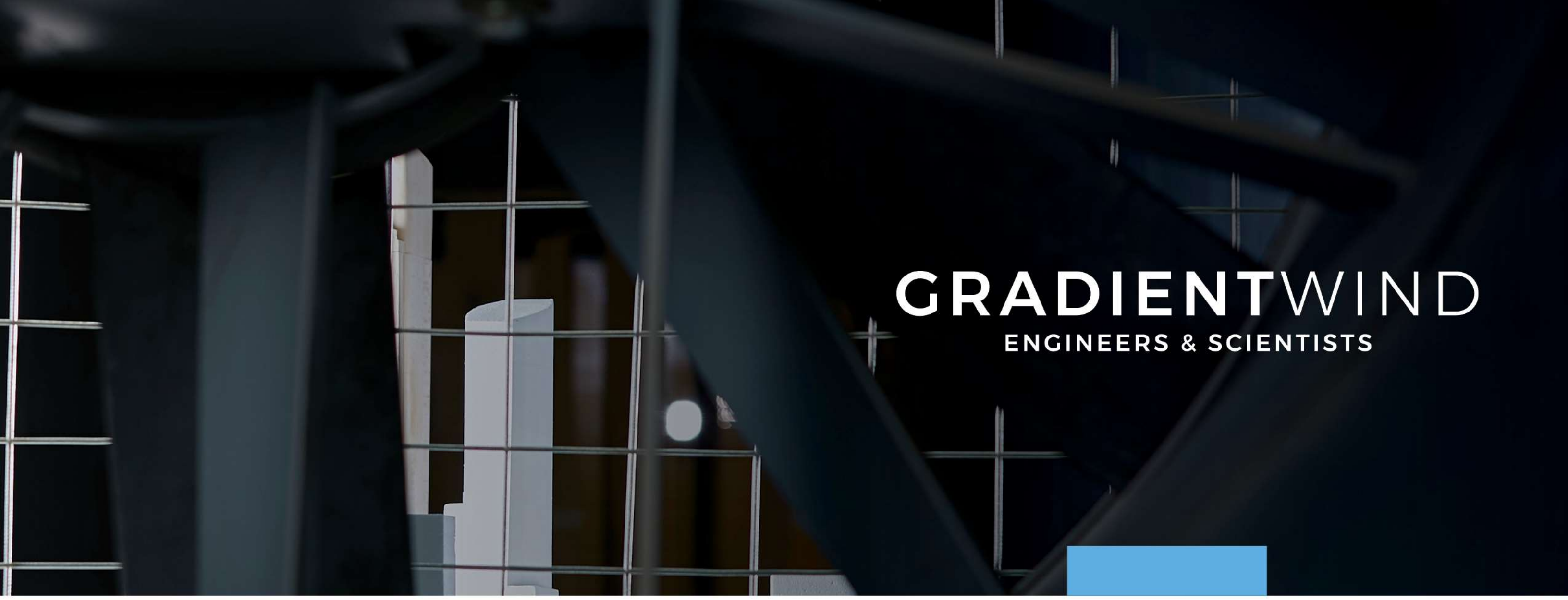
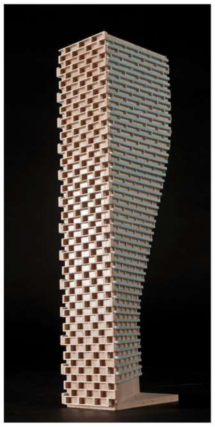
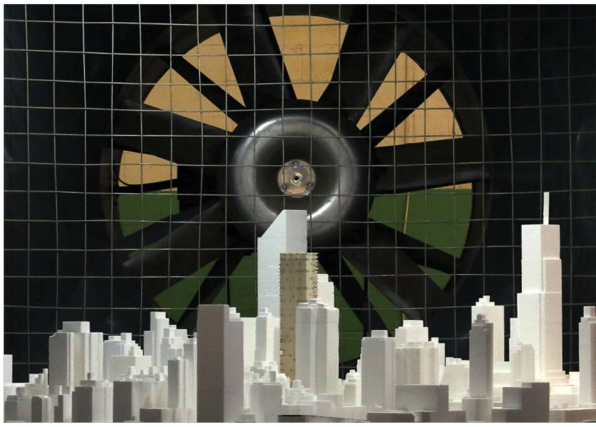


TRANSPORTATION NOISE & VIBRATION FEASIBILITY ASSESSMENT

2233-2235 Hurontario Street
Mississauga, Ontario

Report: 25-253 Transportation Noise and Vibration Feasibility





April 23, 2026

PREPARED FOR
2233 & 2235 Hurontario LTD.
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Toronto, Ontario
M8X 2X3

PREPARED BY
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EXECUTIVE SUMMARY

This report describes a transportation noise and vibration feasibility assessment undertaken in support of zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) applications for the proposed two tower residential development located at 2233-2235 Hurontario Street Mississauga, Ontario. The major sources of transportation noise on the development are the adjacent Hurontario Street (4-lane divided urban arterial), the proposed Hurontario LRT Line (to be put in the centre of Hurontario Street, and Queensway East approximately 200 m to the northwest.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300, Ministry of Transportation Ontario (MTO), (ii) future traffic volumes corresponding to the City of Mississauga roadway classifications and publicly available traffic data (see Appendix A) and (iii) architectural drawings provided by BDP Quadrangle in March 2026.

The results of the current analysis indicate that POW noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the level 2 façade of the shared podium facing Hurontario Street. It is the loudest receptor due to being the most exposed to Hurontario Street and its proposed LRT line. The results show that noise levels predicted due to roadway and LRT traffic exceed 65 dBA at the southwest and southeast facades of the West Tower and podium. For these facades, upgraded building components will be required. An STC rating of 30 for all windows in these areas (shown in Figure 3) is sufficient mitigation. Once detailed suite floor plans and building elevations are developed, detailed design outdoor – indoor noise calculations should be preformed to determine appropriate Sound Transmission Class (STC) ratings for the windows and walls prior to building permit.

The results also indicate that the OLA closest to Hurontario Street, represented by receptor 8, exceeds 60 dBA. Preliminary barrier analysis shows that a 2.5 m tall noise barrier may reduce the noise level to 55 dBA. The noise barrier would need to be built with no gaps, and materials having a surface density of 20 kg/m^2. The barrier is shown in Figure 4.

Noise levels at the central amenity area between the towers on Level 7 (represented by R9) and the southwest terrace at Level 8 of the east tower (presented by R10), exceed 55 dBA but fall below 60 dBA. Preliminary barrier analysis showed that noise barriers were unsuccessful in mitigating noise levels to 55 dBA. Thus, a Type A Warning Clause must be included in all relevant Purchase, Sale, and Lease Agreements. See Section 6 for a summary of the Type A Warning Clause.

The results of the calculations also indicate that the West Tower and podium will require air conditioning, which would allow windows and doors to remain closed (if desired) to ensure a quite and comfortable indoor environment. The east portion of the building would require provisions for air conditioning; however, it would be expected based on the type of building that an air conditioning (or similar) systems would be incorporated into the design. In such a case, the Type D Warning Clause is necessary for all Purchase, Sale and Lease Agreements.

Estimated vibration levels at the foundation of the southwest side of the West Tower (the building closest to the LRT) fall well below the ground vibration criterion. As vibration levels are acceptable, regenerated noise levels are also expected to be acceptable. No vibration mitigation is required.

Surroundings include midrise residential buildings to the east, north and west of the development, and the Mississauga Hospital campus to the south. Apart from small root top air conditioning units there are no significant sources of stationary noise sources. Given higher level of background noise due to traffic along Hurontario Street, stationary noise impacts are not anticipated to be significant.

The proposed heating and cooling equipment associated with the development will be designed to comply with the NPC-300 sound level limits, by judicious selection of the equipment and placing it on high roof away from sensitive receivers. Where necessary noise screens or silencers can be incorporated into the design. As such no impacts are anticipated from the development on to the surroundings and the development itself.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 2233 & 2235 Hurontario LTD. to undertake a transportation noise feasibility and ground vibrations assessment, in support of zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) applications for the proposed two tower residential development located at 2233-2235 Hurontario Street Mississauga, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local transportation traffic, and the vibration levels generated by the nearby proposed Hurontario LRT Line.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1], Ministry of Transportation Ontario (MTO)[2]. Noise calculations were based on architectural drawings provided by BDP Quadrangle in March 2026, with future traffic volumes corresponding to the City of Mississauga roadway classifications and publicly available traffic data (see Appendix A).

2. TERMS OF REFERENCE

The focus of this traffic noise feasibility assessment is a proposed development comprising of two towers sharing a podium with staggered setbacks. The site is northeast of Hurontario Street, which is the main source of noise, and is approximately 200 m southeast of Queensway East. A proposed LRT line is planned to run through Hurontario Street. Since the Hurontario Street LRT is about 24 m from the proposed development, it also a source of ground vibration since it is within 75 metres (m) of the subject site. Therefore, ground vibrations are also considered as part of this study.

The proposed development comprises two residential towers rising, both rising 35-storeys to the east and west, respectively, on a shared stepped six and seven-storey podium with a slight 'V'-shaped planform. The tower closest to Hurontario Street is labeled as West Tower, and the east tower farthest from Hurontario Street is labeled as East Tower, for the purposes of this report (see Figure 1).

---

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[2] Ministry of Transportation Ontario, "*Environmental Guide for Noise*", August 2021

At grade is a central lobby shared by both towers, office and retail space, surface parking space, indoor amenities, and a ramp leading to three levels of below-grade parking. The mezzanine makes space for bicycle parking. Levels 2-6 are mostly occupied by residential units but also includes locker space. The planform around West Tower and the portion of the podium connecting the two towers sets back at Level 7 with an outdoor amenity on its roof. Level 7 of West Tower is dedicated to an indoor amenity, and the third of Level 7 for East Tower facing the outdoor amenity is an indoor amenity. The remaining portion of Level 7 in East Tower is dedicated to residential units. The planform sets back once more around East Tower at Level 8, where there is an outdoor amenity area. The East Tower Level 8 is dedicated to an indoor amenity. The remaining floors of both towers up to level 34 are made up of residential units. Half of Level 35 for both towers is taken up by indoor amenities, and the rest of the space for residential units. Both towers are topped by Mechanical Penthouses (MPH).

The subject site is directly surrounded by existing residential mid and high rises. Iggy Kaneff Park is found behind one row of apartment buildings to the northeast. The Mississauga Hospital Campus is found on the opposite side of Hurontario Street from the subject site. To properly account for reflection impacts from the transportation noise, the planned rebuild of the campus into the Peter Gilgan Mississauga Hospital is considered in the model. Figure 1 presents the subject site and the surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local transportation sources, (ii) predict vibration levels on the study building produced from the subway system, and (iii) explore potential noise mitigation where required.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. NPC-300 specifies that the recommended indoor noise limit for various spaces in the development are listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [3]

Type of Space	Time Period	L_{eq} (dBA)
		Road
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	07:00 - 23:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

[3] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Table C-9
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. In this study, the podium roofs in this development were considered as outdoor amenity areas, and as such, defined as an OLA.

4.2.2 Roadway Traffic Volumes

The NPC-300 dictates that noise calculations should consider future sound levels based on roadways' classification and the railway transit systems at the mature state of development. Thus, traffic volumes are based on roadway classifications outlined in the City of Mississauga's Transportation Master Plan[7] (TMP). The Ultimate Traffic for Hurontario Street is based on data provided by the City of Mississauga, as seen in Appendix A. AADT for Queensway East was taken from the Peel Region's open dataset[8] (see Appendix A). The truck volume percentage for Hurontario Street was given in the data provided by the City of Mississauga, and the truck volume percentage for Queensway East was assumed to be 3.15% heavy and 3.85% medium. This assumption uses the truck volume percentage from the Hurontario data, due to the absence of the detail from the open dataset. The day and night split for both roadways was assumed to be 90/10 and the annual growth rate was assumed to be 2% per year. The projected AADT year was selected to be 2038 because the year of maturity was assumed to be 10 years after the construction of the project (assumed to be 2 years after the release of this report).

Hurontario LRT volumes are based on data presented in Appendix B.6. of the Environmental Project Report, dated June 2014[9]. Table 2 on the proceeding page presents the transportation traffic data used in this assessment.

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[7] Mississauga Transportation Master Plan, May 2019
[8] Peel Region Traffic Count Station, November 2019 [Last Updated March 2025]
[9] Hurontario-Main LRT Project: Environmental Project Report Appendix B.6, June 2014

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway/ Transit Class	Speed Limit (km/h)	Projected 2038 AADT Count	Day/Night Split (%)	Truck Volume Percentages	
					Medium	Heavy
Hurontario Street	4-Lane Urban Divided Arterial	50	49,528	90/10	3.85	3.15
Queensway East	4-Lane Urban Divided Arterial	60	29,193	90/10	3.85	3.15
Proposed Hurontario Line	LRT	50	**560/88***		-	-

**Day/night traffic split*

4.2.3 Theoretical Roadway Traffic Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program CadnaA which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) version 2.5 to represent the roadways as line sources. The CadnaA computer program can represent three-dimensional surfaces and the three orders of reflection of sound waves over a suitable spectrum for human hearing.

The TNM analysis model has been recognized by the Ministry of Transportation Ontario (MTO) as the recommended noise model for transportation projects (ref. Environmental Guide for Noise, 2022 by the Ministry of Transportation (MTO)[10]). The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[11]. A total of 12 receptors, as shown in Figure 2, were modeled in this study.

[10] Ministry of Transportation, Environmental Guide for Noise, 2022. Retrieved from Environmental Guide for Noise 2022

[11] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and
Rail Traffic", Draft February 12, 2020

Noise predictions from CadnaA were supported by the MECP computerized noise assessment program, STAMSON 5.04. Appendix B includes the STAMSON 5.04 input and output data. However, STAMSON is older software, which requires each receptor to be calculated separately. STAMSON also does not accurately account for building reflections and multiple screening elements, and curved road geometry. Considering these factors, the results given by CadnaA were used to determine noise control and building Warning Clause recommendations.

- Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- The Hurontario LRT Line is modelled as a 4-car SRT in STAMSON.

4.3 Ground Vibration and Ground-borne Noise

Transit systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more often, a complex layering of soils and rock strata. Also, similar to sound waves in air, ground vibrations produce perceptible motions and regenerated noise known as 'ground-borne noise' when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when there is excitation of the ground, such as from a train or subway. Repetitive motion of the wheels on the track or rubber tires passing over an uneven surface causes vibration to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a unique noise signature.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical units of ground vibration measures are millimeters per second (mm/s), or inch per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is common practice to use the reference value of one micro-inch per second (µin/s) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

4.3.1 Ground Vibration Criteria

The Canadian Railway Association and Canadian Association of Municipalities have set standards for new sensitive land developments within 300 metres of a railway right-of-way, as published in their document *Guidelines for New Development in Proximity to Railway Operations*[12], which indicate that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one second time-period at the first floor and above of the proposed building.

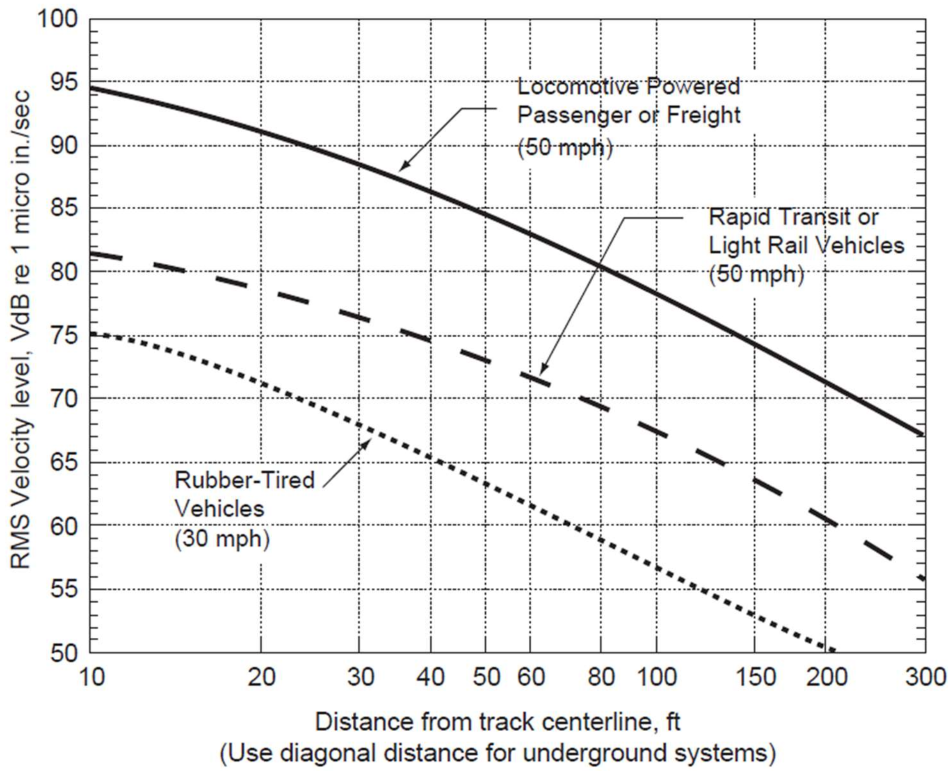
[12] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

4.3.2 Theoretical Ground Vibration Prediction Procedure

Potential vibration impacts of the trains were predicted using the Federal Transit Authority's (FTA) *Transit Noise and Vibration Impact Assessment*[13] protocol. The FTA general vibration assessment is based on an upper bound generic set of curves that show vibration level attenuation with distance. These curves, illustrated in the figure on the following page, are based on ground vibration measurements at various transit systems throughout North America. Vibration levels at points of reception are adjusted by various factors to incorporate known characteristics of the system being analyzed, such as operating speed of vehicle, conditions of the track, construction of the track and geology, as well as the structural type of the impacted building structures. The vibration impact on the building was determined using a set of curves for Rapid Transit at a speed of 50 mph. Adjustment factors were considered based on the following information:

- The maximum operating speed of the LRT line is 31 mph (50 km/h) at peak.
- The setback distance between the development and the closest track is 24 m.
- The vehicles are assumed to have soft primary suspensions.
- Tracks are not welded, though in otherwise good condition.
- Soil conditions do not efficiently propagate vibrations.
- The building's foundation will bear on bedrock.

[13] John A. Volpe National Transportation Systems Center, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, September 2018



FTA GENERALIZED CURVES OF VIBRATION LEVELS VERSUS DISTANCE
(ADOPTED FROM FIGURE 10-1, FTA TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT)

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. Table 3 presents the receptor sound levels as calculated in CadnaA. A couple exterior amenities on Buildings B and C are not accounted for with OLAs because OLAs measured on those buildings return sound levels low enough to assume similar guideline compliance for all OLAs on those buildings.

TABLE 4: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Roadway Noise Level (dBA)	
			Day	Night
R1	6.7	POW - West Tower Level 2 – Southwest Façade	68	62
R2	108.4	POW - West Tower Level 34 – Southwest Façade	68	61
R3	108.4	POW - West Tower Level 34 – Southeast Façade	64	57
R4	108.4	POW - West Tower Level 34 – Northwest Façade	62	55
R5	108.4	POW - West Tower Level 34 – Northeast Façade	57	51
R6	108.4	POW - East Tower Level 34 – Southeast Façade	59	52
R7	108.4	POW - East Tower Level 34 – Northwest Façade	59	53
R8	22.9	OLA - West Tower Level 7– Southwest Portion	68	N/A*
R9	22.9	OLA - West Tower Level 7 – Central Portion	60	N/A*
R10	28.3	OLA - East Tower Level 8 – Southwest Portion	59	N/A*
R11	108.4	POW - West Tower Level 34 – Southeast Façade, Southern Portion	66	60
R12	108.4	POW - West Tower Level 34 – Northwest Façade, Southern Portion	63	57

*Noise levels during the nighttime are not considered for OLAs

The results of the current analysis indicate that POW noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the level 2 façade of the shared podium facing Hurontario Street. It is the loudest receptor due to being the most exposed to Hurontario Street and its proposed LRT line.

Upgraded building components, including STC rated glazing elements and exterior walls, will be required where noise levels exceed 65 dBA, as discussed in Section 4.2.1. The noise levels predicted due to roadway and LRT traffic exceed 65 dBA at the southwest and southeast facades of the West Tower and podium. An STC rating of 30 for all windows in these areas (shown in Figure 3) is sufficient mitigation. Once detailed suite floor plans and building elevations are developed, detailed design outdoor – indoor noise calculations should be preformed to determine appropriate Sound Transmission Class (STC) ratings for the windows and walls prior to building permit.

The results of the calculations also indicate that the West Tower and podium will require air conditioning which would allow windows and doors to remain closed (if desired) to ensure a quite and comfortable indoor environment. The east portion of the building would require provisions for air conditioning; however, it would be expected based on the type of building that an air conditioning (or similar) systems would be incorporated into the design. In such a case, the Type D Warning Clause is necessary for all Purchase, Sale and Lease Agreements (see Section 6).

Table 5 below outlines the correlation calculation results between CadnaA and STAMSON 5.04. Since the results differ between ±3 dBA, CadnaA is deemed an acceptable analogous method to STAMSON 5.04. Calculations made in STAMSON are presented in Appendix B.

TABLE 5: RESULT CORRELATION WITH STAMSON

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)		CadnaA Noise Level (dBA)	
			Day	Night	Day	Night
R3	108.4	POW - West Tower Level 34 – Southeast Façade	64	58	64	57
R8	22.9	OLA - West Tower Level 7– Southwest Portion	65	N/A*	68	N/A*

*Noise levels during the nighttime are not considered for OLAs

The southwest terrace on Level 7 (represented by R8) exceeds 60 dBA. Preliminary barrier analysis shows that a 2.5 m tall noise barrier installed around the perimeter of the terrace, as presented in Figure 4, would provide sufficient noise level mitigation. The noise barriers would need to be built with no gaps, and materials having a surface density of 20 kg/m^2.

Noise levels at the central amenity area between the towers on Level 7 (represented by R9) and the southwest terrace at Level 8 of the east tower (presented by R10), exceed 55 dBA but fall below 60 dBA. these areas are already screened by the building massing, and preliminary noise barrier analysis showed that it was unfeasible to reduce noise levels on the terraces any further. Thus, all Lease Purchase, and Sale Agreements should include a Type A Warning Clause, see Section 6.

5.2 Ground Vibrations and Ground-Borne Noise Levels

Estimated vibration levels at the foundation nearest to the Hurontario LRT (southwest façade of the shared podium) are expected to be 0.031 mm/s (62 dBV), based on the FTA protocol. The site has an offset distance of 24 m to the centreline of the proposed Hurontario Line LRT. Details of the calculation are provided in Appendix C. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the foundation, concerns due to vibration impacts are not expected. As vibration levels are acceptable, regenerated noise levels are also expected to be acceptable. No vibration mitigation is required.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that POW noise levels will range between 57 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the level 2 façade of the shared podium facing Hurontario Street. It is the loudest receptor due to being the most exposed to Hurontario Street and its proposed LRT line.

The results show that noise levels predicted due to roadway and LRT traffic exceed 65 dBA at the southwest and southeast facades of the West Tower and podium. For these facades, upgraded building components will be required. An STC rating of 30 for all windows in these areas (shown in Figure 3) is sufficient mitigation. Once detailed suite floor plans and building elevations are developed, detailed design outdoor – indoor noise calculations should be preformed to determine appropriate Sound Transmission Class (STC) ratings for the windows and walls prior to building permit.

The results also indicate that the OLA closest to Hurontario Street, represented by receptor 8, exceeds 60 dBA. Preliminary barrier analysis shows that a 2.5 m tall noise barrier may reduce the noise level to 55 dBA. The noise barrier would need to be built with no gaps, and materials having a surface density of 20 kg/m^2. The barrier is shown in Figure 4.

Noise levels at the central amenity area between the towers on Level 7 (represented by R9) and the southwest terrace at Level 8 of the east tower (presented by R10), exceed 55 dBA but fall below 60 dBA. Preliminary barrier analysis showed that noise barriers were unsuccessful in mitigating noise levels to 55 dBA. Thus, the following Type A Warning Clause must be included in all relevant Purchase, Sale, and Lease Agreements:

Type A

> *"Purchasers/tenants are advised that sound levels due to increasing road 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."*

The results of the calculations indicate that the West Tower and podium will require air conditioning which would allow windows and doors to remain closed (if desired) to ensure a quite and comfortable indoor environment. The east portion of the building would require provisions for air conditioning; however, it would be expected based on the type of building that an air conditioning (or similar) systems would be incorporated into the design. In such a case, the Type D Warning Clause is necessary for all Purchase, Sale and Lease Agreements, as shown on the proceeding page:

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."*

Estimated vibration levels at the foundation of the southwest side of the West Tower (the building closest to the LRT) fall well below the ground vibration criterion. As vibration levels are acceptable, regenerated noise levels are also expected to be acceptable. No vibration mitigation is required.

Surroundings include midrise residential buildings to the east, north and west of the development, and the Mississauga Hospital campus to the south. Apart from small root top air conditioning units there are no significant sources of stationary noise sources. Given higher level of background noise due to traffic along Hurontario Street, stationary noise impacts are not anticipated to be significant.

The proposed heating and cooling equipment associated with the development will be designed to comply with the NPC-300 sound level limits, by judicious selection of the equipment and placing it on high roof away from sensitive receivers. Where necessary noise screens or silencers can be incorporated into the design. As such no impacts are anticipated from the development on to the surroundings and the development itself.

This concludes our transportation noise feasibility and ground vibrations assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

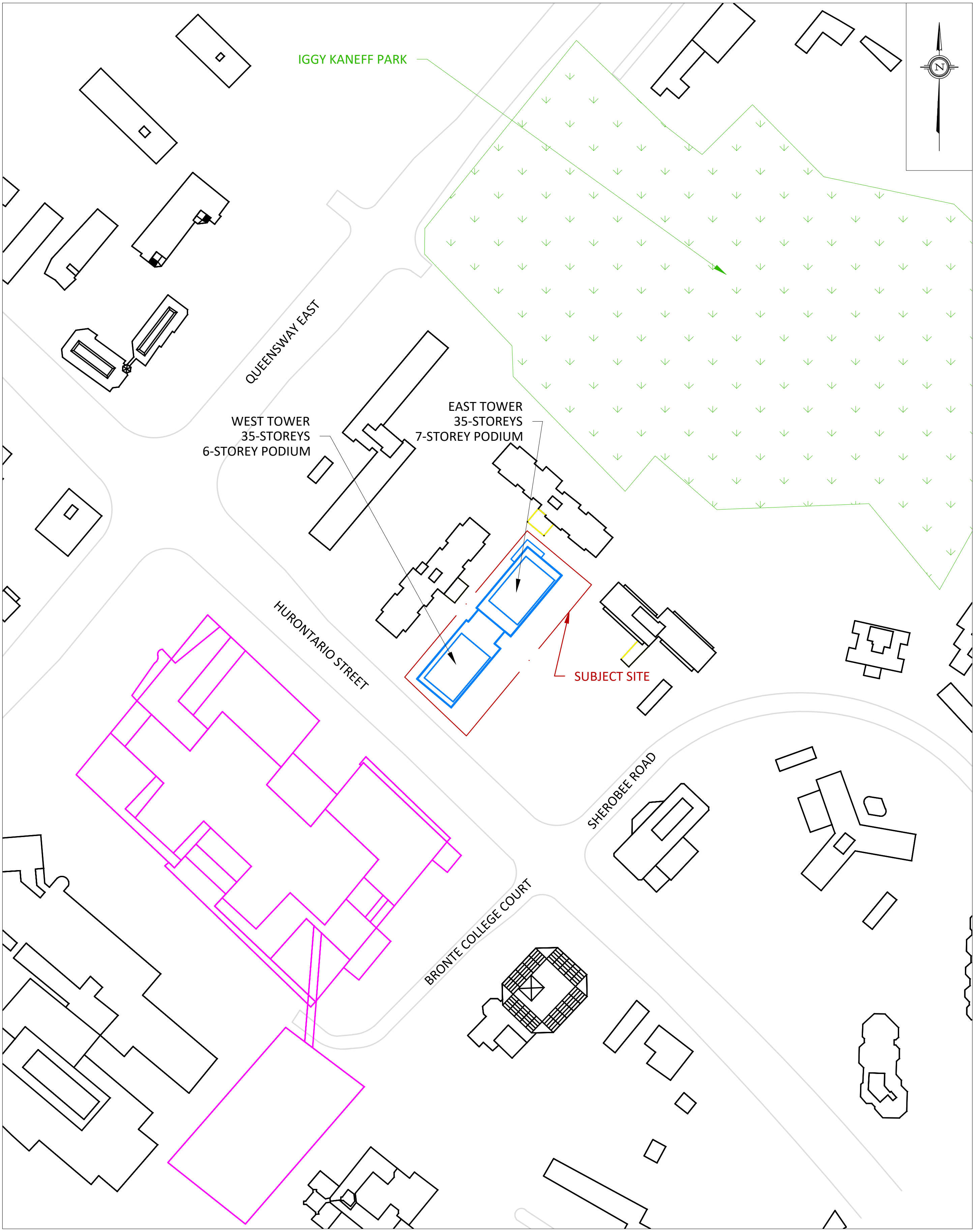
Sincerely,

Gradient Wind Engineering Inc.

Michael Pantano, M.A.Sc.
Junior ANV Scientist

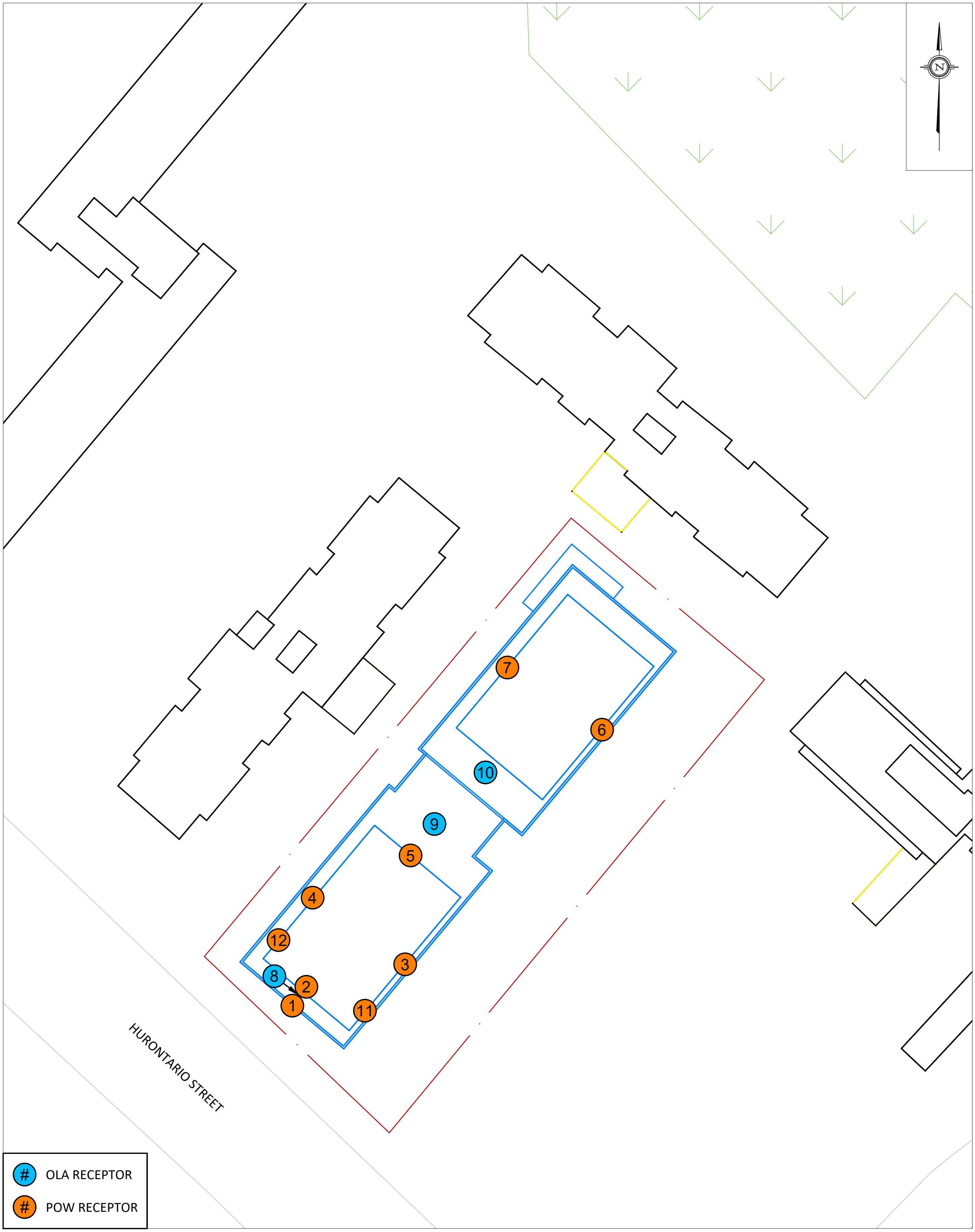
Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 25-253 Transportation Noise and Ground Vibration Feasibility



GRADIENTWIND
ENGINEERS & SCIENTISTS
127 WALGREEN ROAD, OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	2233-2235 HURONTARIO STREET, MISSISSAUGA TRANSPORTATION NOISE AND GROUND VIBRATIONS ASSESSMENT
SCALE	1:3000 (APPROX.)
DRAWING NO.	25-253-1
DATE	MARCH 20, 2026
DRAWN BY	M.P.
DESCRIPTION	FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT



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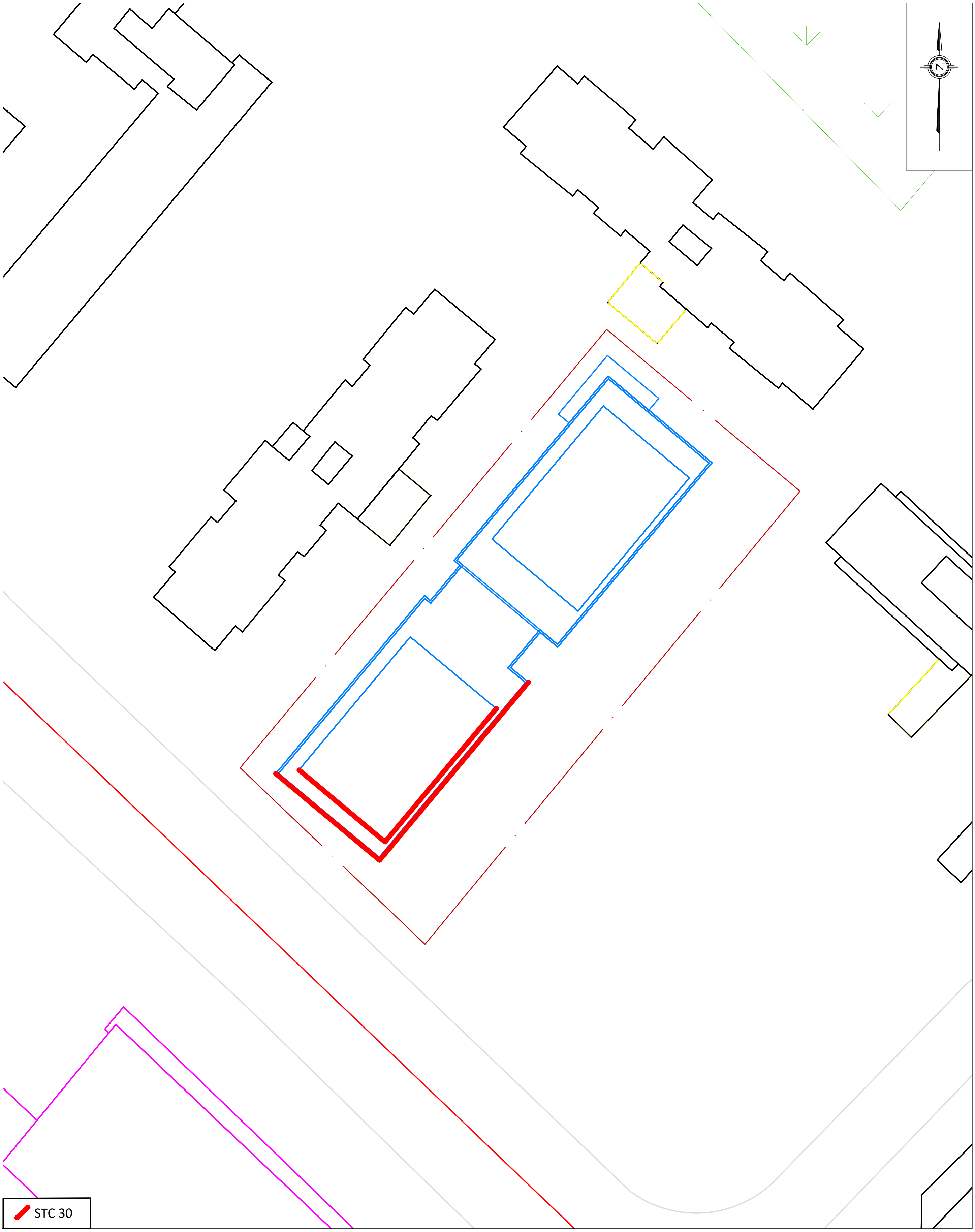
PROJECT	2233-2235 HURONTARIO STREET, MISSISSAUGA TRANSPORTATION NOISE AND GROUND VIBRATIONS ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	25-253-2
DATE	MARCH 25, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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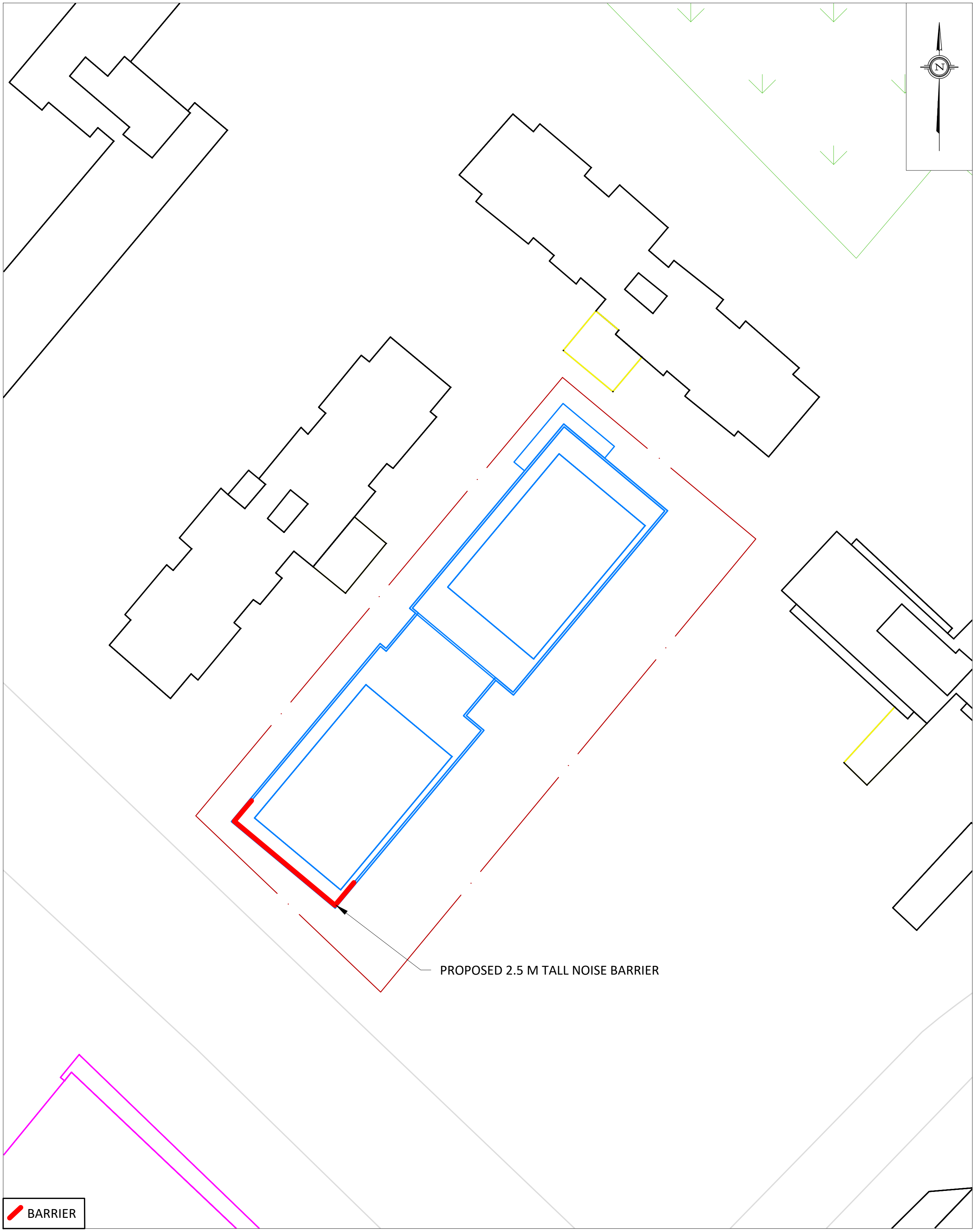
PROJECT	2233-2235 HURONTARIO STREET, MISSISSAUGA TRANSPORTATION NOISE AND GROUND VIBRATIONS ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	25-253-3
DATE	MARCH 26, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE 3:
STC RECOMMENDATIONS



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PROJECT	2233-2235 HURONTARIO STREET, MISSISSAUGA TRANSPORTATION NOISE AND GROUND VIBRATIONS ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	25-253-4
DATE	MARCH 26, 2026	DRAWN BY	M.P.

DESCRIPTION

FIGURE 4:
POTENTIAL BARRIER

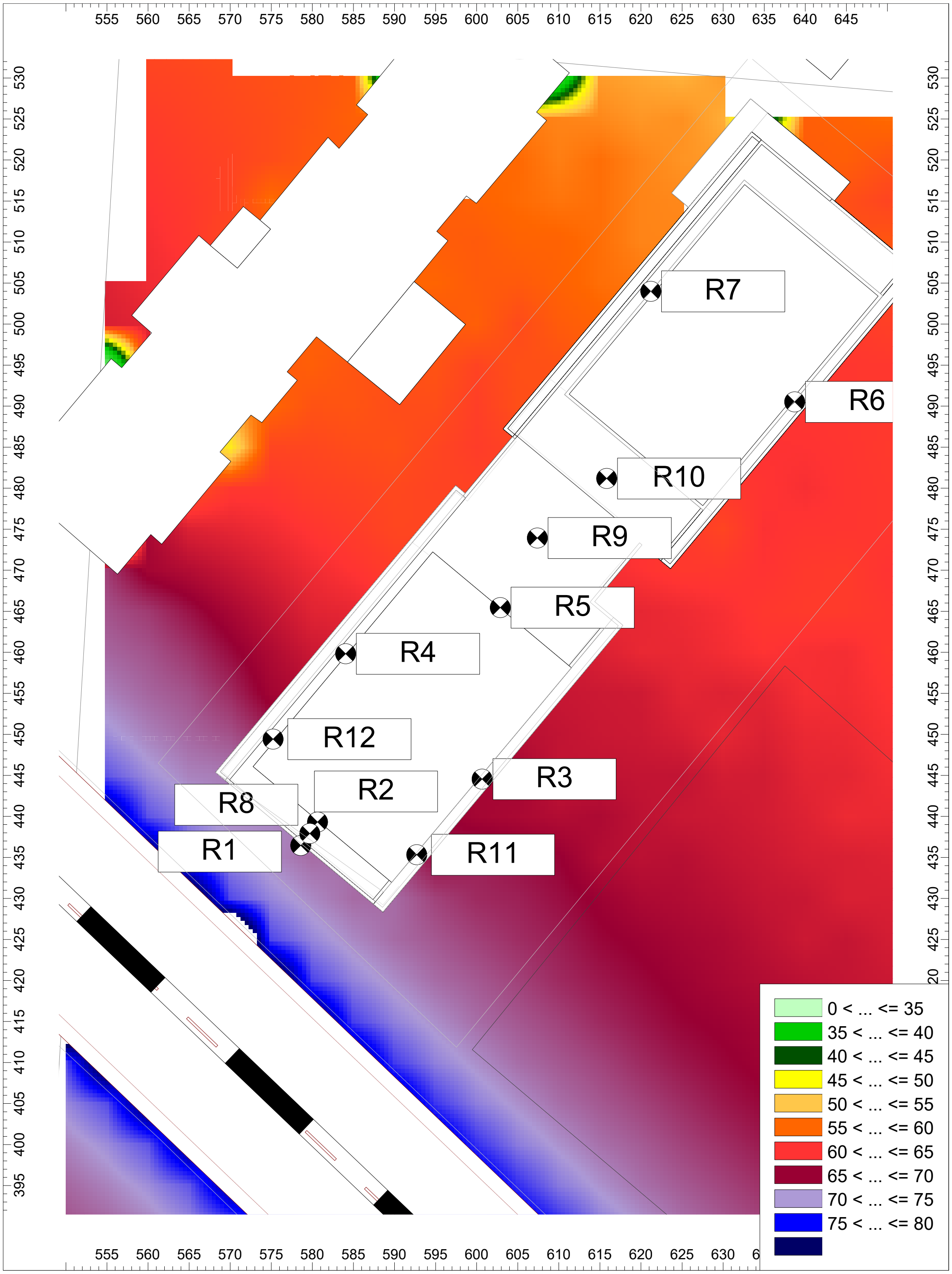


FIGURE 5: DAYTIME TRANSPORTATION NOISE CONTOURS (4 M ABOVE GRADE)

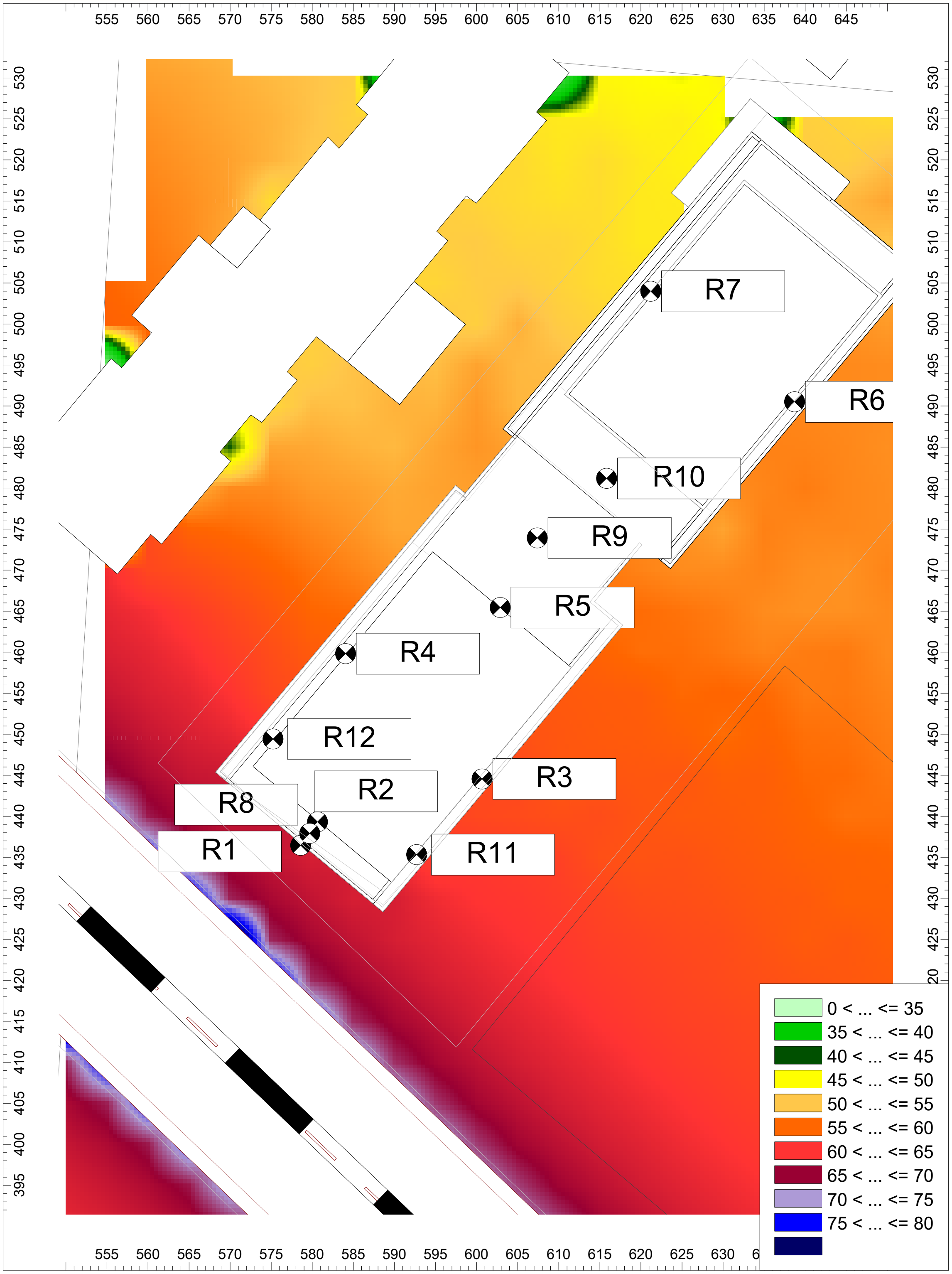
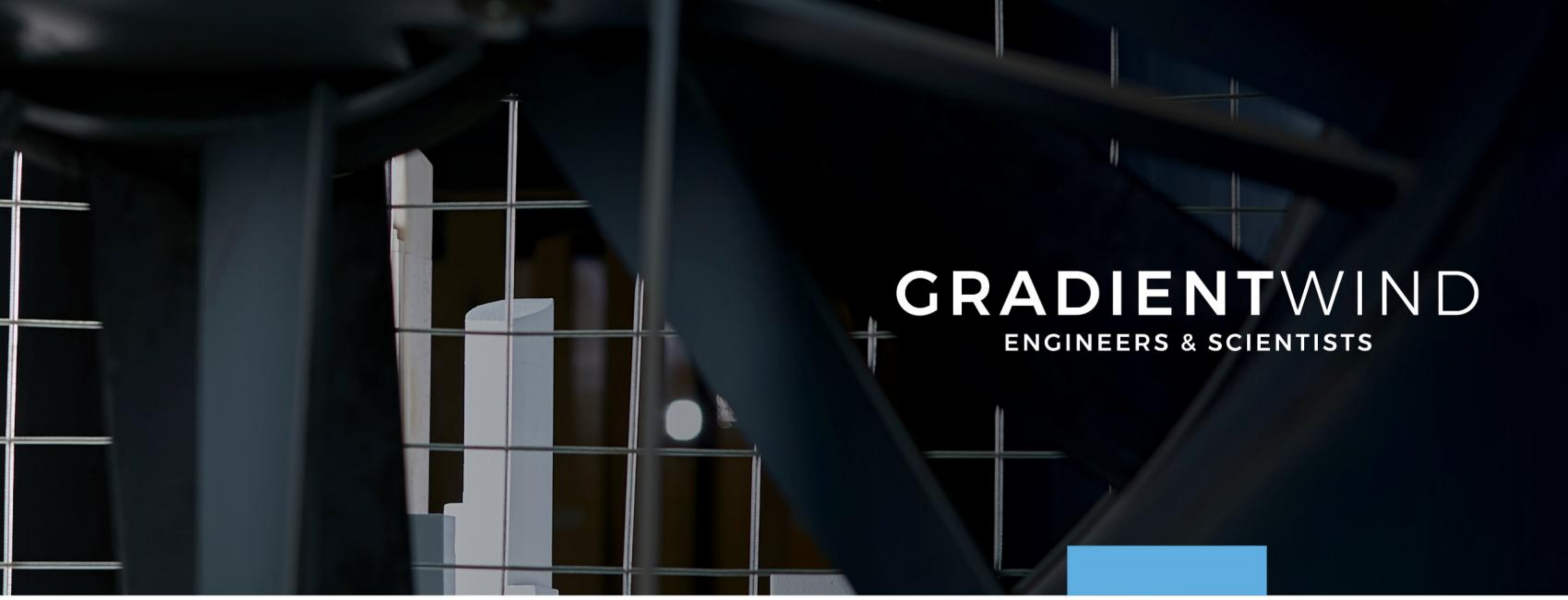
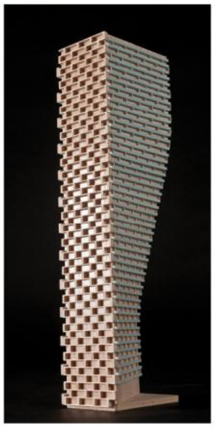
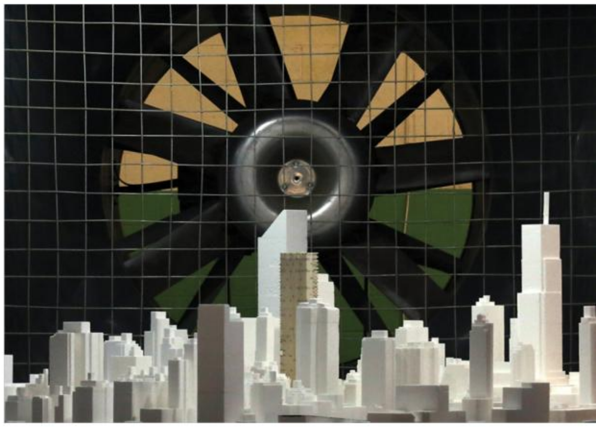


FIGURE 6: NIGHTTIME TRANSPORTATION NOISE CONTOURS (4 M ABOVE GRADE)







APPENDIX A

TRAFFIC DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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Raw Roadway Traffic Data

Publicily Avaliable Traffic Data For Queensway East. Obtained from the Region of Peel

OBJECTID	STATION_ID	NUM_LANES	MEDIAN	MED_TYPE	TURN_LANE	LONGITUTE	LATITUDE	UTM_E	UTM_N	ROAD_NAME	LOCATION	DIR	COUNT_TYPE	Y_2017_NE	Y_2017_SW
763	2004925	4	Y	RAISED	3	-79.6059056	43.575579	612564.5	4825679	QUEENSWAY	0.3 KM WEST OF CAMILLA RD.	EW	DIRECTIONAL	7723	11538

Data request for Hurontario Street obtained from the City of Mississauga

Date: 12-Apr-23

NOISE REPORT FOR PROPOSED DEVELOPMENT

REQUESTED BY:

Name: Essraa Alquassab

Company: Gradient Wind Consulting

PREPARED BY:

Name: Naveda Dukhan

Tel#: 905-615-3200 ext.8948

MISSISSAUGA

Location: 1. Hurontario St @ Park St. E

ID# 587

ON SITE TRAFFIC DATA

Specific	Street Names				
	1. Hurontratio St.@ Park St. E				
AADT:	36800				
# of Lanes:	4 Lanes				
% Trucks:	7%				
Medium/Heavy Trucks Ratio:	55/45				
Day/Night Split:	90/10				
Posted Speed Limit:	50km/hr				
Gradient Of Road:	2%				
Ultimate R.O.W:	30m				

Comments:

Ultimate Traffic Only (2041)

There is a proposed LRT line along Hurontario Street. Existing lanes may be converted from 6 lanes to 4 lanes with 2 LRT lines in the middle.

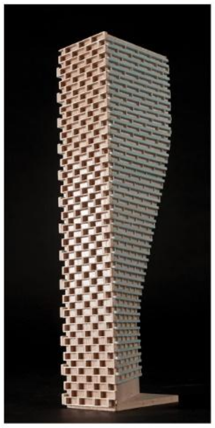
Please contact Rory O'Sullivan @ (905) 615-3200 ext. 8813 or Rory.OSullivan@mississauga.ca for more info regarding LRT.

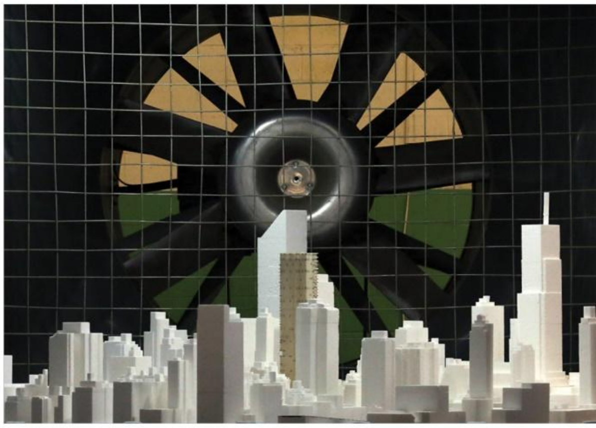
Processed Traffic Data

	Queensway East		Hurontario Street
Year of Count	2017	Year of Count	2023
AADT NE Direction	7723	Total AADT	36800
AADT SW Direction	11538	Truck Percentage	7%
Total AADT	19261	Medium/Heavy Truck Split	55/45
Projected 2038 AADT*	**29193**	**Projected 2038 AADT***	**49528**
Speed Limit (km/h)	**60**	**Speed Limit (km/h)**	**50**
Medium Percent**	**3.85%**	**Medium Percent**	**3.85%**
Heavy Percent**	**3.15%**	**Heavy Percent**	**3.15%**

* 2% growth rate assumed

** Medium and Heavy Vehicle rates assumed





APPENDIX B

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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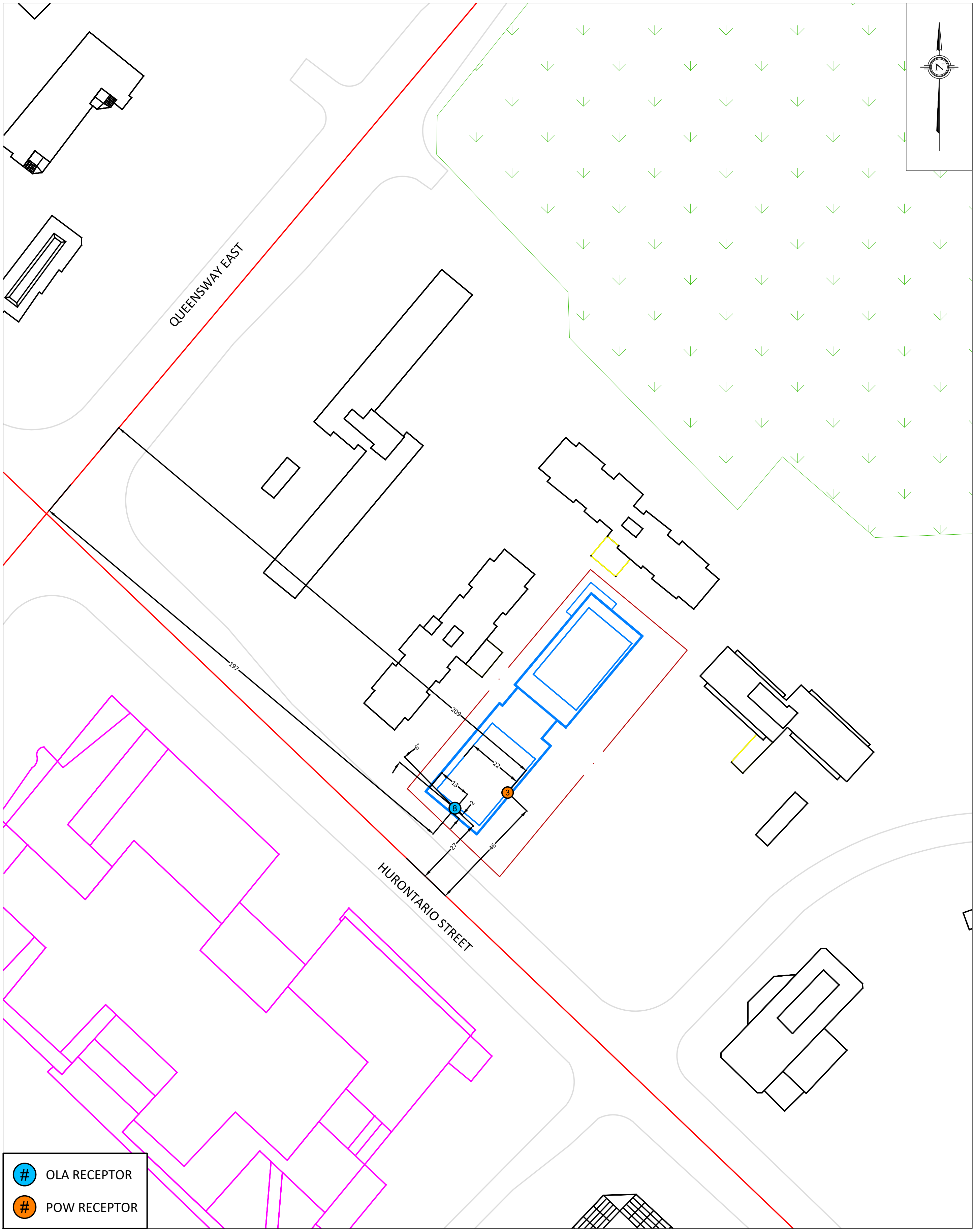

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PROJECT	2233-2235 HURONTARIO STREET, MISSISSAUGA TRANSPORTATION NOISE AND GROUND VIBRATIONS ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	25-253-A1
DATE	MARCH 25, 2026
DRAWN BY	M.P.
DESCRIPTION	FIGURE A1: STAMSON PARAMETERS

```
STAMSON 5.0        NORMAL REPORT        Date: 25-03-2026 13:18:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te                   Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hurontario (day/night)
----------------------------------------------
Car traffic volume  : 41455/4606  veh/TimePeriod  *
Medium truck volume :  1716/191   veh/TimePeriod  *
Heavy truck volume  :  1404/156   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):  49528
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.85
    Heavy Truck  % of Total Volume     :   3.15
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Hurontario (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  46.00 / 46.00  m
Receiver height           : 108.40 / 108.40 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 24435/2715  veh/TimePeriod  *
Medium truck volume :  1012/112   veh/TimePeriod  *
Heavy truck volume  :   828/92    veh/TimePeriod  *
Posted speed limit  :    60 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):  29193
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.85
    Heavy Truck  % of Total Volume     :   3.15
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Queensway (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 209.00 / 209.00 m
Receiver height           : 108.40 / 108.40 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            : 121.80 m
Barrier receiver distance :  22.00 / 22.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Hurontario (day)
-------------------------------------

Source height = 1.33 m

ROAD (0.00 + 64.07 + 0.00) = 64.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  71.95   0.00  -4.87  -3.01   0.00   0.00   0.00  64.07
----------------------------------------------------------------------------

Segment Leq : 64.07 dBA

Results segment # 2: Queensway (day)
------------------------------------

Source height = 1.33 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.33 !      108.40 !       97.13 !        97.13

ROAD (0.00 + 40.72 + 0.00) = 40.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.00  71.25   0.00 -11.44   0.00   0.00   0.00 -19.08  40.72
----------------------------------------------------------------------------

Segment Leq : 40.72 dBA

Total Leq All Segments: 64.09 dBA

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

Source height = 1.33 m

ROAD (0.00 + 57.54 + 0.00) = 57.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90      0   0.00  65.42   0.00  -4.87  -3.01   0.00   0.00   0.00  57.54
----------------------------------------------------------------------------

Segment Leq : 57.54 dBA
```

```
Results segment # 2: Queensway (night)
--------------------------------------

Source height = 1.33 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.33 !      108.40 !       97.13 !        97.13

ROAD (0.00 + 34.19 + 0.00) = 34.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------------
   -90     90   0.00  64.71   0.00 -11.44   0.00   0.00   0.00 -19.08  34.19
-----------------------------------------------------------------------------

Segment Leq : 34.19 dBA

Total Leq All Segments: 57.56 dBA

RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - 4-car SRT:
Traffic volume    :   560/88    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  46.00 / 46.00  m
Receiver height           : 108.40 / 108.40 m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 52.80 + 0.00) = 52.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90      0   0.00  60.67  -4.87  -3.01   0.00   0.00   0.00  52.80
-----------------------------------------------------------------------

Segment Leq : 52.80 dBA

Total Leq All Segments: 52.80 dBA
```

```
Results segment # 1: LRT (night)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 47.77 + 0.00) = 47.77 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90      0   0.00  55.65  -4.87  -3.01   0.00   0.00   0.00  47.77
----------------------------------------------------------------------

Segment Leq : 47.77 dBA

Total Leq All Segments: 47.77 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.40
                         (NIGHT): 57.99
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-03-2026 13:18:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Hurontario (day/night)
----------------------------------------------
Car traffic volume  : 41455/4606  veh/TimePeriod  *
Medium truck volume :  1716/191   veh/TimePeriod  *
Heavy truck volume  :  1404/156   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):  49528
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.85
    Heavy Truck  % of Total Volume     :   3.15
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Hurontario (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :  22.90 / 22.90  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  21.40 m
Barrier receiver distance :   2.00 / -9.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Queensway (day/night)
---------------------------------------------
Car traffic volume  : 24435/2715  veh/TimePeriod  *
Medium truck volume :  1012/112   veh/TimePeriod  *
Heavy truck volume  :   828/92    veh/TimePeriod  *
Posted speed limit  :    60 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):  29193
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.85
    Heavy Truck  % of Total Volume     :   3.15
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Queensway (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   6.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 197.00 / 197.00 m
Receiver height           :  22.90 / 22.90  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 6.00 deg
Barrier height            :  21.40 m
Barrier receiver distance :  13.00 / 13.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Hurontario (day)
-------------------------------------
Source height = 1.33 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver     ! Barrier      ! Elevation of
Height  (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
------------+--------------+--------------+--------------
       1.33 !        22.90 !        21.30 !        21.30

ROAD (0.00 + 64.35 + 0.00) = 64.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
   -90     90   0.00  71.95   0.00  -2.55   0.00   0.00   0.00  -5.04  64.35
--------------------------------------------------------------------------

Segment Leq : 64.35 dBA
```

Results segment # 2: Queensway (day)

Source height = 1.33 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.33	22.90	21.48	21.48

ROAD (0.00 + 57.33 + 0.00) = 57.33 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	6	0.00	71.25	0.00	-11.18	-2.73	0.00	0.00	-4.99	52.34*
-90	6	0.00	71.25	0.00	-11.18	-2.73	0.00	0.00	0.00	57.33

* Bright Zone !

Segment Leq : 57.33 dBA

Total Leq All Segments: 65.14 dBA

Results segment # 1: Hurontario (night)

Source height = 1.33 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.33	22.90	30.09	30.09

ROAD (0.00 + 62.87 + 0.00) = 62.87 dBA

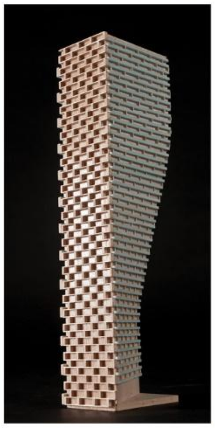
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.42	0.00	-2.55	0.00	0.00	0.00	99.00	161.87
-90	90	0.00	65.42	0.00	-2.55	0.00	0.00	0.00	0.00	62.87

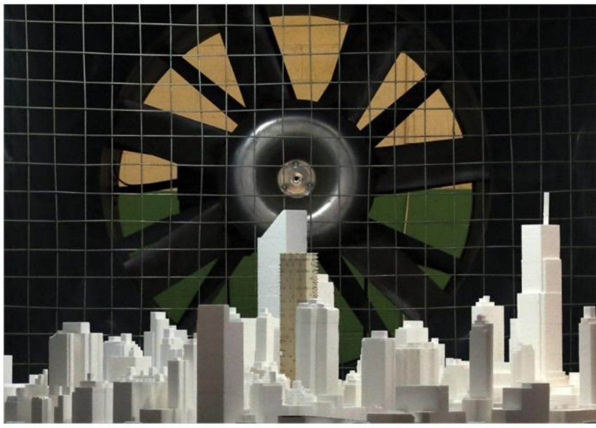
* Bright Zone !

Segment Leq : 62.87 dBA

```
Results segment # 2: Queensway (night)
--------------------------------------

Source height = 1.33 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.33 !       22.90 !       21.48 !        21.48

ROAD (0.00 + 50.80 + 0.00) = 50.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90      6   0.00  64.71   0.00 -11.18  -2.73   0.00   0.00  -4.99  45.80*
   -90      6   0.00  64.71   0.00 -11.18  -2.73   0.00   0.00   0.00  50.80
--------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 50.80 dBA

Total Leq All Segments: 63.13 dBA

RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - 4-car SRT:
Traffic volume    :   560/88    veh/TimePeriod
Speed             :    50  km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :  22.90 / 22.90  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  21.40 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: LRT (day)
------------------------------

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source       ! Receiver     ! Barrier      ! Elevation of
Height   (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
-------------+--------------+--------------+---------------
        0.50 !        22.90 !        14.60 !         14.60

RT/Custom (0.00 + 42.34 + 0.00) = 42.34 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     90   0.00  60.67  -2.55   0.00   0.00   0.00 -15.78  42.34
-----------------------------------------------------------------------

Segment Leq : 42.34 dBA

Total Leq All Segments: 42.34 dBA

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source       ! Receiver     ! Barrier      ! Elevation of
Height   (m) ! Height   (m) ! Height   (m) ! Barrier Top  (m)
-------------+--------------+--------------+---------------
        0.50 !        22.90 !        14.60 !         14.60

RT/Custom (0.00 + 37.31 + 0.00) = 37.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-----------------------------------------------------------------------
   -90     90   0.00  55.65  -2.55   0.00   0.00   0.00 -15.78  37.31
-----------------------------------------------------------------------

Segment Leq : 37.31 dBA

Total Leq All Segments: 37.31 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.16
                          (NIGHT): 63.14
```





APPENDIX C

FTA VIBRATIONS CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

GW25-253 23-Mar-26

Hurontario LRT
Possible Vibration Impacts on Subject Site
Predicted using FTA General Assesment

Vehicle Speed 50 km/h 31 mph

	Distance from C/L	
	(m)	(ft)
Subway	24	78.7

	Vibration		
From FTA Manual Fig 10-1			
Vibration Levels at distance from track	70	dBV re 1 micro in/sec	
Adjustment Factors FTA Table 10-1			
Speed reference 50 mph	-4	Speed limit of 50 km/h (31 mph)	
Vehicle Parameters	0	Assume soft primary suspension	
Track Condition	0	N/A	
Track Treatments	0	N/A	
Type of Transit Structure	0	N/A	
Vibration Propagation	0	Inefficient propagation of vibrations through soil	
Vibration Levels at Fdn	66		0.048
Coupling to Building Foundation	-10	Large Masonry on Piles	
Floor to Floor Attenuation	0.0	Ground Floor Unoccupied	
Amplification of Floor and Walls	6		
Total Vibration Level	**62**	dBV or	**0.031** mm/s
Noise Level in dBA	26.6	dBA	

Table 6-11 Source Adjustment Factors for Generalized Predictions of GB Vibration and Noise

Source Factor	Adjustment to Propagation Curve			Comment
		Reference Speed		
	Vehicle Speed	50 mph	30 mph	
Speed	60 mph 50 mph 40 mph 30 mph 20 mph	+1.6 dB 0.0 dB -1.9 dB -4.4 dB -8.0 dB	+6.0 dB +4.4 dB +2.5 dB 0.0 dB -3.5 dB	Vibration level is approximately proportional to 20log(speed/speed$_{ref}$), see Eq. 6-4.
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			Corrugated track is a common problem. Mill scale* on new rail can cause higher vibration levels until the rail has been in use for some time. If there are adjustments for vehicle parameters and the track is worn or corrugated, only include one adjustment.
Special Trackwork within 200 ft	+10 dB (within 100 ft) +5 dB (between 100 and 200 ft)			Wheel impacts at special trackwork will greatly increase vibration levels. The increase will be less at greater distances from the track. Do not include an adjustment for special trackwork more than 200 ft away.
Jointed Track	+5 dB			Jointed track can cause higher vibration levels than welded track.
Uneven Road Surfaces	+5 dB			Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.

*Mill scale on a new rail is a slightly corrugated condition caused by certain steel mill techniques.

Table 6-12 Path Adjustment Factors for Generalized Predictions of GB Vibration and Noise

Path Factor	Adjustment to Propagation Curve		Comment
Resiliently Supported Ties (Low-Vibration Track, LVT)	-10 dB		Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Structure (not additive, apply greatest value only)			
Type of Transit Structure	Relative to at-grade tie & ballast:		In general, the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Elevated structure	-10 dB	
	Open cut	0 dB	
	Relative to bored subway tunnel in soil:		
	Station	-5 dB	
	Cut and cover	-3 dB	
	Rock-based	-15 dB	
Ground-borne Propagation Effects			
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil	+10 dB	Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer — Dist.	Adjust.	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
	50 ft	+2 dB	
	100 ft	+4 dB	
	150 ft	+6 dB	
	200 ft	+9 dB	
Coupling to building foundation	Wood-Frame Houses	-5 dB	In general, the heavier the building construction, the greater the coupling loss.
	1-2 Story Masonry	-7 dB	
	3-4 Story Masonry	-10 dB	
	Large Masonry on Piles	-10 dB	
	Large Masonry on Spread Footings	-13 dB	
	Foundation in Rock	0 dB	

Table 6-13 Receiver Adjustment Factors for Generalized Predictions of GB Vibration and Noise

Receiver Factor	Adjustment to Propagation Curve		Comment
Floor-to-floor attenuation	1 to 5 floors above grade	-2 dB/floor	This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building starting with the first suspended floor.*
	5 to 10 floors above grade	-1 dB/floor	
Amplification due to resonances of floors, walls, and ceilings	+6 dB		The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.

* Floor-to-floor attenuation adjustments for the first floor assume a basement.

Table 6-14 Conversion to Ground-borne Noise

Conversion to Ground-borne Noise			
Noise Level in dBA	Peak frequency of ground vibration:		Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low-, mid-, or high-frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.
	Low frequency (<30 Hz)	-50 dB	
	Mid Frequency (peak 30 to 60 Hz)	-35 dB	
	High frequency (>60 Hz)	-20 dB	