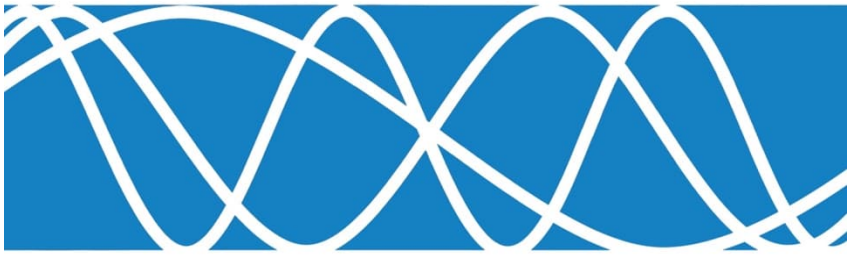
Noise and Vibration Feasibility Study

Proposed Residential Development
97 Bower Street
Acton, ON

October 6, 2025
HGC Project #: 02400173



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1 INTRODUCTION AND SUMMARY

HGC Noise Vibration Acoustics was retained by Castlegrove Developments Inc. to conduct a noise and vibration feasibility study for a proposed residential development located on the north side of Bower Street, north of Mill Street in Acton, Ontario. The purpose of this study is to determine the impact of environmental noise and vibration from the surrounding area on the proposed residential development in accordance with the Ministry of the Environment, Conservation and Parks (MECP) and railway guidelines. The residential development will consist of a 5-storey residential building with at-grade and underground parking. The study is required by the Town of Halton Hills as part of the planning and approvals process.

The primary sources of noise at the proposed development are rail traffic on the Metrolinx Guelph Subdivision rail line to the north and road traffic on Mill Street. Based on traffic data obtained from the Town of Halton Hills, Bower Street is considered to be a low traffic volume roadway and will not be considered in the study. Relevant traffic data was obtained from Metrolinx personnel and the Ministry of Transportation (MTO). The traffic data was used to predict future traffic sound levels at the proposed dwelling façades and outdoor living area. The predicted sound levels were evaluated with respect to the guidelines of the MECP and the railway authority.

The results of the study indicate that the proposed development is feasible with the noise control measures described in this report. Central air conditioning and upgraded glazing constructions are required for the proposed building. Associated acoustical requirements are specified in this report. Noise warning clauses are required to inform future occupants of the traffic sound level excesses and the proximity to industrial/commercial uses and the rail line.

Ground-borne vibration measurements were performed for five train pass-bys at the location of the nearest proposed building façade to the Metrolinx Guelph Subdivision rail line, 30 m from the railway right-of-way. Measured vibration

levels were found to be within the applicable criteria and therefore mitigation for train vibration is not required.

A computer model of the area was created to predict the sound levels at the facades of the proposed building due to off-site stationary noise sources from existing industrial and commercial uses in the area. The results indicate that the sound emissions of the nearby stationary noise sources are expected to be within the MECP guideline sound levels at the proposed development. Mitigation for existing stationary noise sources is not required.

In summary, with suitable controls integrated into the building plans, the proposed development is anticipated to meet the MECP guidelines and is feasible from a noise and vibration perspective. Details of the assessment leading to this conclusion are provided herein.

2 SITE DESCRIPTION AND NOISE SOURCES

Figure 1 is a key plan indicating the location of the proposed site. The site is located on the north side of Bower Street and north of Mill Street, specifically at 97 Bower Street, in Acton, Ontario. A site plan prepared by 4 Architecture Inc. dated September 23, 2025, is provided as Figure 2. Prediction locations are also shown in Figure 2. The proposed development will consist of a 5-storey residential building with at-grade and underground parking.

HGC Engineering personnel visited the site in April 2025 to make observations of the acoustical environment, measure background sound levels, identify significant noise sources within the vicinity and perform ground-borne vibration measurements of train pass-bys. During the site visit, it was noted that the primary sources of noise impacting the site are road traffic on Mill Street and rail traffic on the Metrolinx Guelph Subdivision rail line to the north.

The site is currently unoccupied. The site is adjacent to the Metrolinx Guelph Subdivision railway line right-of-way to the north. The railway is elevated by approximately 2 m. South and east of the site are existing residential dwellings.

There is an electric utility facility adjacent to the subject site to the southwest. Further west there is a school. Northeast of the site, north of the rail line, there are industrial uses. There are a variety of commercial/retail uses along Mill Street. The significant surrounding stationary noise sources are assessed in Section 6. Noise from these surrounding uses were not observed during the site visit. Nevertheless, due to the proximity of the site to the existing commercial and industrial uses, it is recommended that a noise warning clause to identify that such uses may be audible at times be included in the tenancy agreements, as described in Section 7.

3 NOISE AND VIBRATION LEVEL CRITERIA

3.1 Traffic Noise Criteria

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MECP publication NPC-300 “Environment Noise Guideline Stationary and Transportation sources – Approval and Planning”, release date October 21, 2013, and are listed in Table 1 below. The Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) “Guidelines for New Development in Proximity to Railway Operations”, dated May 2013 (RAC/FCM guidelines were also reviewed dated November 2006). The values in Table 1 are energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA].

Table 1: Road and Rail Noise Criteria (dBA)

Space	Daytime $L_{EQ(16\ hour)}$ Road/Rail	Nighttime $L_{EQ(8\ hour)}$ Road/Rail
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA / 40 dBA	45 dBA / 40 dBA
Inside Bedrooms	45 dBA / 40 dBA	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 MECP guidelines.

The guidelines in the MECP publication allow the sound level in an OLA 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 or living/dining room windows exceed 60 dBA or daytime sound levels outside living/dining room and bedroom windows exceed 65 dBA. If the sound level in the plane of a bedroom or living/dining room window is greater than 55 dBA and less than or equal to 65 dBA, the dwelling should be designed with a provision for the installation of central air conditioning in the future, at the occupant's discretion.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of window nighttime sound level is greater than 55 dBA or the daytime sound level is greater than 60 dBA 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/living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and at the plane of the bedroom/living/dining room window due to traffic.

MECP and railway guidelines require brick veneer or a masonry equivalent exterior wall construction from foundation to rafters 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 Metrolinx requirements for a new development adjacent to a principal mainline, included in Appendix A.

3.2 Criteria for Ground-Borne Vibration from Rail Traffic

Metrolinx guidelines require measurements of ground-borne vibration when residential dwelling units are to be located within 75 m of a rail line. The Metrolinx Guelph Subdivision railway tracks to the north are approximately 45 m from the nearest proposed building façade.

Vibration is typically measured in terms of oscillatory velocity or acceleration. The Metrolinx guidelines are given in terms of ground-borne velocity. In this report, vibration levels are quoted in terms of RMS velocity levels (L_V) in units of decibels [dB] relative to 1 mm/s (i.e., 1 mm/s = 0 dB). The guideline limit is 0.14 mm/s, which is equivalent to -17 dB re 1 mm/s. For ease of reference, this limit of -17 dB re 1 mm/s is identified on velocity plots in this report.

Metrolinx limits for acceptable ground-borne vibration are also presented as a curve of maximum allowable vibratory acceleration levels, in units of decibels relative to the acceleration due to gravity (dB re 1g), versus one-third octave band frequency. The Metrolinx spectral criteria have been overlaid on the graphs of measured vibration for easy reference.

4 TRAFFIC NOISE ASSESSMENT

4.1 Road Traffic Data

Traffic data for Mill Street was obtained from the MTO in the form of Average Annual Daily Traffic (AADT) traffic values and is provided in Appendix B. The traffic data is projected to the year 2035 at an annual growth rate of 2.5%. An operating speed limit of 50 km/h and a day/night split of 90/10 was applied for Mill Street. Commercial vehicle percentages were not provided. As per Ministry of Transportation guidelines, a commercial vehicle percentage of 13%, split into 5% medium trucks and 8% heavy trucks was assumed. Table 2 summarizes the road traffic volume data used in this study.

Table 2: 2035 Projected Road Traffic Data

Roadway	AADT	Day / Night Split [%]	Trucks Percentage (%)		Speed Limit [km/h]
			Medium	Heavy	
Mill Street	13,565	90 / 10	5.0	8.0	50

4.2 Rail Traffic Data

Rail traffic data for the Metrolinx Guelph Subdivision rail line was obtained from Metrolinx personnel and is attached in Appendix C. The Metrolinx rail line is used for passenger trains and is classified as a principal main line. The maximum permissible train speed in the area of the site is 113 km/h (70 mph). In conformance with Metrolinx and railway assessment requirements, maximum speeds, maximum number of cars and locomotives per train were used in the traffic noise analysis to yield a worst case estimate of train noise. All Metrolinx trains were modelled as diesel trains as per correspondence with Metrolinx personnel. Traffic data used in the analysis is shown in Table 3.

Table 3: Forecasted Rail Traffic Data

Type of Train	Number of Trains Day/Night	Number of Locomotives	Number of Cars	Max Speed (km/h)
GO Guelph (1 Locomotive)	56 / 12	1	8	113
GO Guelph (2 Locomotive)	8 / 0	2	8	113

4.1 Traffic Noise Predictions

To assess the levels of traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. This modeling software was used to predict the future traffic sound levels (L_{EQ}) at various locations. Sample STAMSON output is provided in Appendix D. The results of these predictions, without mitigation, are summarized in Table 4.

Table 4: Maximum Traffic Sound Level Predictions [dBA]

Prediction Location	Location	Daytime $L_{EQ\ (16\ hour)}$ Road/Rail/Total	Nighttime $L_{EQ\ (8\ hour)}$ Road/Rail/Total
[A]	North Façade	52 / 66 / 66	45 / 62 / 62
[B]	East Façade	56 / 60 / 61	49 / 55 / 56
[C]	South Façade	54 / 56 / 58	48 / 51 / 53
[D]	West Façade	47 / 65 / 65	41 / 60 / 60
[E]	At-Grade OLA	45 / 55 / 56	--

4.2 Traffic Noise Recommendations

The sound level predictions indicate that the future traffic sound levels are expected to exceed the MECP guidelines at the façades of the proposed building. Recommendations are provided in the following sections.

4.2.1 Outdoor Living Areas

The dwelling units in the proposed development may have balconies that are less than 4 m in depth. These areas are not considered to be outdoor amenity areas under MECP guidelines, and therefore are exempt from traffic noise assessment.

The predicted daytime sound level in the at-grade outdoor amenity area on the east side of the building (Prediction Location [E]) is 56 dBA, greater than the MECP limit of 55 dBA but not exceeding the limit by more than 5 dBA. According to MECP guidelines, this excess may be addressed by including a warning clause in sale and lease agreements for the development.

4.2.2 Metrolinx Minimum Distance Setbacks & Safety Berm Requirements

For noise control and safety reasons, Metrolinx policies stipulate that the minimum required setback between a new dwelling and a main line right-of-way is to be a minimum of 30 meters. The proposed building is located at 45 m from the railway right of way and therefore meets this requirement.

Typically, a safety berm 2.5 m in height along with a 3 m high acoustic wall on top is required along the railway right-of-way. The railway authority should be contacted for confirmation regarding the safety berm requirements along the railway line since the railway is elevated.

4.2.3 Indoor Living Areas and Ventilation Requirements

The predicted future sound levels at the building façades will be greater than 60 dBA during nighttime hours and 65 dBA during daytime hours. To address these excesses, the MECP guidelines recommend that the building be equipped with a central air conditioning system, so that windows may remain closed.

Window or through-the-wall air conditioning units are not recommended because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall sound insulating properties of the envelope. Acceptable units are those housed in their own insulated closet with an access door for maintenance. The location, installation, and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300. Associated warning clauses are also recommended.

4.2.4 Building Façade Constructions

Predicted sound levels at the building facades were used to determine sound insulation requirements of the building envelopes. The required acoustic insulation of the wall and window components was determined using methods developed by the National Research Council (NRC).

Exterior Wall Constructions

According to MECP and Metrolinx guidelines, the first row of dwellings with exposure to the railway line which have sound levels exceeding 60 dBA during both nighttime and daytime hours due to rail traffic, will require brick veneer or masonry equivalent exterior walls from foundation to rafters as a minimum construction. This applies to the north and west façades of the proposed building as shown in Figure 4.

Exterior Doors

There may be swing doors and some glazed sliding patio doors for entry onto the balconies from living/dining/bedrooms. The glazing areas on the doors are to be counted as part of the total window glazing area. If exterior swing doors are to be used, they shall be insulated metal doors equipped with head, jamb and threshold weather seals.

Acoustical Requirements for Glazing

At the time of this report, detailed floor plans and elevations are under development. Assuming a typical window to floor area of 50% (30% fixed and 20% operable) for the living/dining rooms and 40% (30% fixed and 10% operable) for the bedrooms in the development, and a conservative wall to floor area of 100% for all rooms, the minimum acoustical requirement for the basic window glazing, including glass in fixed sections, swing or sliding doors, and operable windows, is provided in Table 5.

Table 5: Required Minimum Glazing STC for Specific Building Façades

Location	Minimum Glazing STC
North Façade	STC-33
West Façade	STC-32
All Other Façades	OBC

Note: OBC – meeting the minimum requirements of the Ontario Building Code

Further Work

When detailed floor plans and building elevations are available, the drawings should be reviewed to refine window glazing requirements based on actual window to floor area ratios and to verify the exterior wall construction at the north and west to be brick veneer or an equivalent masonry construction.

5 VIBRATION ASSESSMENT

Metrolinx requires an assessment of ground-borne vibration through measurement if building foundations are to be located within 75 metres of the railway right-of-way, which is the case for the proposed building. The vibration measurements were conducted using a Svantek 977 Sound Level Meter outfitted with a Wilcoxon Research type 793V velocity transducer correctly field calibrated before and after the measurements on April 24, 2025. The weather conditions were fair. Measurements were performed at the anticipated location of the closest future building façade, 30 m from the railway right-of-way, indicated as [V1] in Figure 2.

The results of the measurements are presented in Figures E1 to E5 in Appendix E. Table 6 shows the maximum RMS vibration velocity measurement during each of the train pass bys.

Table 6: Summary of Peak Vibration Measurements of Train Pass-bys

Train Pass-by	Measured Vibration Level (mm/s)	Criteria (mm/s)
1	0.05	0.14
2	0.06	
3	0.08	
4	0.05	
5	0.09	

The upper curve, Figures E1a to E5a, shows RMS vibration velocity as a function of time for the train pass-by. Vibration levels were found to be within the Metrolinx limit of 0.14 mm/s during the train pass-bys.

The lower curves, Figures E1b to E5b, show the maximum measured acceleration as a spectrum of level in dB re g versus one-third octave frequency compared to the Metrolinx criteria curve. These figures show that the highest levels, relative to the criteria, occurred at a frequency of 16 Hz, but remained within the Metrolinx criteria. No further mitigation is required.

6 STATIONARY SOURCE ASSESSMENT

Noise sources associated with industrial and commercial facilities are assessed separately from traffic sources under MECP guidelines. These facilities are considered to be Stationary Sources of Sound and criteria for their assessment are contained in the following section.

6.1 Criteria Governing Stationary Noise Sources

An industrial or commercial facility is classified in MECP guidelines as a stationary source of sound (as opposed to sources such as traffic or construction, for example) for noise assessment purposes. The proposed development is located in an urban acoustical environment classified as Class 1 according to MECP guidelines, which can be characterized by the background sound level being dominated by traffic and human activity.

The façade of a residence, or any associated usable outdoor area, is considered a sensitive point of reception. NPC-300 stipulates that the exclusionary minimum sound level limit for a stationary noise source in an urban Class 1 area is 50 dBA during daytime (07:00 to 19:00) and evening (19:00 to 23:00) hours, and 45 dBA during nighttime hours (23:00 to 07:00). If the background sound levels due to road traffic exceed the exclusionary minimum limits, then the background sound level becomes the criterion. The background sound level is defined as the sound level that is present when the stationary source under consideration is not operating, and may include traffic noise and natural sounds. To ensure a conservative assessment, the exclusionary minimum limits were used for the current analysis.

Commercial activities such as the occasional movement of customer vehicles, occasional deliveries, and garbage collection are not of themselves considered to be significant noise sources in the MECP guidelines. Accordingly, these sources have not been considered in this study. Noise from safety equipment (e.g., back-up beepers), as well as emergency facilities (e.g., fire stations) are also exempt from consideration.

The MECP guidelines stipulate that the sound level impact during a “predicable worst case hour” be considered. This is defined to be an hour when a typically busy “planned and predictable mode of operation” occurs at the subject facility or facilities, coincident with a period of minimal background sound. Compliance with MECP criteria generally results in acceptable levels of sound at residential receptors although there may still be residual audibility during periods of low background sound.

6.2 Assessment of Existing Stationary Noise Sources on Proposed Residential Development

6.2.1 Existing Adjacent Commercial and Industrial Facilities

Southwest of the site there is an electric utility company facility (Halton Hills Hydro Inc.). The noise sources associated with this facility, based on phone conversations with Halton Hills Hydro Inc. personnel, includes a forklift and

boom truck operating in the yard and medium trucks driving through the yard. The facility operates during the daytime hours only. During the site visits there was no noise or activity at this facility.

Southeast of the site on Mill Street there is a veterinarian clinic (Acton Veterinary Clinic). The noise sources associated with this facility include rooftop mechanical equipment. The facility operates during the daytime hours only.

To the northeast there are a variety of industrial and commercial uses including Vector Injection, HarbisonWalker International, Polair Heating & Air Conditioning Ltd., and Specton Construction Products Ltd. The majority of these facilities conduct their work within the buildings. HarbisonWalker International may have outdoor operations that emit noise to the surrounding area. A search of the MECP website “Access Environment” indicates that HarbisonWalker International has a current Acoustical Assessment Report (AAR) for the facility which indicates that the facility meets the sound level criteria at the neighbouring dwellings. Based on a phone conversation with personnel from HarbisonWalker International there may be tractor trailer deliveries and forklift operations in the yard. For the Vector Injection, Polair Heating & Cooling Ltd., and Specton Construction Products Ltd. facilities, it was assumed that there could be medium truck deliveries. These facilities operate during daytime hours only.

6.2.2 Existing Stationary Source Noise Predictions

Predictive noise modelling was used to assess the sound impact of the nearby stationary sources at the most critically impacted façades of the proposed building in accordance with MECP guidelines. The noise prediction model was constructed based on a review of the proposed site plan, site visits, satellite aerial photos, conversations with the neighbouring uses, and estimates of sound emission levels of stationary sources taken from similar past HGC project files.

Table 7: Existing Source Sound Power Levels [dB re 10-12 W]

Source	Octave Band Centre Frequency [Hz]								Overall [dBA]
	63	125	250	500	1k	2k	4k	8k	
Lennox 5-Ton HVAC (KGB060)	--	67	72	77	76	73	68	61	80
Forklift	99	95	91	91	91	88	82	76	95
Boom Truck	84	82	79	81	78	78	78	77	85
Medium Truck Idling	91	87	89	84	91	88	79	71	94
Medium Truck Movement	108	90	92	90	94	91	84	77	97
Tractor Trailer Idling	96	91	88	88	91	90	81	70	95
Tractor Trailer Movement	101	100	94	96	97	95	91	86	101

The above data were inputted into a predictive computer model. The software used for this purpose (Cadna/A version 2025, build: 209.5501) is a computer implementation of ISO Standard 9613-2.2 “Acoustics – Attenuation of Sound During Propagation Outdoors.” The ISO method accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures such as barriers.

The following information and assumptions were used in the analysis.

- Rooftop HVAC units were assumed to be Lennox KGB060 5-Ton units at a height of 1.5 m above the roof.
- Based on phone conversations with Halton Hills Hydro Inc. personnel, there could be a maximum of 4 medium truck movements in an hour and forklift/boom truck operations in the yard. It was noted that during the site visits there was no activity at the Halton Hills Hydro Inc. facility.
- Based on phone conversations with HarbisonWalker International personnel, there could be tractor trailer deliveries in the loading docks and forklift operations in the yard.
- Medium truck deliveries have been assumed for the Vector Injection, Polair Heating & Cooling Ltd., and Specton Construction Products Ltd. facilities.
- Sound data for the above sources was obtained from past HGC project files of similar facilities, which were either originally obtained from the manufacturer or measured at similar facilities.
- Location of stationary noise sources are shown in Figure 5. The rooftop HVAC unit and truck idling noise sources are shown as green crosses. The truck movement noise sources are shown as a green lines. The forklift and boom truck noise sources are shown as green hatched areas.

In this impact assessment, we have considered typical worst-case (busiest hour) scenarios for each time period to be as follows:

Assumed day/evening worst-case scenario:

- Rooftop HVAC units operate continuously.
- The forklifts and boom truck operate for 20 minutes out of an hour.
- Four medium trucks drive through the Halton Hills Hydro Inc. yard.
- Two tractor trailer deliveries at the HarbisonWalker International facility.
- Tractor trailers idling for 10 minutes at the HarbisonWalker International facility.
- One medium truck delivery at the Vector Injection facility.
- Medium trucks idling for 10 minutes at the Vector Injection, Polair Heating & Cooling Ltd., and Specton Construction Products Ltd. facilities.

Assumed night worst-case scenario:

- Rooftop HVAC units operate for 15 minutes out of an hour (outside of business hours).
- No noise created from the Halton Hills Hydro Inc., HarbisonWalker International, Vector Injection, Polair Heating & Cooling Ltd., or Specton Construction Products Ltd. facilities (outside of business hours).

6.2.3 Results

The unmitigated sound levels due to existing stationary noise sources at the façades of the proposed building are summarized in Table 8 and presented graphically in Figures 6 and 7.

Table 8: Predicted Sound Levels from Existing Stationary Noise Sources on the Proposed Building [dBA]

Location	Daytime (07:00 – 23:00)	Nighttime (23:00 – 07:00)	Criteria Day/Night	Criteria Met
North Façade	<40	<35	50/45	✓
East Façade	45	<35	50/45	✓
South Façade	50	<35	50/45	✓
West Façade	47	<35	50/45	✓
At-Grade OLA	<40	--	50/--	✓

The results of the calculations indicate that the predicted sound levels due to the operation of the nearby stationary sources of noise are expected to be within the applicable MECP limits at the façades of the proposed building during

an assumed worst-case operational scenario. Mitigation is not required for steady stationary noise sources in the area.

7 WARNING CLAUSES

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

Suggested wording for future dwellings with sound level excesses.

Type A:

> Purchasers/tenants are advised that sound levels due to increasing road and rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks.

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

Type D:

> 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 the Environment, Conservation and Parks. (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 MECP publication NPC-300.)

Suitable wording to inform future residents of the nearby commercial and industrial facilities, and that sounds from these facilities may at times be audible.

Type E:

> Purchasers/tenants are advised that due to the proximity of the nearby commercial and/or industrial facilities, noise from the facilities may at times be audible.

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

Metrolinx standard warning clause which is required for all residual developments located within 300 m of their main line is given below.

Type G:

> Warning: Metrolinx and its assigns and successors in interest operate commuter transit service within 300 metres from the subject land. In addition to the current use of these lands, there may be alterations to or expansions of the rail and other facilities on such lands in the future including the possibility that Metrolinx or any railway entering into an agreement with Metrolinx or any railway assigns or successors as aforesaid may expand their operations, which expansion may affect the environment of the occupants in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual units. Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under these lands.

8 SUMMARY AND RECOMMENDATIONS

The following list and Table 9 summarize the recommendations made in this report.

1. Central air conditioning systems are required for all proposed dwelling units. The location, installation and sound ratings of the air conditioning devices should comply with NPC-300.

2. Brick veneer or a masonry equivalent exterior wall construction is required for the north and west façades of the proposed building as shown in Figure 4.

3. Upgraded glazing constructions are required for the proposed building as indicated in Section 4.2.4.

4. Warning clauses are required in the property and tenancy agreements and offers of purchase and sale in order to inform future owners/tenants of the sound level excesses and the proximity to the railway and commercial/industrial uses.

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

Table 9: Summary of Noise Control Requirements and Noise Warning Clauses

Location	Acoustic Barrier	Ventilation Requirements*	Type of Warning Clause	Minimum Glazing STC+	Exterior Wall Construction
North Façade	--	Central A/C	A, D, E, G	STC-33	Brick veneer or Masonry Equivalent
West Façade	--	Central A/C	A, D, E, G	STC-32	Brick veneer or Masonry Equivalent
All Other Façades	--	Central A/C	A, D, E, G	OBC	--
At-Grade OLA	--	--	--	--	--

Note:
-- no specific requirement
OBC – meeting the minimum requirements of the Ontario Building Code
* The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
+ With assumed window to floor area ratios of 50% for living rooms/dining rooms and 40% for bedrooms. When detailed floor plans and building elevations are available, an acoustical consultant should review the drawings to refine the window glazing constructions based on actual window to floor area ratios.

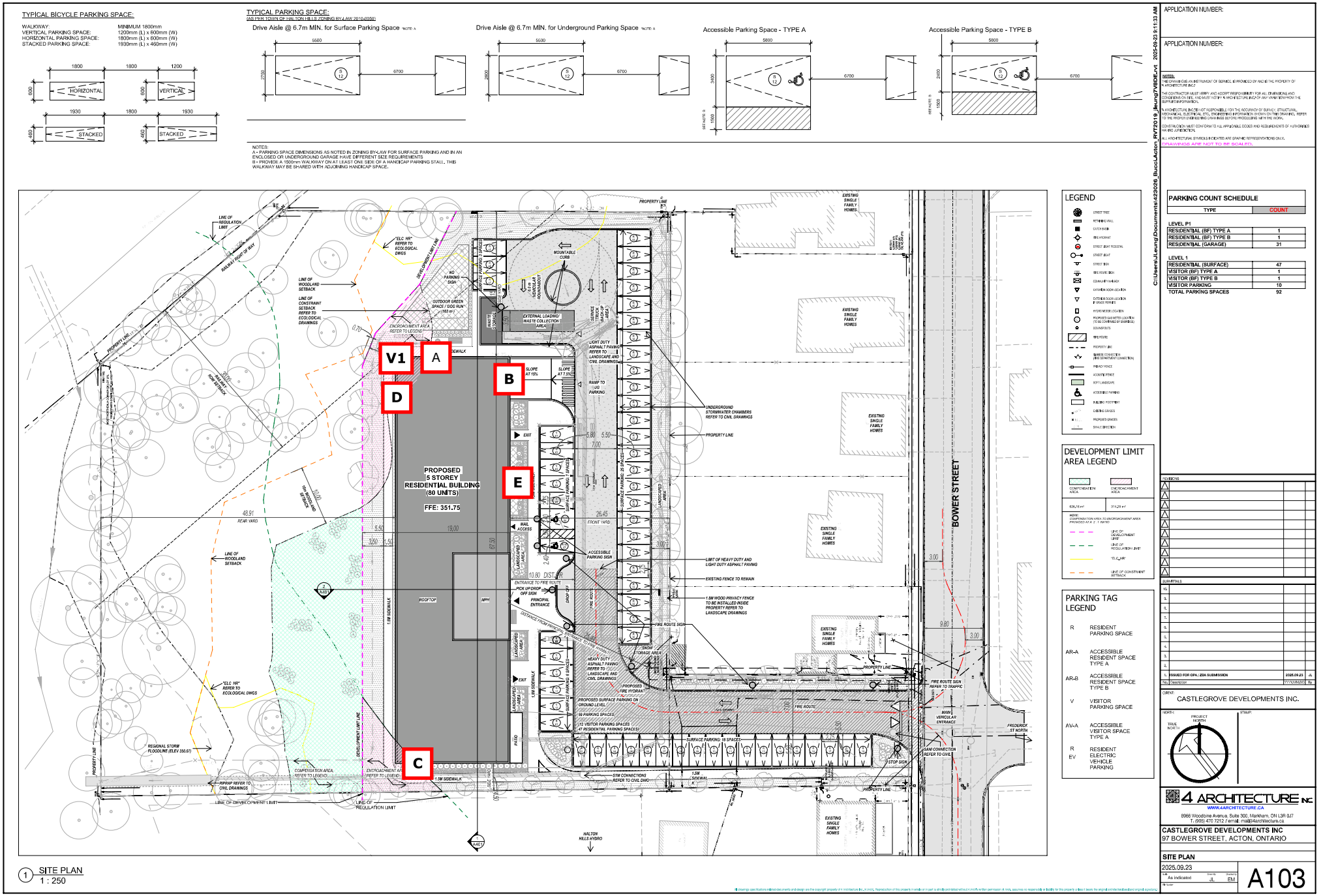
8.1 Implementation

To ensure that the noise recommendations outlined above are fully implemented, it is recommended that:

1. When detailed floor plans and building elevations are available, the exterior wall and glazing construction should be verified and refined based on actual window to floor area ratios and to verify the exterior wall construction.

2. Prior to the issuance of occupancy permits for this development, the City's building inspector or a Professional Engineer qualified to perform acoustical engineer services in the Province of Ontario should certify that the noise control measures have been properly incorporated, installed, and constructed.

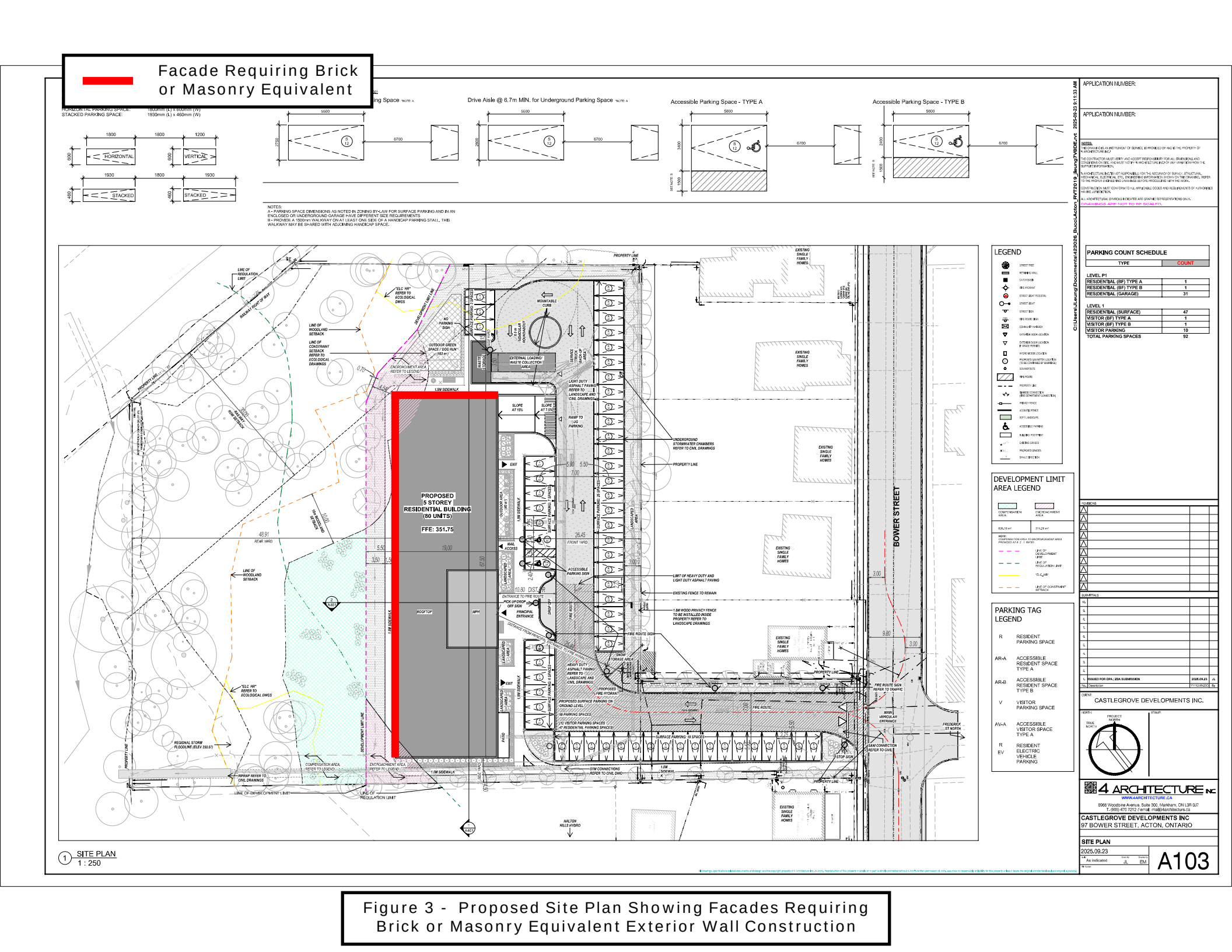
Figure 1 - Key Plan



1 SITE PLAN
1 : 250

Figure 2 - Proposed Site Plan Showing Prediction Locations and Vibration Measurement Location

Facade Requiring Brick or Masonry Equivalent



1 SITE PLAN
1 : 250

Figure 3 - Proposed Site Plan Showing Facades Requiring Brick or Masonry Equivalent Exterior Wall Construction

Figure 4 - Locations of Existing Stationary Noise Sources

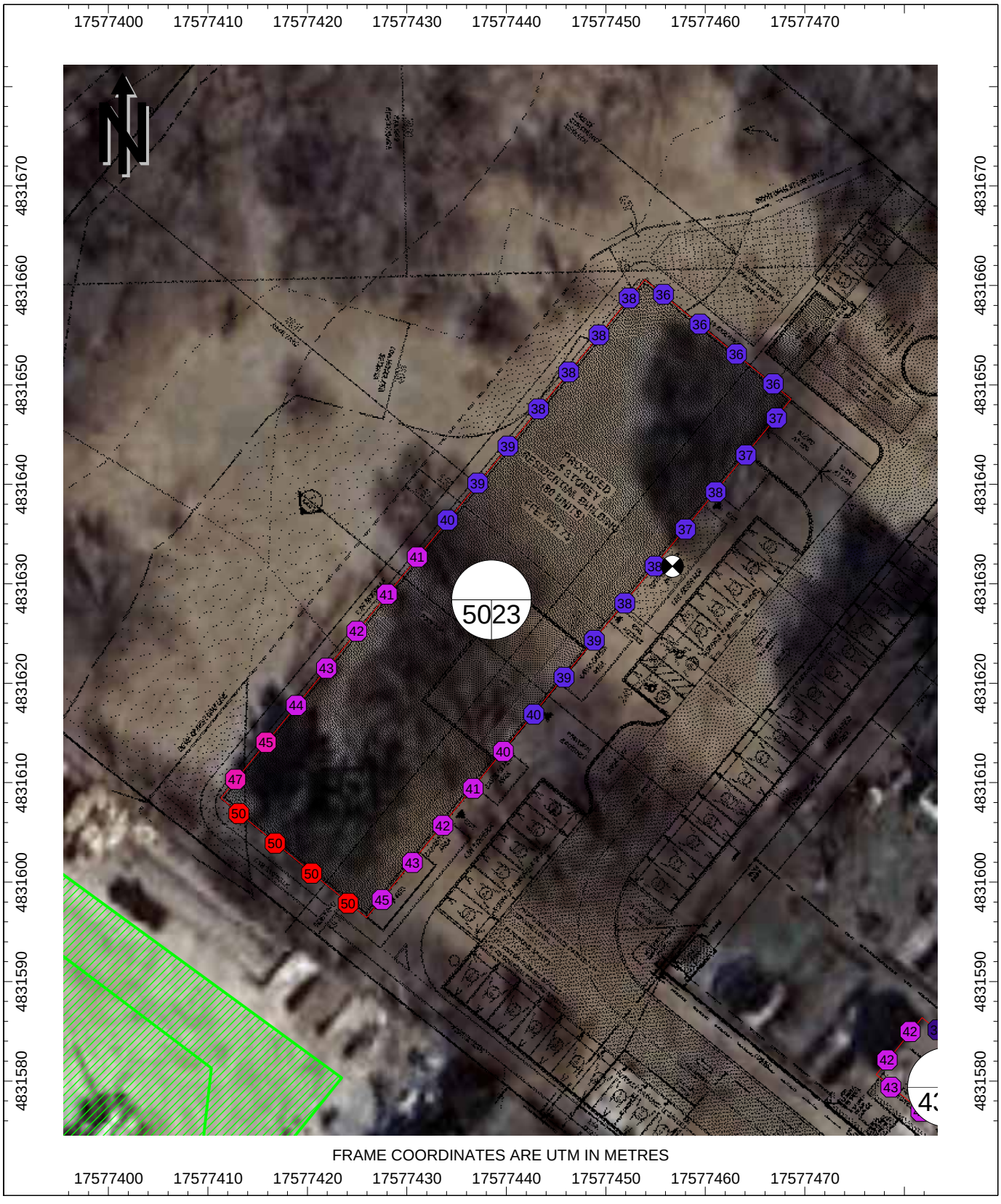


Figure 5 - Impact of Existing Stationary Noise Sources, Daytime

Figure 6 - Impact of Existing Stationary Noise Sources, Nighttime

Appendix A
Rail Guidelines

PRINCIPAL MAIN LINE REQUIREMENTS FOR NEW DEVELOPMENT

A. Safety setback of dwellings from the railway rights-of-way to be a minimum of 30 metres in conjunction with a safety berm. The safety berm shall be adjoining and parallel to the railway rights-of-way with returns at the ends, 2.5 metres above grade at the property line, with side slopes not steeper than 2.5 to 1.

B. Noise attenuation barrier shall be adjoining and parallel to the railway rights-of-way, having returns at the ends, and a minimum total height of 5.5 metres above top-of-rail. Acoustic fence to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre of surface area. Subject to the review of the noise report, GO Transit may consider other measures recommended by an approved Noise Consultant.

C. Ground-borne vibration transmission to be evaluated in a report through site testing to determine if dwellings within 75 metres of the railway rights-of-way will be impacted by vibration conditions in excess of 0.14 mm/sec RMS between 4 Hz and 200 Hz. The monitoring system should be capable of measuring frequencies between 4 Hz and 200 Hz, $\pm$ 3 dB with an RMS averaging time constant of 1 second. If in excess, isolation measures will be required to ensure living areas do not exceed 0.14 mm/sec RMS on and above the first floor of the dwelling.

D. The Owner shall install and maintain a chain link fence of minimum 1.83 metre height along the mutual property line.

E. The following clause should be inserted in all development agreements, offers to purchase, and agreements of Purchase and Sale or Lease of each dwelling unit within 300m of the railway right-of-way.

> **Warning:** Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the right-of-way or their 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 dwelling(s). Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way.

F. Any proposed alterations to the existing drainage pattern affecting the railway right-of-way must receive prior concurrence from GO Transit and be substantiated by a drainage report to the satisfaction of GO Transit.

G. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and vibration isolation measures implemented are not to be tampered with or altered and further that the Owner shall have sole responsibility for and shall maintain these measures to the satisfaction of GO Transit.

H. The Owner enter into an Agreement stipulating how GO Transit's concerns will be resolved and will pay GO Transit's reasonable costs in preparing and negotiating the agreement.

I. The Owner may be required to grant GO Transit an environmental easement for operational emissions, registered on title against the subject property in favour of GO.

Appendix B
Road Traffic Data

Year	Highway	Location Description	Dist (KM)	Pattern Type	AADT	SADT	SWADT	WADT	Truck AADT	Total Collisions	Total CR	Trucks Collisions	Truck CR
1999	7			UC	9,050	9,600	10,600	8,600	720	10	0.9	1	0.1
2000	7			UC	9,550	10,100	11,300	9,000	760	11	1.0	0	0.0
2001	7			UC	9,500	10,200	11,200	8,950	760	4	0.4	0	0.0
2002	7			UC	9,300	9,900	10,900	8,700	560	10	0.9	0	0.0
2003	7			UC	9,650	10,200	11,300	9,100	580	5	0.4	0	0.0
2004	7			UC	9,800	10,500	11,500	9,200	590	4	0.3	0	0.0
2005	7			UC	9,950	10,500	11,600	9,350	600	4	0.3	1	0.1
2006	7			UC	10,100	10,700	11,800	9,500	610	3	0.2	0	0.0
2007	7			UC	12,000	12,700	13,900	11,300	1,100	5	0.3	0	0.0
2008	7			UC	12,500	13,200	12,400	11,700	1,100	4	0.3	0	0.0
2009	7			UC	13,500	14,300	15,800	12,700	1,200	4	0.2	1	0.1
2010	7			UC	14,500	15,300	16,900	13,600	1,300	3	0.2	0	0.0
2011	7			UC	15,500	15,500	16,100	14,700	1,400	0	0.0	0	0.0
2012	7			UC	16,800	16,900	18,000	16,000	1,500	4	0.2	1	0.0
2013	7			UC	15,000	15,000	15,100	14,200	1,350	4	0.2	0	0.0
2014	7			UC	15,300	15,300	14,700	14,500	1,400	0	0.0	0	0.0
2015	7			UC	11,300	11,300	10,900	10,700	1,000	2	0.1	0	0.0
2016	7			UC	11,500	11,500	11,100	10,900	1,050	2	0.1	0	0.0
2017	7			UC	11,800	11,700	11,800	11,300	1,050	0	0.0	0	0.0
2018	7			UC	12,000	11,900	12,100	11,500	1,100	1	0.1	0	0.0
2019	7			UC	15,200	15,000	15,200	14,600	1,350	1	0.1	0	0.0
2021	7			UC	15,300	15,300	15,500	14,700	1,400	2	0.1	0	0.0
2021	7	CHURCHILL RD HALTON HILLS START OF NA	2.0										
1988	7	N JCT HWY 25 MAIN ST	3.1	C	5,700	6,350	6,350	5,150	570	8	1.2	0	0.0
1989	7			C	5,950	6,600	6,650	5,350	600	10	1.5	1	0.1
1990	7			C	6,050	6,700	6,700	5,450	600	15	2.2	1	0.1
1991	7			C	6,200	6,800	6,900	5,650	620	9	1.3	0	0.0
1992	7			C	6,200	6,700	6,900	5,700	620	9	1.3	0	0.0
1993	7			C	6,300	6,850	6,950	5,800	630	6	0.8	0	0.0
1994	7			C	6,300	6,900	7,000	5,700	630	6	0.8	1	0.1
1995	7			C	6,400	7,000	7,150	5,850	640	5	0.7	0	0.0
1996	7			C	6,200	7,050	7,050	5,600	620	5	0.7	0	0.0
1997	7			C	6,250	7,050	7,100	5,600	620	2	0.3	0	0.0
1998	7			C	6,850	7,750	7,750	6,150	680	2	0.3	0	0.0
1999	7			C	6,800	7,600	7,700	6,100	480	2	0.3	1	0.1
2000	7			C	7,100	8,000	8,000	6,400	640	5	0.6	0	0.0
2001	7			C	7,000	7,900	7,900	6,300	630	3	0.4	0	0.0
2002	7			C	7,050	7,900	7,950	6,350	490	4	0.5	0	0.0
2003	7			C	7,250	8,100	8,150	6,550	650	2	0.2	0	0.0
2004	7			C	7,400	8,350	8,350	6,650	670	8	0.9	1	0.1
2005	7			C	7,500	8,350	8,400	6,750	750	6	0.7	0	0.0

Year	Highway	Location Description	Dist (KM)	Pattern Type	AADT	SADT	SWADT	WADT	Truck AADT	Total Collisions	Total CR	Trucks Collisions	Truck CR
2006	7			C	7,650	8,500	8,550	6,900	760	7	0.8	1	0.1
2007	7			C	7,750	8,600	8,750	6,950	780	7	0.8	0	0.0
2008	7			C	7,850	8,650	8,550	7,050	780	5	0.6	2	0.2
2009	7			C	8,000	8,800	8,900	7,200	800	4	0.4	0	0.0
2010	7			C	8,100	8,950	9,000	7,300	810	4	0.4	0	0.0
2011	7			C	8,250	9,100	9,150	7,400	820	0	0.0	0	0.0
2012	7			C	8,350	9,200	9,000	7,500	840	1	0.1	0	0.0
2013	7			UC	8,450	8,500	8,500	8,000	840	1	0.1	0	0.0
2014	7			UC	8,600	8,650	8,250	8,150	860	4	0.4	1	0.1
2015	7			UC	8,700	8,750	8,350	8,250	870	2	0.2	1	0.1
2016	7			UC	8,850	8,900	8,500	8,400	880	1	0.1	0	0.0
2017	7			UC	8,950	8,900	9,000	8,600	900	1	0.1	0	0.0
2018	7			UC	9,050	9,000	9,100	8,700	900	1	0.1	1	0.1
2019	7			UC	9,200	9,050	9,200	8,850	1,450	2	0.2	0	0.0
2021	7			UC	9,450	9,450	9,600	9,100	1,500	1	0.1	0	0.0
1988	7	HALTON HILLS MILTON TOWNLINE RD	3.9	C	5,700	6,350	6,350	5,150	570	10	1.2	1	0.1
1989	7			C	5,950	6,600	6,650	5,350	600	10	1.2	0	0.0
1990	7			C	6,050	6,700	6,700	5,450	600	10	1.2	1	0.1
1991	7			C	6,200	6,800	6,900	5,650	620	14	1.6	0	0.0
1992	7			C	6,200	6,700	6,900	5,700	620	10	1.1	1	0.1
1993	7			C	6,300	6,850	6,950	5,800	630	18	2.0	3	0.3
1994	7			C	6,300	6,900	7,000	5,700	630	13	1.5	1	0.1
1995	7			C	6,400	7,000	7,150	5,850	640	9	1.0	0	0.0
1996	7			C	6,200	7,050	7,050	5,600	620	8	0.9	1	0.1
1997	7			C	6,250	7,050	7,100	5,600	620	15	1.7	1	0.1
1998	7			C	6,850	7,750	7,750	6,150	680	12	1.2	1	0.1
1999	7			C	6,800	7,600	7,700	6,100	480	7	0.7	0	0.0
2000	7			C	7,100	8,000	8,000	6,400	640	4	0.4	1	0.1
2001	7			C	7,000	7,900	7,900	6,300	630	5	0.5	0	0.0
2002	7			C	7,050	7,900	7,950	6,350	490	5	0.5	0	0.0
2003	7			C	7,250	8,100	8,150	6,550	650	12	1.2	0	0.0
2004	7			C	7,400	8,350	8,350	6,650	670	11	1.0	0	0.0
2005	7			C	7,500	8,350	8,400	6,750	750	10	0.9	0	0.0
2006	7			C	7,650	8,500	8,550	6,900	760	6	0.6	0	0.0
2007	7			C	7,750	8,600	8,750	6,950	780	7	0.6	0	0.0
2008	7			C	7,850	8,650	8,550	7,050	780	7	0.6	0	0.0
2009	7			C	8,000	8,800	8,900	7,200	800	2	0.2	0	0.0
2010	7			C	8,100	8,950	9,000	7,300	810	4	0.3	0	0.0
2011	7			C	8,250	9,100	9,150	7,400	820	10	0.9	1	0.1
2012	7			C	8,350	9,200	9,000	7,500	840	5	0.4	0	0.0
2013	7			C	8,450	9,300	9,200	7,600	840	5	0.4	0	0.0

Appendix C
Rail Traffic Data

Andrew Rogers

From: Rail Data Requests <RailDataRequests@metrolinx.com>
Sent: March 6, 2025 11:54 AM
To: Haocheng Wang
Cc: Yvonne Lo
Subject: RE: Rail Traffic Data Request

Hi Haocheng,

Further to your request dated February 20, 2025, the subject lands (97 Bower St, Acton) are located within 300 metres of the Metrolinx Guelph Subdivision (which carries Kitchener GO rail service).

It's anticipated that GO rail service on this Subdivision will be comprised of diesel trains only. The GO rail fleet combination on this Subdivision will consist of up to 2 locomotives and 8 passenger cars. The typical GO rail weekday train volume forecast near the subject lands, including both revenue and equipment trips is in the order of 76 trains. The planned detailed trip breakdown is listed below:

	1 Diesel Locomotive	2 Diesel Locomotives		1 Diesel Locomotive	2 Diesel Locomotives
Day (0700-2300)	56	8	Night (2300-0700)	12	0

The current track design speed near the subject lands is 70 mph (113 km/h).

There are no *anti-whistling by-laws* in affect near the subject lands.
Operational information is subject to change and may be influenced by, among other factors, service planning priorities, operational considerations, funding availability and passenger demand.

It should be noted that this information only pertains to Metrolinx rail service. It would be prudent to contact other rail operators in the area directly for rail traffic information pertaining to non-Metrolinx rail service.

I trust this information is useful. Should you have any questions or concerns, please do not hesitate to contact me.

Best Regards,

Jenna Auger (She/Her)
Third Party Projects Review (TPPR)
Development & Real Estate Management
T: (416)-881-0579
10 Bay Street | Toronto | Ontario | M5J 2N8

METROLINX

Appendix D
Sample STAMSON Output

```
STAMSON 5.0        NORMAL REPORT        Date: 14-08-2025 16:28:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: n_r1.te              Time Period: Day/Night 16/8 hours
Description: North facade, Prediction Location [A].


Rail data, segment # 1: Metrolinx (day/night)
-----------------------------------------------
Train            ! Trains      ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             ! (Left)      ! (Right)     !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------------+-------+------+------+------+----
  1. Metrolinx   !  28.0/6.0   !  28.0/6.0   ! 113.0 !  1.0 !  8.0 !Diesel! Yes
  2. Metrolinx2  !   4.0/0.0   !   4.0/0.0   ! 113.0 !  2.0 !  8.0 !Diesel! Yes

Data for Segment # 1: Metrolinx (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  :  60.00 / 60.00  m
Receiver height           :  14.50 / 14.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Whistle Angle             :     85 deg   Track 1
Reference angle           :   0.00

Results segment # 1: Metrolinx (day)
------------------------------------

LOCOMOTIVE (0.00 + 65.61 + 0.00) = 65.61 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.19  73.32  -7.19  -0.52   0.00   0.00   0.00  65.61
-------------------------------------------------------------------------

WHEEL (0.00 + 56.16 + 0.00) = 56.16 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.30  64.76  -7.83  -0.77   0.00   0.00   0.00  56.16
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 53.15 + 0.00) = 53.15 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    78     85   0.19  76.18  -7.19 -15.84   0.00   0.00   0.00  53.15
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 46.83 + 0.00) = 46.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    85     87   0.19  76.18  -7.19 -22.16   0.00   0.00   0.00  46.83
-------------------------------------------------------------------------

Segment Leq : 66.34 dBA

Total Leq All Segments: 66.34 dBA

Results segment # 1: Metrolinx (night)
--------------------------------------

LOCOMOTIVE (0.00 + 60.96 + 0.00) = 60.96 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.19  68.68  -7.19  -0.52   0.00   0.00   0.00  60.96
-------------------------------------------------------------------------

WHEEL (0.00 + 51.84 + 0.00) = 51.84 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.30  60.44  -7.83  -0.77   0.00   0.00   0.00  51.84
```

```
------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 48.89 + 0.00) = 48.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
------------------------------------------------------------------------
    78     85   0.19  71.92  -7.19 -15.84   0.00   0.00   0.00  48.89
------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 42.57 + 0.00) = 42.57 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
------------------------------------------------------------------------
    85     87   0.19  71.92  -7.19 -22.16   0.00   0.00   0.00  42.57
------------------------------------------------------------------------

Segment Leq : 61.75 dBA

Total Leq All Segments: 61.75 dBA

Road data, segment # 1: Mill St E (day/night)
-------------------------------------------
Car traffic volume  : 10621/1180  veh/TimePeriod  *
Medium truck volume :   610/68    veh/TimePeriod  *
Heavy truck volume  :   977/109   veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

    24 hr Traffic Volume (AADT or SADT):   9600
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  14.00
    Medium Truck % of Total Volume     :   5.00
    Heavy Truck  % of Total Volume     :   8.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Mill St E (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 188.00 / 188.00 m
Receiver height           :  14.50 / 14.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Mill St E (day)
-----------------------------------

Source height = 1.68 m

ROAD (0.00 + 51.54 + 0.00) = 51.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
------------------------------------------------------------------------------
     0     90   0.26  69.13   0.00 -13.89  -3.70   0.00   0.00   0.00  51.54
------------------------------------------------------------------------------

Segment Leq : 51.54 dBA

Total Leq All Segments: 51.54 dBA

Results segment # 1: Mill St E (night)
-------------------------------------

Source height = 1.68 m

ROAD (0.00 + 45.03 + 0.00) = 45.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
------------------------------------------------------------------------------
     0     90   0.26  62.61   0.00 -13.88  -3.70   0.00   0.00   0.00  45.03
```

```
--------------------------------------------------------------------------------

Segment Leq : 45.03 dBA

Total Leq All Segments: 45.03 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 66.48
                           (NIGHT): 61.84
```

```
STAMSON 5.0        NORMAL REPORT        Date: 14-08-2025 16:28:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ola_e.te             Time Period: 16 hours
Description: At-grade OLA, Prediction Location [E].


Rail data, segment # 1: Metrolinx
---------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
  1. Metrolinx   !  56.0/12.0  ! 113.0 !  1.0 !  8.0 !Diesel! Yes
  2. Metrolinx2  !   8.0/0.0   ! 113.0 !  2.0 !  8.0 !Diesel! Yes

Data for Segment # 1: Metrolinx
-------------------------------
Angle1   Angle2           :  35.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  74.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
No Whistle
Reference angle           :   0.00

Results segment # 1: Metrolinx
------------------------------

LOCOMOTIVE (0.00 + 54.91 + 0.00) = 54.91 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    35     90   0.58  73.32 -10.99  -7.43   0.00   0.00   0.00  54.91
-------------------------------------------------------------------------

WHEEL (0.00 + 45.58 + 0.00) = 45.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    35     90   0.66  64.76 -11.51  -7.67   0.00   0.00   0.00  45.58
-------------------------------------------------------------------------

Segment Leq : 55.39 dBA

Total Leq All Segments: 55.39 dBA

Road data, segment # 1: Mill St E
---------------------------------
Car traffic volume  : 10621 veh/TimePeriod  *
Medium truck volume :   610 veh/TimePeriod  *
Heavy truck volume  :   977 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Mill St E
-------------------------------
Angle1   Angle2           : -60.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      3
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 167.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Mill St S
---------------------------------
Car traffic volume  : 10621 veh/TimePeriod
Medium truck volume :   610 veh/TimePeriod
```

```
Heavy truck volume  :   977 veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Mill St S
-------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      5
House density             :     50 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 406.00 m
Receiver height           :   1.50 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Mill St E
------------------------------

Source height = 1.68 m

ROAD (0.00 + 44.39 + 0.00) = 44.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -60     90   0.65  69.13   0.00 -17.32  -1.86   0.00  -5.56   0.00  44.39
-------------------------------------------------------------------------------

Segment Leq : 44.39 dBA

Results segment # 2: Mill St S
------------------------------

Source height = 1.68 m

ROAD (0.00 + 32.54 + 0.00) = 32.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.65  69.13   0.00 -23.70  -4.46   0.00  -8.43   0.00  32.54
-------------------------------------------------------------------------------

Segment Leq : 32.54 dBA

Total Leq All Segments: 44.66 dBA



TOTAL Leq FROM ALL SOURCES:       55.74
```

Appendix E

Measured Vibration Velocity Levels and Acceleration Spectrums

Figure E1a: Pass-by 1 [V1]
Measured Vibratory Velocity Level

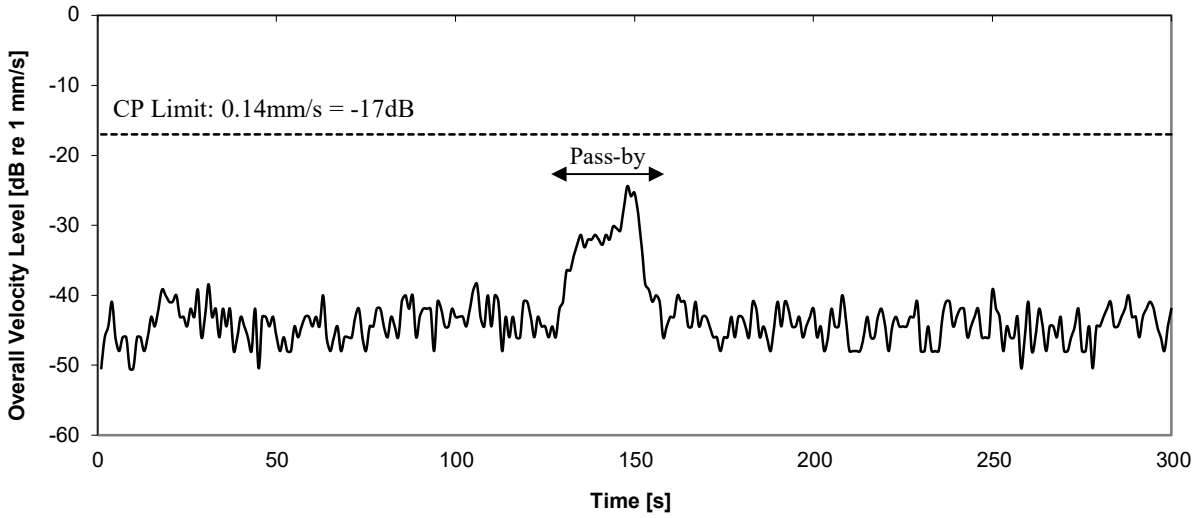


Figure E1b: Pass-by 1 [V1]
Acceleration Spectrum @ Peak Level (1 sec. Duration)

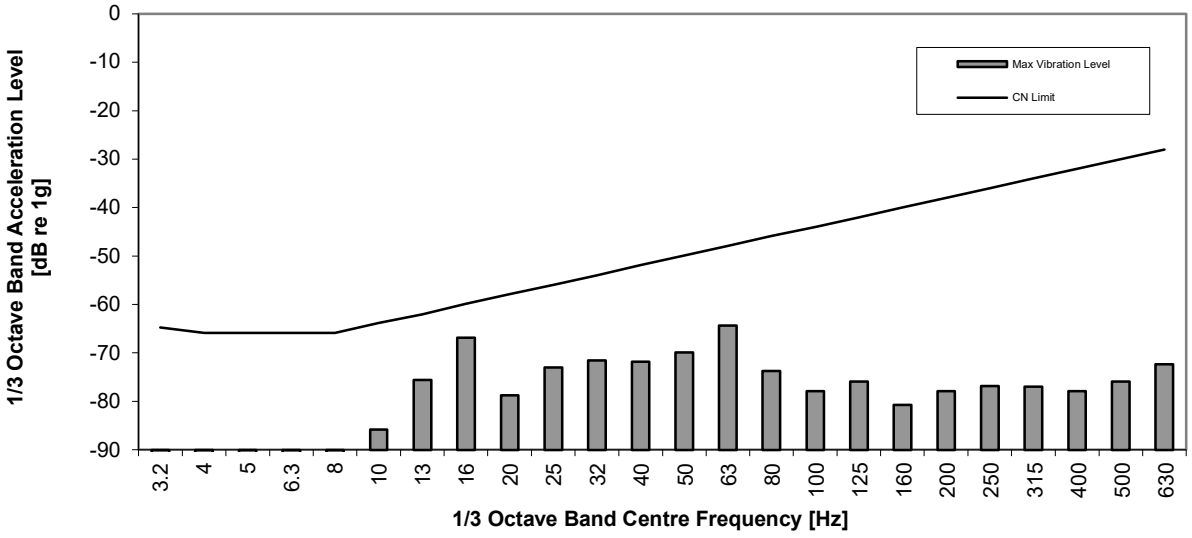


Figure E2a: Pass-by 2 [V1]
Measured Vibratory Velocity Level

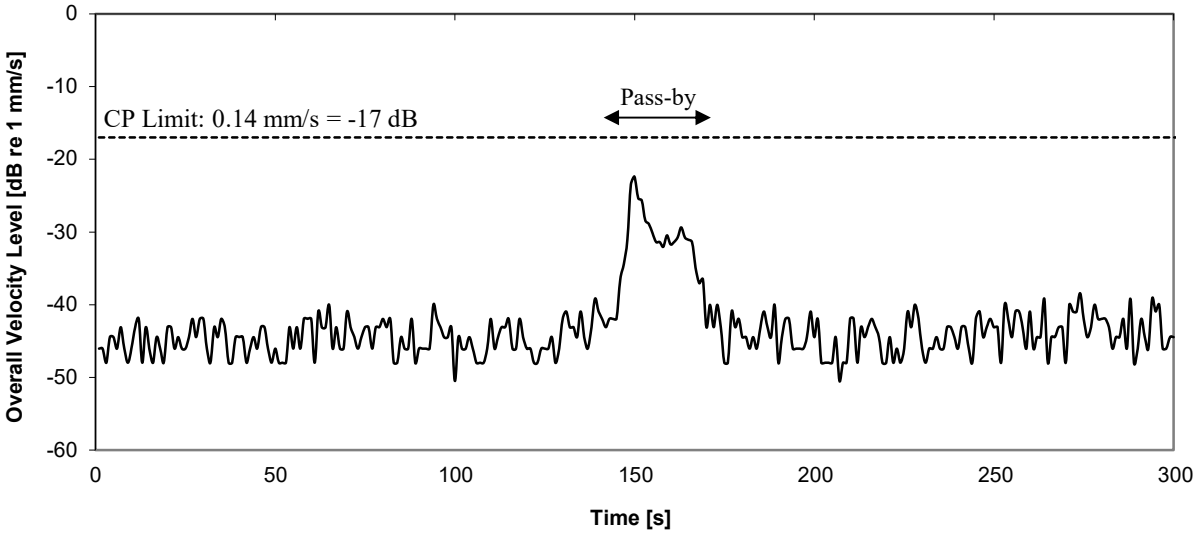


Figure E2b: Pass-by 2 [V1]
Acceleration Spectrum @ Peak Level (1 sec. Duration)

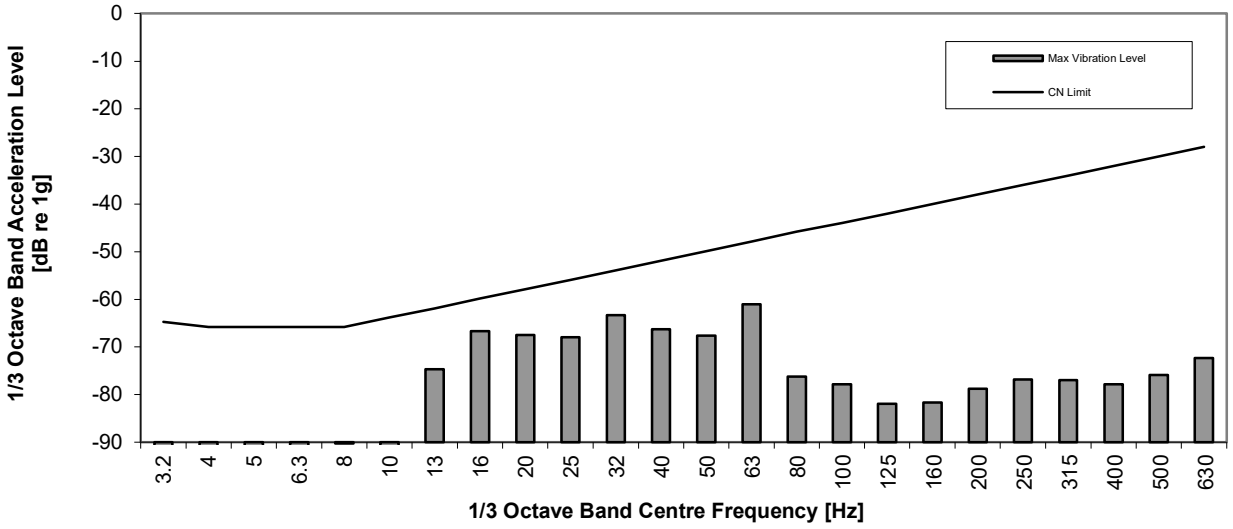


Figure E3a: Pass-by 3 [V1]
Measured Vibratory Velocity Level

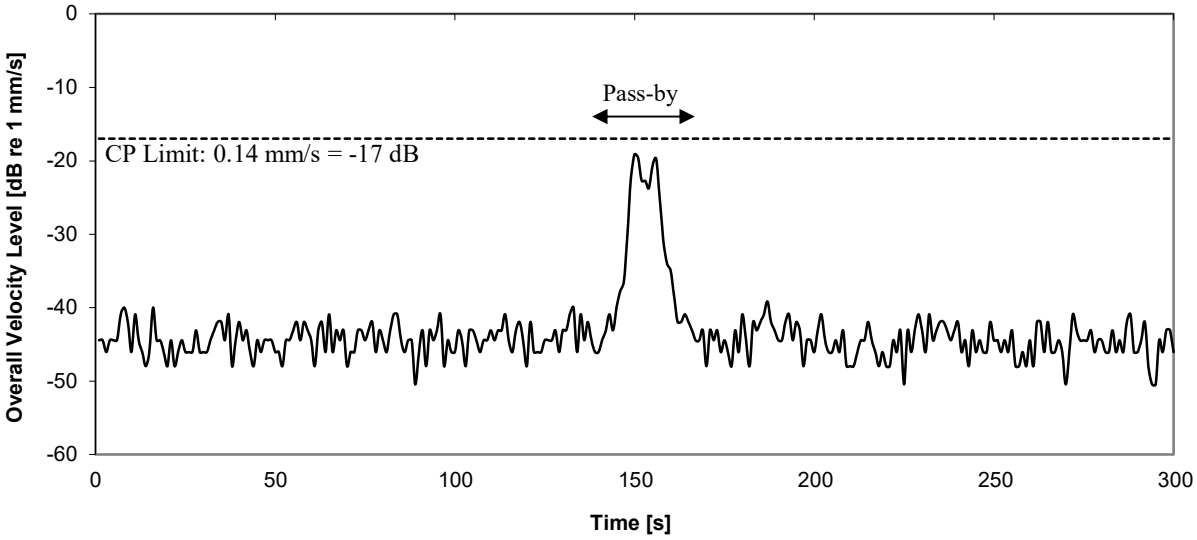


Figure E3b: Pass-by 3 [V1]
Acceleration Spectrum @ Peak Level (1 sec. Duration)

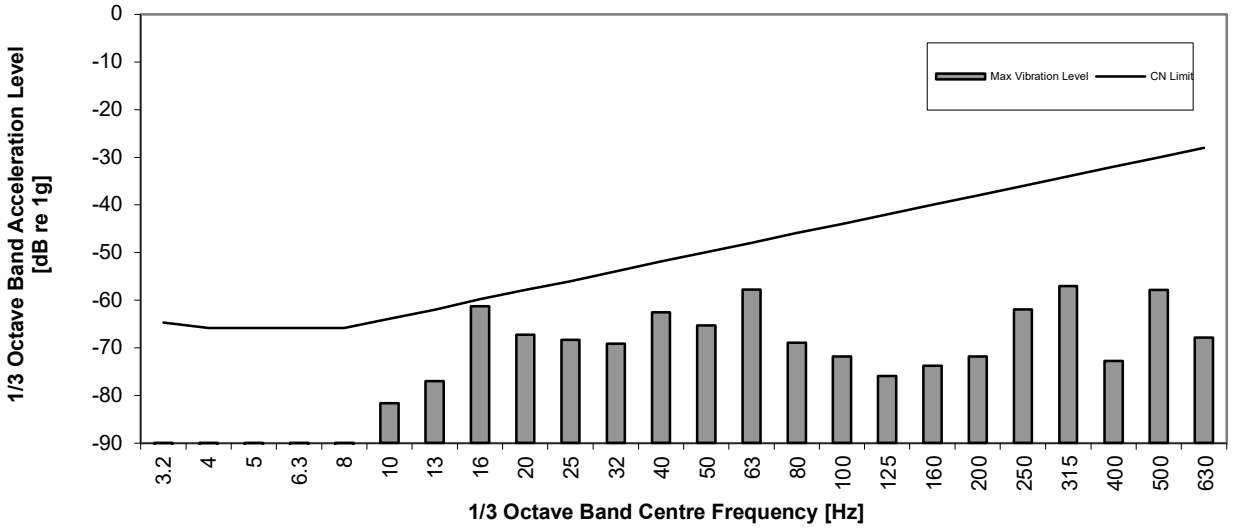


Figure E4a: Pass-by 4 [V1]
Measured Vibratory Velocity Level

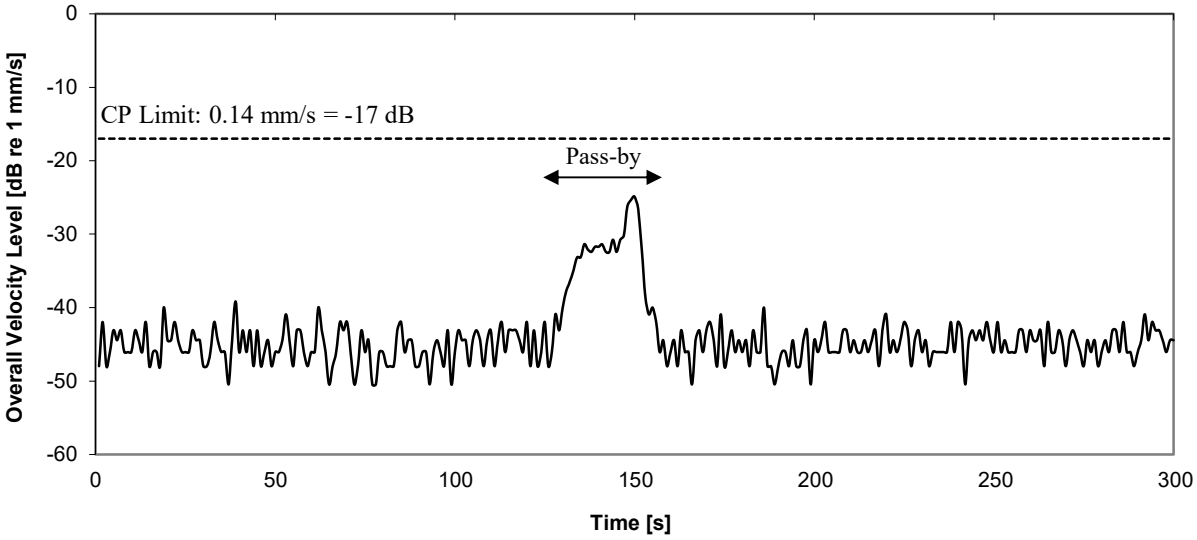


Figure E4b: Pass-by 4 [V1]
Acceleration Spectrum @ Peak Level (1 sec. Duration)

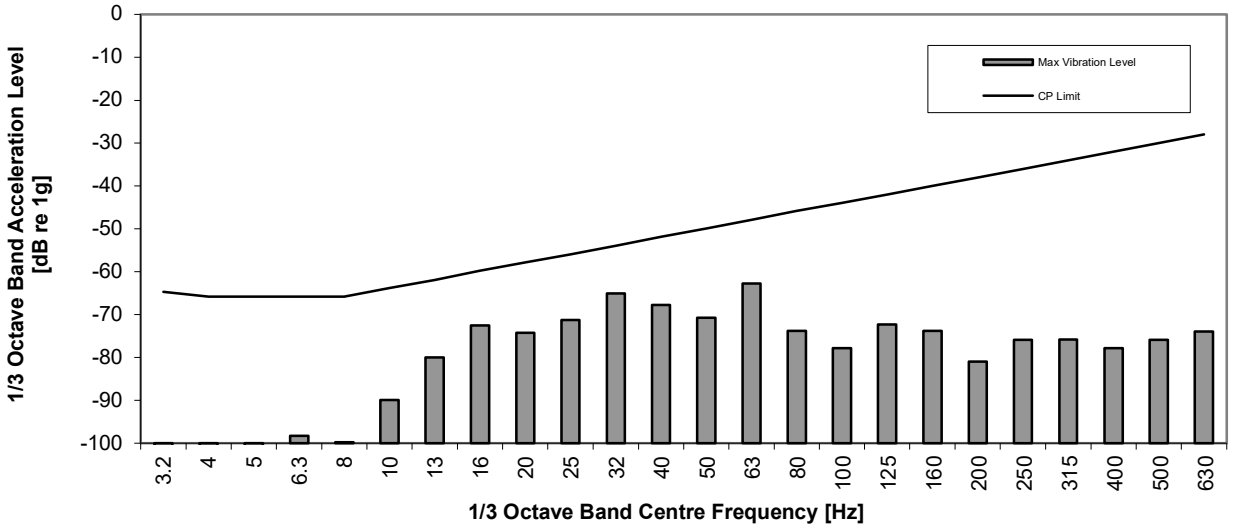


Figure E5a: Pass-by 5 [V1]
Measured Vibratory Velocity Level

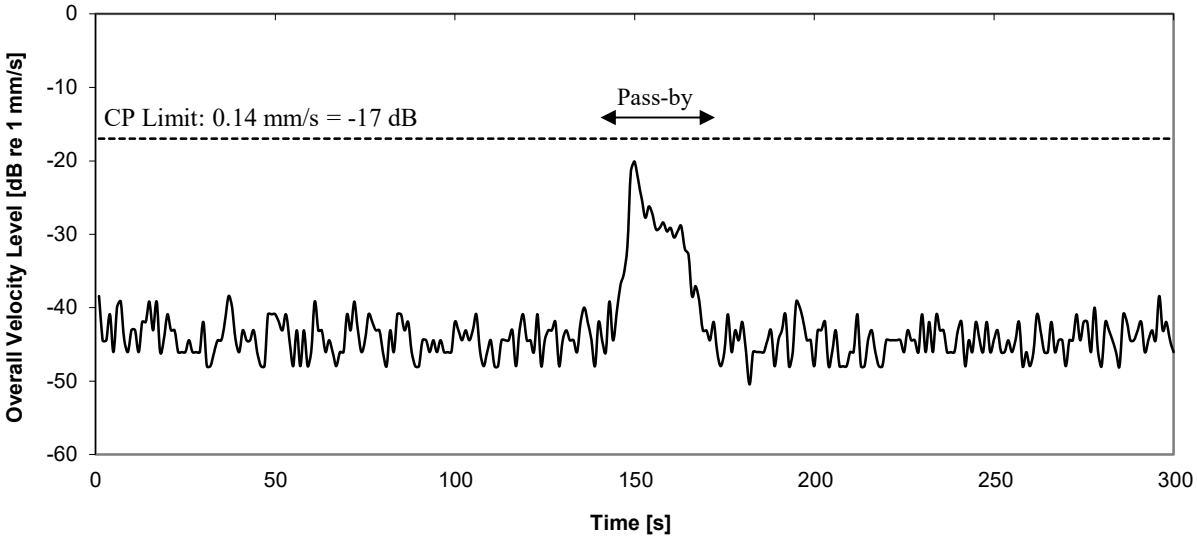


Figure E5b: Pass-by 5 [V1]
Acceleration Spectrum @ Peak Level (1 sec. Duration)