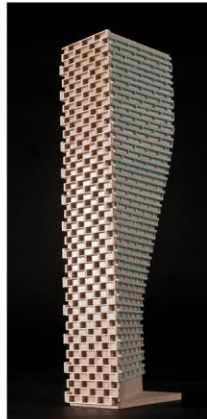


**TRANSPORTATION NOISE
& VIBRATION FEASIBILITY
ASSESSMENT**

586 Eglinton Avenue East
Toronto, Ontario

REPORT: 20-245-Noise & Vibration



September 9, 2021

PREPARED FOR

Sanderling Developments Ltd.
c/o Gowling WLG (Canada) LLP
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100 King Street West
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a transportation noise and vibration feasibility assessment performed for a proposed mixed-use development at 586 Eglinton Avenue East in Toronto, Ontario. The proposed development comprises a 32-storey residential tower rising from a four-storey office podium. The near-field surroundings of the development are characterized by low-rise residential buildings in all directions, with a mixture of low- and mid-rise buildings along Eglinton Avenue East. The primary source of transportation noise impacting the study site is Eglinton Avenue East. The Future Eglinton Crosstown LRT (located below grade along Eglinton Avenue East) is a source of ground vibrations. Figure 1 illustrates a site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) requirements; (ii) future vehicular traffic volumes based on roadway classification and theoretical capacities; and (iii) architectural drawings provided by architectsAlliance in March 2021 and updated in July 2021.

The results of the current analysis indicate that noise levels will range between 50 and 71 dBA during the daytime period (07:00-23:00) and between 59 and 63 dBA during the nighttime period (23:00-07:00). The highest noise levels (i.e. 71 dBA) occur along the development's south façade, which are nearest and most exposed to the Eglinton Avenue East. Noise levels at the Level 5 podium terrace fall below NPC-300 criteria, therefore noise control measures are not expected to be required. It is recommended that the center of the terrace be setback from the south edge of the podium, to ensure there is block from Eglinton Avenue East.

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. 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 results also indicate that the development will require air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements. Specific noise control for the development would be evaluated at the time of site plan control.

Estimated vibration levels at the nearest property line to the GO/VIA Rail corridor are expected to be 0.02 mm/s RMS (56 dBV), based on the FTA protocol and a conservative offset distance of 29 m to the nearest railway track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the property line, vibration mitigation will not be required. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

With regards to stationary noise, impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. There are no significant existing sources of stationary noise impacting the development. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

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Appendix B – FTA Vibration Calculations

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Gowling WLG on behalf of Sanderling Developments Ltd. to undertake a transportation noise and vibration feasibility assessment for the proposed mixed-use development at 586 Eglinton Avenue East in Toronto, Ontario. This report summarizes the methodology, results, and recommendations related to a transportation noise and vibration feasibility assessment, investigating exterior noise and vibration levels generated by local roadway and LRT traffic.

The assessment was performed based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300 guidelines. Noise calculations were based on architectural drawings received from architectsAlliance in March 2021 and updated in July 2021, with future traffic volumes corresponding to roadway classifications and theoretical capacities.

2. TERMS OF REFERENCE

The focus of this transportation noise and vibration feasibility assessment is the proposed mixed-use development at 586 Eglinton Avenue East. The study site is situated on the north side of Eglinton Avenue East, between Bayview Avenue to the east and Bruce Park Avenue approximately 40 metres to the west.

The proposed development comprises a 32-storey residential tower rising from a four-storey office podium. Sloping topography north-south over the site allows for grade-level entrances at the P1 Level along the north elevation, and at Level 1 along the south elevation. At the P1 Level, a laneway provides access from Bruce Park Avenue to secondary building access points, loading areas, and a ramp to two levels of below-grade parking (P2 and P3) along the north end of the building. At Level 1, the floorplate extends partially to the north and west, cantilevering over grade. Residential and office lobbies, retail, and secondary building access points are located along the south elevation, fronting Eglinton Avenue East. At Level 2, the floorplate extends to the north and south to form the typical podium floorplate, cantilevering over P1 Level loading areas and Level 1 entrances, respectively. At Level 5, the podium sets back from all elevations to the tower, accommodating green roof space and an exterior amenity over the podium rooftop. At Level 6 the floorplate extends in all directions to form the typical tower floorplate. Above Level

32 the floorplate sets back from all elevations to meet a single-storey-height mechanical penthouse (MPH).

The near-field surroundings of the development are characterized by low-rise residential buildings in all directions, with a mixture of low- and mid-rise buildings along Eglinton Avenue East. The primary source of transportation noise impacting the study site is Eglinton Avenue East. The Future Eglinton Crosstown LRT (located below grade along Eglinton Avenue East) is a source of ground vibrations. Figure 1 illustrates a site plan with surrounding context.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise and vibration levels on the study buildings produced by local transportation sources, and (ii) determine whether exterior noise and vibration levels exceed the allowable limits specified by the MECP Noise Control Guidelines – NPC-300 as outlined in Section 4 of this report.

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 particular 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 vehicle traffic, 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. The NPC-300 guidelines specify that the recommended indoor noise limit range (that is relevant to this study) is 50, 45 and 40 dBA for office space, residence living rooms and sleeping quarters respectively, as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 47, 42 and 37 dBA. Indoor noise levels due to railway traffic are 5 dB lower. However, the dominant source of transportation noise for this site is due to roadway traffic sources.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD)¹

Type of Space	Time Period	Leq (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.	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 reduction². Therefore, where

¹ Adapted from Table C-2, Part C, Section 3.2.3 of NPC-300

² Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125

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 normally triggers the need for central air conditioning (or similar systems). Where noise levels exceed 65 dBA daytime and 60 dBA nighttime building components will require higher levels of sound attenuation³.

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit is acceptable only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons.

4.2.2 Roadway Traffic Volumes

NPC-300 dictates that noise calculations should consider future sound levels based on a roadway’s classification at the mature state of development. Therefore, traffic volumes have been considered for the mature state of development based on roadway classifications and theoretical roadway capacities. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY AND RAILWAY TRAFFIC DATA

Segment	Roadway/Transit Class	Speed Limit (km/h)	Future AADT
Eglinton Avenue East	4-UAU	50	30,000

4.2.3 Theoretical Roadway Traffic Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway noise calculations were performed by treating each road segment as a separate line source of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks.
- Reflective intermediate ground surfaces were assumed.
- Surrounding buildings were used as noise barriers.

³ MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

- The study site was treated as having gently sloping topography.
- Noise receptors were strategically placed at four locations around the study area, as illustrated in Figure 1.

4.3 Ground Vibration & Ground-borne Noise

4.3.1 Background on Vibrations

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.

Similar to sound waves in air, ground vibrations also 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. The repetitive motion of steel 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 noise signature that is unique to that structure and soil combination.

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 measurement units of ground vibration are millimeters per second (mm/s) or inches 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 ($\mu\text{in/s}$) 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.

4.3.2 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*⁴, 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.

4.3.3 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 Assessment⁵ 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 Light Rail Vehicles at a speed of 40 km/h. LRT section drawings and other information was obtained from the Eglinton Crosstown LRT Environmental Project Report⁶ to determine train speed and track depth in the area of the study site. Adjustment factors were considered based on the following information:

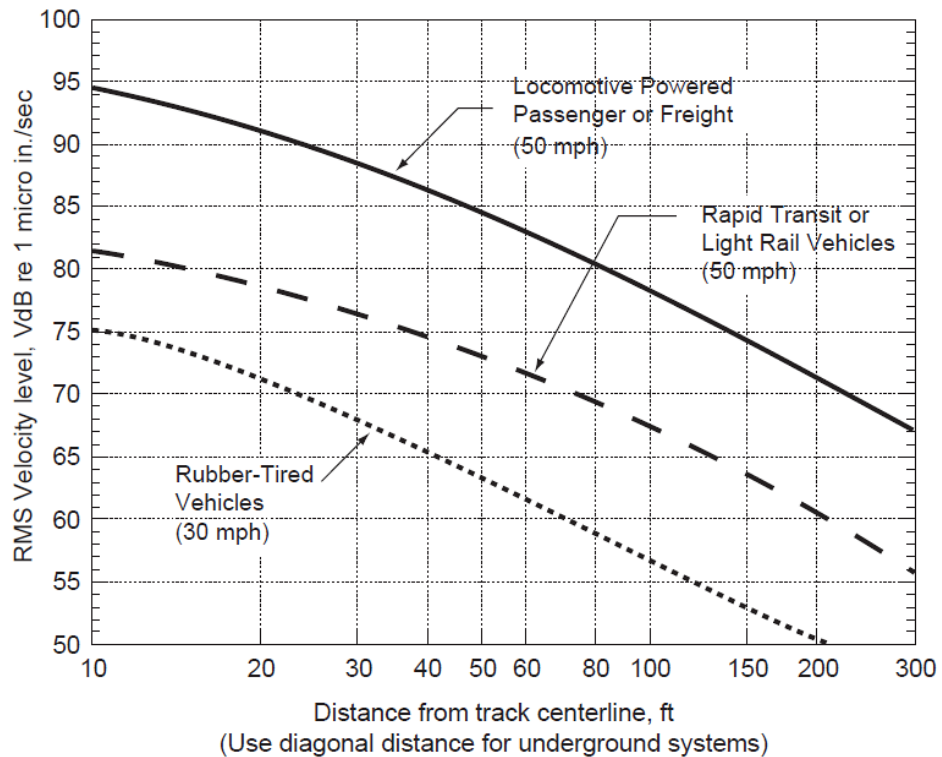
- The maximum operating speed of the trains near the study site is 40 km/h (25 mph).
- The stretch-string distance between the development and the closest track is 29 m.
- The vehicles are assumed to have soft primary suspensions.
- Tracks are in good condition.

⁴ Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

⁵ C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

⁶ <http://thecrosstown.ca/the-project/reports/EglintonCrosstownLRTEnvironmentalProjectReport>

- Soil conditions near the site comprise silt and sand which do not efficiently propagate vibrations, as per the Eglinton Crosstown LRT Geotechnical Investigation prepared by Coffey Geotechnics Inc., dated March 3, 2010.
- The building's foundation is assumed to be poured concrete (large masonry) on piles.
- There is no special trackwork or stations in the area of the study site.



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

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height (m)	Plane of Window Receptor Location	Roadway Noise Level (dBA)	
			Day	Night
1	16.7	Level 4 – South Façade	71	63
2	97.3	Level 30 – South Façade	70	63
3	97.3	Level 30 – East Façade	67	59
4	21.3	Level 5 – Podium Terrace	50	N/A

5.2 Ground Vibrations & Ground-Borne Noise Levels

Estimated vibration levels at the nearest property line to the GO/VIA Rail corridor are expected to be 0.02 mm/s RMS (56 dBV), based on the FTA protocol and a conservative offset distance of 29 m to the nearest railway track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the property line, vibration mitigation will not be required. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 50 and 71 dBA during the daytime period (07:00-23:00) and between 59 and 63 dBA during the nighttime period (23:00-07:00). The highest noise levels (i.e. 71 dBA) occur along the development’s south façade, which are nearest and most exposed to the Eglinton Avenue East. Noise levels at the Level 5 podium terrace fall below NPC-300 criteria, therefore noise control measures are no expected to be required. It is recommended that the center of the terrace be setback from the south edge of the podium, to ensure there is block from Eglinton Avenue East.

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. 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 results also indicate that the development will require air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements. Specific noise control for the development would be evaluated at the time of site plan control.

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With regards to stationary noise, impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. There are no significant existing sources of stationary noise impacting the development. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below NPC-300 limits.

This concludes our 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.

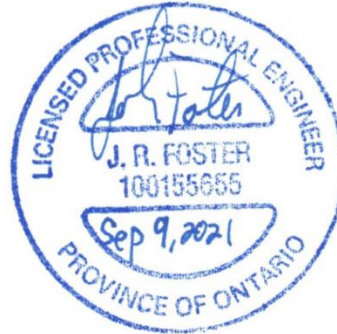
Sincerely,

Gradient Wind Engineering Inc.

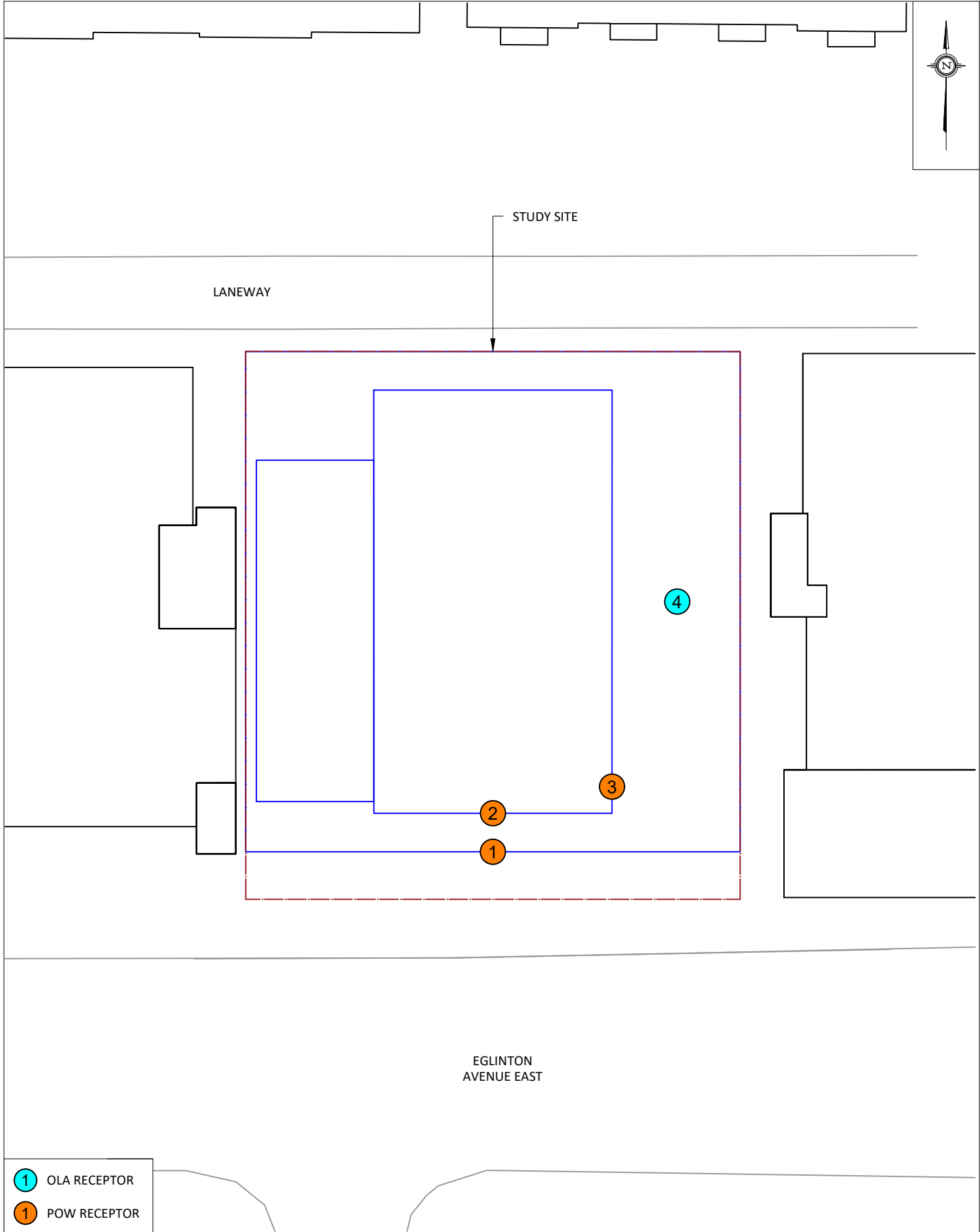
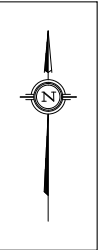


Michael Lafortune, C.E.T.
Environmental Scientist

Gradient Wind File #20-245-Noise & Vibration



Joshua Foster, P.Eng.
Principal



- ① OLA RECEPTOR
- ① POW RECEPTOR

GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD, OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT	586 EGLINTON AVENUE EAST, TORONTO TRANSPORTATION NOISE & VIBRATION FEASIBILITY ASSESSMENT	DESCRIPTION	FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT, RECEPTOR LOCATIONS	
	SCALE	1:400 (APPROX.)	DRAWING NO.		GW20-245-1
	DATE	APRIL 14, 2021	DRAWN BY		M.L.

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ENGINEERS & SCIENTISTS



APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 14-04-2021 11:54:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Eglinton (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Eglinton (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 : 17.00 / 17.00 m
Receiver height : 16.70 / 16.70 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Eglinton (day)

Source height = 1.50 m

ROAD (0.00 + 70.95 + 0.00) = 70.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	71.49	0.00	-0.54	0.00	0.00	0.00	0.00
70.95									

Segment Leq : 70.95 dBA

Total Leq All Segments: 70.95 dBA

Results segment # 1: Eglinton (night)

Source height = 1.50 m

ROAD (0.00 + 63.35 + 0.00) = 63.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	63.89	0.00	-0.54	0.00	0.00	0.00	0.00
63.35									

Segment Leq : 63.35 dBA

Total Leq All Segments: 63.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 70.95
(NIGHT) : 63.35

GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 14-04-2021 11:54:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Eglinton (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Eglinton (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 : 20.00 / 20.00 m
Receiver height : 97.30 / 97.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Eglinton (day)

Source height = 1.50 m

ROAD (0.00 + 70.24 + 0.00) = 70.24 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	71.49	0.00	-1.25	0.00	0.00	0.00	0.00
70.24									

Segment Leq : 70.24 dBA

Total Leq All Segments: 70.24 dBA

Results segment # 1: Eglinton (night)

Source height = 1.50 m

ROAD (0.00 + 62.64 + 0.00) = 62.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	63.89	0.00	-1.25	0.00	0.00	0.00	0.00
62.64									

Segment Leq : 62.64 dBA

Total Leq All Segments: 62.64 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 70.24
(NIGHT) : 62.64

GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 14-04-2021 11:54:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Eglinton (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Eglinton (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 : 22.00 / 22.00 m
Receiver height : 97.30 / 97.30 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Eglinton (day)

Source height = 1.50 m

ROAD (0.00 + 66.82 + 0.00) = 66.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	0	0.00	71.49	0.00	-1.66	-3.01	0.00	0.00	0.00
66.82									

Segment Leq : 66.82 dBA

Total Leq All Segments: 66.82 dBA

Results segment # 1: Eglinton (night)

Source height = 1.50 m

ROAD (0.00 + 59.22 + 0.00) = 59.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	0	0.00	63.89	0.00	-1.66	-3.01	0.00	0.00	0.00
59.22									

Segment Leq : 59.22 dBA

Total Leq All Segments: 59.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 66.82
(NIGHT) : 59.22

GRADIENTWIND

ENGINEERS & SCIENTISTS

STAMSON 5.0 NORMAL REPORT Date: 14-04-2021 11:55:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Eglinton1 (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Eglinton1 (day/night)

Angle1 Angle2 : -90.00 deg 17.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 36.00 / 36.00 m
Receiver height : 21.30 / 21.30 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 17.00 deg
Barrier height : 19.80 m
Barrier receiver distance : 17.00 / 17.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

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Road data, segment # 2: Eglinton2 (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Eglinton2 (day/night)

Angle1 Angle2 : 17.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 36.00 / 36.00 m
Receiver height : 21.30 / 21.30 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 17.00 deg Angle2 : 90.00 deg
Barrier height : 112.50 m
Barrier receiver distance : 17.00 / 17.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

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Results segment # 1: Eglinton1 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	21.30	11.95	11.95

ROAD (0.00 + 48.74 + 0.00) = 48.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	17	0.00	71.49	0.00	-3.80	-2.26	0.00	0.00	-16.69

SubLeq
48.74

Segment Leq : 48.74 dBA

Results segment # 2: Eglinton2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	21.30	11.95	11.95

ROAD (0.00 + 43.87 + 0.00) = 43.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
17	90	0.00	71.49	0.00	-3.80	-3.92	0.00	0.00	-19.90

SubLeq
43.87

Segment Leq : 43.87 dBA

Total Leq All Segments: 49.96 dBA

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Results segment # 1: Eglinton1 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	21.30	11.95	11.95

ROAD (0.00 + 41.14 + 0.00) = 41.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	17	0.00	63.89	0.00	-3.80	-2.26	0.00	0.00	-16.69

SubLeq
41.14

Segment Leq : 41.14 dBA

Results segment # 2: Eglinton2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	21.30	11.95	11.95

ROAD (0.00 + 36.27 + 0.00) = 36.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
17	90	0.00	63.89	0.00	-3.80	-3.92	0.00	0.00	-19.90

SubLeq
36.27

Segment Leq : 36.27 dBA

Total Leq All Segments: 42.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 49.96
(NIGHT): 42.36

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APPENDIX B

FTA VIBRATION CALCULATIONS

Possible Vibration Impacts on 586 Eglinton Ave East
Predicted using FTA General Assessment

Train Speed	40 km/h	25 mph
	Distance from C/L	
	(m)	(ft)
LRT	29.0	95.1

Vibration

From FTA Manual Fig 10-1

Vibration Levels at distance from track 68 dBV re 1 micro in/sec

Adjustment Factors FTA Table 10-1

Speed reference 50 mph	-6	Speed Limit of 40 km/h (25 mph)
Vehicle Parameters	0	Assume Soft primary suspension, Weels run true
Track Condition	0	None
Track Treatments	0	None
Type of Transit Structure	0	None
Efficient vibration Propagation	0	None
Vibration Levels at Fdn	62	0.032
Coupling to Building Foundation	-10	Large Masonry on Piles
Floor to Floor Attenuation	-2.0	Ground Floor Occupied
Amplification of Floor and Walls	6	
Total Vibration Level	55.9794	dBV or 0.016 mm/s
Noise Level in dBA	20.9794	dBA

**Table 10-1. Adjustment Factors for Generalized Predictions of
Ground-Borne Vibration and Noise**

<i>Factors Affecting Vibration Source</i>				
Source Factor	Adjustment to Propagation Curve		Comment	
Speed	Reference Speed		Vibration level is approximately proportional to $20 \cdot \log(\text{speed}/\text{speed}_{\text{ref}})$. Sometimes the variation with speed has been observed to be as low as 10 to 15 $\log(\text{speed}/\text{speed}_{\text{ref}})$.	
	Vehicle Speed			
		50 mph		30 mph
	60 mph	+1.6 dB		+6.0 dB
	50 mph	0.0 dB		+4.4 dB
	40 mph	-1.9 dB		+2.5 dB
30 mph	-4.4 dB	0.0 dB		
20 mph	-8.0 dB	-3.5 dB		
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. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.	
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB		If both the wheels and the track are worn, only one adjustment should be used. 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.	
Special Trackwork	+10 dB		Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.	
Jointed Track or Uneven Road Surfaces	+5 dB		Jointed track can cause higher vibration levels than welded track. 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.	

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise (Continued)				
<i>Factors Affecting Vibration Path</i>				
Path Factor	Adjustment to Propagation Curve		Comment	
Resiliently Supported Ties	-10 dB		Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.	
Track Configuration (not additive, apply greatest value only)				
Type of Transit Structure	Relative to at-grade tie & ballast:		The general rule is 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	<u>Dist.</u>	<u>Adjust.</u>	
		50 ft	+2 dB	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.
		100 ft	+4 dB	
150 ft		+6 dB		
200 ft	+9 dB			
Coupling to building foundation	Wood Frame Houses		-5 dB	The general rule is 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	
<i>Factors Affecting Vibration Receiver</i>				
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.
	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.
<i>Conversion to Ground-borne Noise</i>				
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, typical 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
	Typical (peak 30 to 60 Hz):			-35 dB
	High frequency (>60 Hz):			-20 dB