 1: CP (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	31.5/11.8	80.0	4.0	160.0	Diesel	No
* 2. GO	66.1/15.1	86.0	1.0	12.0	Diesel	No

* The identified number of trains have been adjusted for future growth using the following parameters:

Train type: No Name	Unadj. Trains	Annual % Increase	Years of Growth
1. Freight	24.0/9.0	2.50	11.00
2. GO	57.0/13.0	2.50	6.00

Data for Segment # 1: CP (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 42.20 / 42.20	m
Receiver height	: 4.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	: 0.00	

Results segment # 1: CP (day)

LOCOMOTIVE (0.00 + 71.64 + 0.00) = 71.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	79.52	-6.72	-1.17	0.00	0.00	0.00	71.64

WHEEL (0.00 + 67.07 + 0.00) = 67.07 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	75.61	-7.19	-1.35	0.00	0.00	0.00	67.07

Segment Leq : 72.94 dBA

Total Leq All Segments: 72.94 dBA

Results segment # 1: CP (night)

LOCOMOTIVE (0.00 + 70.07 + 0.00) = 70.07 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	77.95	-6.72	-1.17	0.00	0.00	0.00	70.07

WHEEL (0.00 + 65.54 + 0.00) = 65.54 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	74.08	-7.19	-1.35	0.00	0.00	0.00	65.54

Segment Leq : 71.38 dBA

Total Leq All Segments: 71.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.94
(NIGHT): 71.38