NOISE AND VIBRATION FEASIBILITY STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
30 QUEEN STREET
MISSISSAUGA, ONTARIO

FOR

EDENSHAW QUEEN DEVELOPMENTS LIMITED

PREPARED BY

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FEBRUARY 4, 2022

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1.0 INTRODUCTION

At the request of Edenshaw Queen Developments Limited, J.E. COULTER ASSOCIATES LIMITED has completed a noise and vibration feasibility study of the proposed 40- and 42-storey (not-including mechanical penthouse) residential development on the northeast corner of Ann and Park Streets in Mississauga, Ontario. See Figure 1 in Appendix A for an Area Plan.

The purpose of the study is to prepare recommendations to address noise/vibration issues in support of the subject property's rezoning application. This report will show that applicable MECP, Metrolinx, CN, and City of Mississauga noise guidelines can be met with modest noise control measures. These recommendations will take into consideration the sound from the surrounding transportation sources. Please see Figure 2 in Appendix A for a Site Plan.

This report also briefly reviews the impact of the development on itself and surrounding areas.

The site is surrounded on all sides by existing residential development with Port Credit GO Station and railway to the north. A review of the area indicates there are no sources of stationary noise that would have the potential to affect the occupants of the future building itself. As a result, stationary noise sources are not considered further within this report. This report focuses on the transportation noise and vibration impacts.

The future Hurontario LRT's Port Credit Station is located to the east of the site. The station is still being designed. Metrolinx will share more information regarding potential equipment from this station as it becomes available. It is not expected there will be significant sources of stationary noise that need to be mitigated. If so, further coordination can be completed with Metrolinx to implement any potential noise control at the station itself.

2.0 APPLICABLE CRITERIA

The Ministry of the Environment and Climate Change's (MECP) applicable criteria to a site such as this are found in its publication *NPC-300* "Environmental Guide for Noise, Stationary and Transportation Sources – Approval and Planning."

As per *NPC-300*, this development would be considered a Class 1 – Urban area.

The MECP and the City of Mississauga do not promulgate vibration limits on new developments. Best practice standards in Ontario are based on the previous versions of the ISO-2631 vibration guidelines, which suggested a maximum limit of 0.14mm/s RMS for vibration in areas where people sleep. MECP and TTC typically target 0.10 mm/s RMS at residences during transit expansions. These standards are reviewed within this study. Vibration control is not a strict requirement but a guideline.

2.1 Transportation Noise Guidelines

Transportation noise sources addressed by *NPC-300* include aircraft, rail traffic, and roadway traffic (which include cars, trucks, buses, etc.).

Where the sound levels exceed 55 dB L_{eq} in private outdoor living areas (OLA), MECP requires noise mitigation measures to be incorporated into the subdivision design (i.e., intervening structures such as acoustic barriers or buildings and/or greater setbacks from the noise source). However, MECP will permit sound levels up to 60 dB L_{eq} daytime (5 dB above the criterion level

of 55 dB L_{eq}) in private outdoor living areas (OLA) if it is not technically feasible to achieve 55 dB. Where the criterion levels are marginally exceeded, a warning clause is required in the *Agreement of Purchase and Sale* and the subdivision agreement. With respect to condominiums or townhouses, balconies are considered OLAs only if they are 4m or greater in depth.

For residential buildings, the Ministry's ventilation requirements are based on the sound level at the exterior building façade. Where the sound levels at the exterior of the building façade exceed 55 dB L_{eq} daytime at the living room window or 50 dB L_{eq} nighttime at the bedroom window, the unit must be provided with forced air heating, with a provision for future air conditioning by the owner. An excess up to 10 dB is permissible, provided a warning clause is given. Where the sound levels exceed this limit (i.e., 65 dB L_{eq} daytime or 60 dB L_{eq} nighttime), air conditioning must be incorporated into the building design prior to occupancy. Warning clauses are applicable as well.

Air-conditioning requirements are applied so that adequate interior sound levels can be maintained with the windows closed.

The MECP also stipulates acceptable indoor sound levels limits, which vary depending on whether they are railway noise sources or roadway noise sources.

The applicable MECP criteria are summarized in Table 1, below.

Table 1: Noise Criteria Summary

Type of Space	Road		Rail	
	Daytime (dB L_{eq}) (0700–2300)	**Nighttime (dB L_{eq}) (2300–0700)**	**Daytime (dB L_{eq}) (0700–2300)**	**Nighttime (dB L_{eq}) (2300–0700)**
Outdoor Living Area (OLA	55	N/A	55	N/A
Bedrooms	45	40	40	35
Living/Dining	45	45	40	40
Kitchen/Baths	45	45	40	40

Note: OLAs for condominiums are terraces/balconies greater than 4m in depth and common amenity areas such as rooftop patios intended for quiet enjoyment.

The primary source of transportation noise that has the potential to exceed the guidelines is the railway corridor. The Lakeshore West corridor carries GO Train Traffic, VIA traffic, and some freight traffic. The site is located ~250m from Lakeshore Road and ~280m from Hurontario Street (and the associated Hurontario LRT). Traffic noise from these roadways is not expected to be significant at such setbacks and is not considered further. Similarly, Park Street and Elizabeth Street are projected to carry very little traffic (~ 4,000 vehicles per day ultimate) and would not generate sound levels high enough to exceed the guideline levels.

2.2 Vibration Guidelines

As mentioned, the MECP and the City of Mississauga do not enforce vibration level limits for new developments. Instead, railways such as CP, CN, and Metrolinx request that vibration levels on the nearest residential floor not exceed 0.14mm/s RMS overall between 4 Hz and 200 Hz. These limits are outlined in the Federation of Canadian Municipalities' Railway Proximity Guidelines and CN's Principal Main Line Requirements. If an excess above this level is expected, vibration control measures need to be incorporated into the development.

The subject site is located approximately 75m south of the railway right of way. As a result, vibration measurements have been completed.

3.0 TRANSPORATION NOISE SOURCES

The following sections summarize the noise sources surrounding the proposed development.

3.1 Roadway Noise Sources

The site is bounded immediately to the east by the future LRT with Hurontario Street beyond. Nearby streets such as Queen, Ann, and Park carry significantly less traffic based on volumes provided by the City and are not considered further. Traffic volumes for the Hurontario LRT are taken from the 2014 EPR appendices. Ultimate traffic volumes for Hurontario Street were provided by the City of Mississauga. These volumes are summarized in Table 2 below. The speed limit in the area is assumed to be 60 km/hr for both LRVs and traffic.

Table 2: Future Road Traffic Volumes

Roadway	Daytime Traffic				Nighttime Traffic			
	Cars	Medium	Heavy	LRT Sets	Cars	Medium	Heavy	LRT Sets
Hurontario	21,237	880	743	280	2,360	95	83	44

3.2 Light Rail Transit

The City of Mississauga and Metrolinx are planning to construct a light rail transit system between Port Credit and Steeles Avenue along Hurontario Street.

An Environmental Assessment of the project was originally completed in 2014. The 2014 plan for the LRT was to run in the centre of Hurontario Street in the area of the subject development. Please see Figure 3 in Appendix A for the local area plan from the 2014 EPR. .

The 2014 study predicted that the LRT volume would be 280 vehicle sets during the daytime and 44 vehicle sets during the nighttime. Each vehicle was expected to produce a maximum sound level of 82 dBA at 7.5m while travelling at 60 km/hr. Note that the LRT will be covered south of the railway corridor as it enters a terminal station and will not generate significant noise at the future development site.

3.3 Railway Traffic

The nearby rail corridor is one of the busier corridors and carries CN freight traffic as well as Metrolinx/GO Transit and VIA Rail. Traffic volumes have been provided by CN and Metrolinx for

the corridor. The volumes are summarized in Table 3, below. Except for the GO Transit traffic, which is already projected to the future, the VIA and CN rail volumes are escalated by 10 years using a 2.5% per annum growth rate (approximately 1 dB increase over current traffic volumes).

Table 3: Railway Traffic Summary

Service	Daytime Volume	Nighttime Volume	Locomotives Per Train	Rail Cars Per Train	Speed (km/h)
VIA	12	0	2	10	152
CN Freight	1	0	4	140	96
CN Way Freight	1	4	2	25	96
GO Transit	192	46	1	12	137

Metrolinx has indicated that the future traffic will consist of a mix of diesel and electric trains, but have indicated that differences in sound levels should not be assumed. As such, all trains are treated as diesel trains for this review.

4.0 TRANSPORTATION NOISE ASSESSMENT

Based on the volumes provided in Section 3.0, the sound levels have been calculated at several locations of the proposed development. The calculated sound levels are summarized in Table 4, below.

Table 4: Transportation Noise Summary

Location	Tower	Description	Rail		Road		Combined	
			Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)	Daytime (dBA $L_{eq,16hr}$)	Nighttime (dBA $L_{eq,8hr}$)
1	North	North Façade, Central	76	73	61	55	76	73
2	North	East Façade, North Side	73	70	64	58	74	70
3	North	West Façade, North Side	73	70	N/A	N/A	73	70
4	North	South Façade, East Side	66	63	61	55	67	64
5	North	3rd Floor Amenity	71	N/A	57	N/A	71	N/A
6	South	North Façade, East Side	70	66	63	56	70	67
7	South	East Façade, North Side	69	66	66	59	71	67
8	South	South Façade, East Side	60	56	63	56	65	59
9	South	11th Floor Amenity	60	N/A	44	N/A	60	N/A

Note: OLA sound level calculations assume the presence of a 1.1m high safety barrier that acts as a noise barrier.

Please see Appendix B for sample calculations.

4.1 Noise Control Recommendations

The calculated sound levels exceed the MECP guidelines. As a result, noise control measures will be required.

Ventilation Upgrades

As the sound levels exceed 65 dBA L_{eq} during the daytime and 60 dBA L_{eq} during the nighttime, the entire development should be provided with central air conditioning. All of the affected units will need to be supplied with Warning Clause D (see Appendix C) in their *Agreements of Purchase and Sale or Lease*. The use of central air conditioning is fairly standard for new residential developments.

Noise Barriers

It is recommended that all private terraces/balconies be limited in depth to less than 4m. Otherwise, these terraces may require noise barriers.

The primary outdoor amenity on the north tower will have sound levels above the MECP limit. Table 5 outlines the barrier heights needed to achieve various sound levels.

Table 5: Barrier Heights vs. Sound Levels

Barrier Height (m)	OLA Sound Level (dBA $L_{eq,16hr}$)
1.1	71
4.0	63
6.0	60
20.0	57

As can be seen in the table above, it is not practical to achieve the target sound level of 60 dBA in the north tower's outdoor amenity area without significant noise control measures. Given the excessive sound levels, the outdoor amenity area should not be designated as intended for quiet enjoyment of the outdoors. As noted in *NPC-300*, the MECP only considers outdoor amenity areas as noise sensitive if they are:

- intended and designed for the quiet enjoyment of the outdoor environment; and
- readily accessible from the building.

As the above amenity area cannot be designed for such an application, it should not be designated or marketed for such uses.

The primary outdoor amenity area on the 11th floor of the south tower will meet the upper limit of 60 dBA assuming a standard 1.1m high parapet or screen. Table 6 outlines the barrier heights needed to achieve the lower limit of 55 dBA.

Table 6: Barrier Heights vs. Sound Levels

Barrier Height (m)	OLA Sound Level (dBA $L_{eq,16hr}$)
1.1	60
2.0	58
2.5	57
4.0	55

As can be seen from Table 6, achieving the target sound level of 55 dBA in the amenity area is challenging and would require a significant noise barrier. The use of a 1.1m tall screen or barrier would result in sound levels within the MECP's upper limit of 60 dBA while also providing a reasonably quiet space for outdoor enjoyment. The specific requirements for noise control should be confirmed prior to the site plan application as the building design progresses.

For rooftops, noise barriers can be constructed from a variety of materials including glass, concrete, masonry, metal, or plastic. As per *NPC-300*, such a rooftop noise barrier may have surface densities as low as 10 kg/m^2 and "should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps. Any gaps under the barrier that are necessary for drainage purposes should be minimized and localized, so that the acoustical performance of the barrier is maintained."

All units should be provided with Warning Clause B in their *Agreements of Purchase and Sale or Lease*.

Exterior Glazing and Walls/Panels

All exterior wall assemblies on the north, east, and west façades of the north and south tower should be constructed with brick veneering or masonry equivalent. Where spandrel panels are used in these, they should be constructed to achieve STC 55 in order to achieve an acoustical equivalent. An example construction for metal spandrel would be:

- Aluminum panel in aluminum frames
- 50mm rigid batt insulation
- 20 GA. galvanized steel backpan
- 16mm gypsum board or 13mm cement board laminated to backpan
- 12mm air space
- 64mm batt insulation
- 64mm steel studs @ 600mm o/c
- 2x16mm gypsum board (Fire Code C or Type X).

The suite layouts for the proposed development have not been detailed. Preliminary sound levels have been calculated using the National Research Council's BPN-56 prediction procedure using the most current plans. The preliminary calculations assume a 40% window-to-floor area ratio for bedrooms and a 60% window-to-floor area ratio for living rooms.

Table 7: Window STC Requirements

Façade	Room Type	Window STC
North	Bedroom	41
	Living Room	43
East/West	Bedroom	38
	Living Room	40
South	Bedroom	35
	Living Room	35

The above façade (window and spandrel) STC recommendations are preliminary. The STC requirements should be confirmed based on the final building designs.

5.0 VIBRATION ASSESSMENT

CN and Metrolinx typically require vibration measurements for developments 75m or closer to their railway rights-of-way. Vibration measurements were conducted along the northern property line of the future development. The four highest vibration levels are summarized in Table 8, below. Sample passby spectrum data are provided in Appendix B. The measurement location is also shown in Appendix B.

Table 8: Measured Vibration Levels

Train Passby	Direction	RMS Vibration (mm/s)
1	Eastbound	0.03
2	Westbound	0.04
3	Eastbound	0.03
4	Westbound	0.04

As can be seen in Table 8, the vibration levels are well below the limit of 0.14 mm/s RMS, as expected due to the low speed of the trains near the stations. Vibration control measures are not required for the subject site.

The vibration levels from the LRT could not be confirmed as the LRT is not yet operational. Based on confidential discussions with Metrolinx, the detailed design of the LRT trackwork is not yet complete. Given the very low speeds at the terminus station, it is not expected the LRT will generate vibration levels that exceed the limit of 0.14 mm/s RMS.

6.0 IMPACT OF THE DEVELOPMENT ON ITSELF AND THE SURROUNDING AREA

The City requests that new developments consider the noise impact of the development both on itself and the surrounding area.

There is residential development around the entire subject site. Typically, for a development such as this, exhaust fans and mechanical equipment located on the rooftop are the major noise generators.

In terms of the impact of the development on itself, the development's own mechanical/electrical equipment needs to be considered.

The mechanical design of the development has not yet progressed to the point where the impact of the development on itself or its surroundings can be accurately quantified. As plans

mature, a review of the impacts of the development on itself as well as on the surrounding area can be completed. In most cases, the most critical receptors are often the building's own future occupants.

Noise control measures for the development's mechanical equipment can be readily incorporated into the design. In many cases, equipment can also be selected to avoid a noise impact entirely. It is recommended a review of the outdoor noise impact of the development be completed at such a time when the mechanical design is completed, prior to the building permit application.

7.0 CONCLUSIONS

The proposed development is located in an area with a modest amount of transportation noise. The transportation sound levels exceed the MECP guidelines, and noise control measures in the form of ventilation upgrades, noise barriers, and façade elements have been recommended. The extent and nature of these upgrades is similar to those required for residential developments built nearby busy railways. These recommendations will be confirmed and detailed as part of the site plan application for the proposed development as the building design is finalized.

This analysis has been completed to demonstrate the development's feasibility. The glazing recommendations may need to be revisited should there be changes to the layouts that affect the noise control measures noted in this report.

Overall, the transportation noise study demonstrates the proposed development is technically feasible from a noise and vibration perspective. There are no major noise and/or vibration issues that would prove challenging to address at later stages of the design.

8.0 SUMMARY OF RECOMMENDATIONS

To meet the requirements of the Ministry of the Environment, Conservation and Parks, the City of Mississauga, Metrolinx, and CN, the following noise control measures will be required:

1. All units will be supplied with central air conditioning. Warning Clause Type D will be inserted into the *Agreements of Purchase and Sale or Lease* for all units.

2. Terraces and private balconies greater than 4m in depth are currently not proposed. If included, such areas should be reviewed for noise control measures, where required. Given the significant ambient sound levels, such private terraces should be avoided.

3. All units within the development need to be supplied with Warning Clause Type B in their *Agreements of Purchase and Sale or Lease*.

4. General glazing and spandrel panel recommendations have been provided based on current suite layouts. An updated analysis should be completed if there are changes to the floor plans and window elevations that would affect the glazing requirements.

5. The north tower's 3rd floor amenity area should not be designated or planned for quiet use given the high sound levels. The south tower's 11th floor amenity area is predicted to meet the guidelines assuming a standard 1.1m tall noise barrier along the perimeter.

6. As the development is located within 300m of the railway corridor, all units should be provided with the standard CN and Metrolinx Warning Clauses in any case. The warning clauses are to be inserted into the *Agreements of Purchase and Sale or Lease*.

7. Vibration control is not required as the vibration levels were measured to be well below 0.14 mm/s RMS. The LRT vibration levels are similarly expected to be well below the limit.

8. Prior to the building permit application, or at such a time when the final design is completed, a review of the proposed development's mechanical and electrical equipment should be completed to ensure that applicable noise guidelines are met at the surrounding areas as well as at the future development itself.

9. The future Hurontario LRT's Port Credit Station is located to the east of the site. The station is still being designed and final details on any equipment proposed have not been provided. Metrolinx will share more information regarding potential equipment from this station as it becomes available. An additional analysis will be completed once this information is received. Significant noise sources are not expected and would not affect the feasibility of the development as there is still time to implement noise control measures at the station itself. The significant ambient noise present also mitigates any potential impact from the stationary sources.

/pt

APPENDIX A: FIGURES

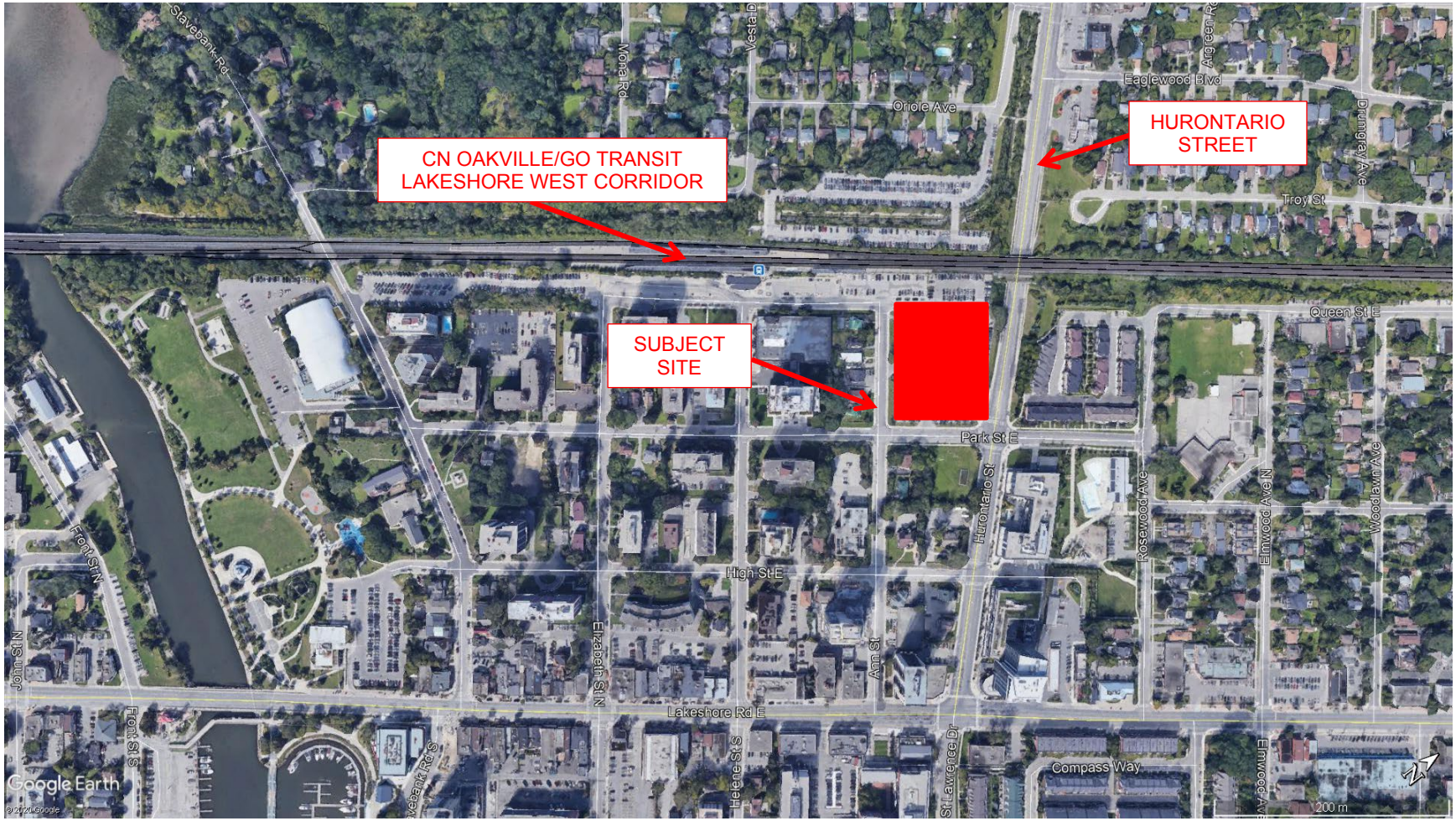


Figure 1: Key Plan

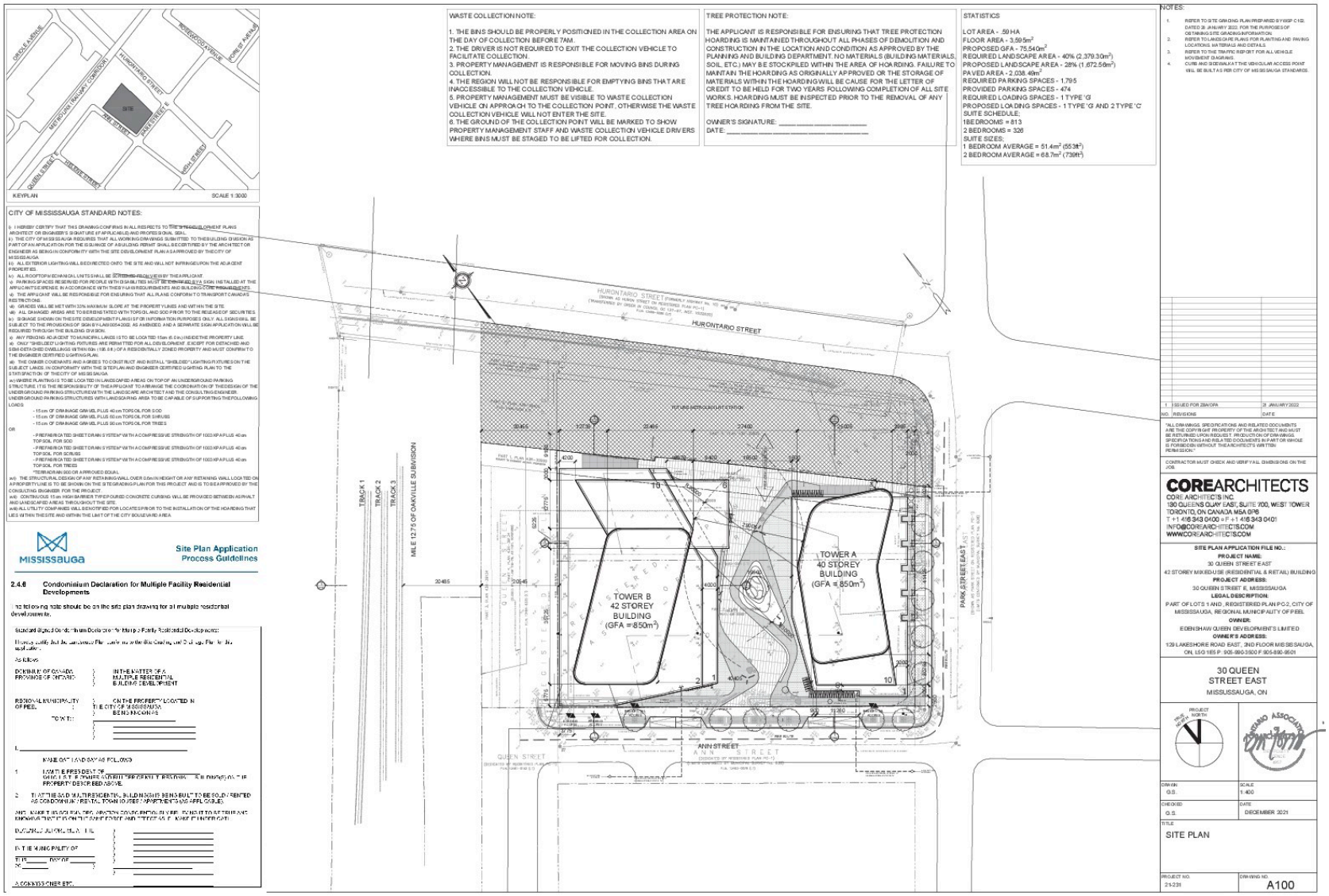


Figure 2: Site Plan

APPENDIX B: DATA AND SAMPLE CALCULATIONS

Subject: 23 Elizabeth Street North, Mississauga - Rail Data Request
From: Rail Data Requests <RailDataRequests@metrolinx.com>
Date: 2020-03-19, 4:42 p.m.
To: Sam Kulendran <skulendran@jecoulterassoc.com>

Good Day Sam,

Further to your request dated March 18, 2020, the subject property (23 Elizabeth Street North, Mississauga) is located in proximity to the Port Credit GO Station on Metrolinx's Oakville Subdivision which carries Lakeshore West GO Train service. We note we do not maintain information pertaining to idling and stationary activities at stations – that would be up to the consultant to collect that information for a typical weekday period.

It's anticipated that GO service on this lines will be comprised of a mix of both diesel and electric trains within (at least) a 10-year time horizon. The combined preliminary midterm weekday train volume forecast at this location, including both revenue and equipment trips is in the order of 238 trains – (54 diesel: 45 day, 9 night; 184 electric: 147 day, 37 night). Trains will be comprised of a single locomotive and up to 12 passenger cars.

The maximum track design speed at this location on this corridor is 85 mph (137 km/h).

Currently, anti-whistling is in effect at the Stavebank Road at-grade crossing.

With respect to future electrified rail service, Metrolinx is committed to finding the most sustainable solution for electrifying the GO and UP Express rail network and we are currently working towards the next phase. Metrolinx has not made a final decision regarding the electric train technology or technologies to be deployed. We can, however, provide the following interim information which may be helpful;

1. At lower speeds, train noise is dominated by the powertrain. At higher speeds, train noise is dominated by the wheel- track interaction. Hence, at higher speeds, the noise level and spectrum of electric trains is expected to be very similar, if not identical, to those of equivalent diesel trains.

2. Along with electrification, Metrolinx will intensify service levels along all of its corridors to deliver the promised GO Expansion service. Everything else being equal, this will likely result in an overall increase in train noise emissions.

Given the above considerations, it would be prudent, for the purposes of acoustical analyses, to assume that the acoustical characteristics of electrified and diesel trains are equivalent. In light of the aforementioned information, acoustical models should employ diesel train parameters as the basis for analyses. We anticipate that additional information regarding specific operational parameters for electrified trains will become available in the future.

Operational information is subject to change and may be influenced by, among other factors, service planning priorities, operational considerations, funding availability, and passenger demand.

It should be noted that this information is only as it pertains to Metrolinx trains. It would be prudent to contact other rail operators in the area directly for their rail traffic information.

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

Best Regards,

Terri Cowan
Third Party Projects Officer
Third Party Projects Review| Capital Projects Group
Metrolinx | 20 Bay Street, Suite 600 |Toronto, Ontario|M5J 2W3
T: 416-202-3903 C: 416-358-1595

Dear Sam:

Re: Train Traffic Data – CN Oakville Subdivision near 23 Elizabeth Street N, Mississauga ON

The following is provided in response to Sam's 2020/03/18 request for information regarding rail traffic in the vicinity of 23 Elizabeth Street North, in Mississauga ON at approximately Mile 13.01 on CN's Oakville Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

	0700-2300			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	1	140	60	4
Way Freight	1	25	60	4
Passenger	12	10	95	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	60	4
Way Freight	4	25	60	4
Passenger	0	10	95	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Oakville Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are two (2) at-grade crossing in the immediate vicinity of the study area at Mile 12.02 Revus Ave, and Mile 13.11 Stavebank Rd Xing. Anti-whistling bylaws are in effect at both Mile 12.02 Revus Ave and Mile 13.11 Stavebank Rd. Please note that engine warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

The double mainline track is considered to be continuously welded rail throughout the study area.

The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, **Adjacent Development**, Canadian National Railway Properties at Proximity@cn.ca should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,

Michael Vallins P.Eng
Manager, Public Works- Eastern Canada

NOISE REPORT FOR PROPOSED DEVELOPMENT

Date: 22-Dec-21

REQUESTED BY:

Name: Sam Kulendran, B.A.Sc., P.Eng.

Company: J.E. Coulter Associates Ltd.

PREPARED BY:

Nam Steven Guan

Tel#: 905-615-3200 ext. 5933

MISSISSAUGA

Location:
Park Street E - Stavebank Rd to Hurontario St
Ann Street - Lakeshore Rd E to Queen St E
Queen Street E - Elizabeth St N to Ann St
Hurontario Street (1) - Lakeshore Rd E to Park St E
Hurontario Street (2) - north of Park St E

ID 528

ON SITE TRAFFIC DATA

Specific	*Street Names*				
	Park St E	Ann St	Queen St E	Hurontario St (1)	Hurontario St (2)
AADT:	4,000	2,000	2,000	21,300	25,400
# of Lanes:	2 Lanes	2 Lanes	1 Lane	4 Lanes	4 Lanes
% Trucks:	4%	2%	2%	7%	7%
Medium/Heavy Trucks Ratio:	55/45	55/45	55/45	55/45	55/45
Day/Night Split:	90/10	90/10	90/10	90/10	90/10
Posted Speed Limit:	50 km/h	50 km/h	50 km/h	50 km/h	50 km/h
Gradient Of Road:	<2%	<2%	<2%	<2%	4%
Ultimate R.O.W:	20 m	20 m	20 m	30 m	30 m

Comments: Ultimate traffic data only (2041).

STAMSON 5.0 NORMAL REPORT Date: 03-02-2022 07:41:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: north.te Time Period: Day/Night 16/8 hours
Description: Roadway Sound Levels North

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Via	15.7/0.0	150.0	2.0	10.0	Diesel	Yes
* 2. Freight	1.3/0.0	96.0	4.0	140.0	Diesel	Yes
* 3. Way Freight	1.3/5.2	96.0	2.0	25.0	Diesel	Yes
* 4. GO	192.0/46.0	137.0	1.0	12.0	Diesel	Yes

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

No	Train type: Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	Via	12.0/0.0	2.50	11.00
2.	Freight	1.0/0.0	2.50	11.00
3.	Way Freight	1.0/4.0	2.50	11.00
4.	GO	192.0/46.0	0.00	10.00

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

Angle1 Angle2	-77.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	2	(Reflective ground surface)
Receiver source distance	45.00 / 45.00	m
Receiver height	1.50 / 20.00	m
Topography	1	(Flat/gentle slope; no barrier)
No Whistle		
Reference angle	0.00	

Results segment # 1: Metrolinx (day)

LOCOMOTIVE (0.00 + 75.10 + 0.00) = 75.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	90	0.00	80.20	-4.77	-0.33	0.00	0.00	0.00	75.10

WHEEL (0.00 + 67.84 + 0.00) = 67.84 dBA

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

-77	90	0.00	72.94	-4.77	-0.33	0.00	0.00	0.00	67.84

Segment Leq : 75.85 dBA

Total Leq All Segments: 75.85 dBA

Results segment # 1: Metrolinx (night)

LOCOMOTIVE (0.00 + 71.73 + 0.00) = 71.73 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	90	0.00	76.82	-4.77	-0.33	0.00	0.00	0.00	71.73

WHEEL (0.00 + 64.64 + 0.00) = 64.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-77	90	0.00	69.73	-4.77	-0.33	0.00	0.00	0.00	64.64

Segment Leq : 72.51 dBA

Total Leq All Segments: 72.51 dBA

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

```
Car traffic volume  : 21237/2360  veh/TimePeriod  *
Medium truck volume :   880/98    veh/TimePeriod  *
Heavy truck volume  :   743/83    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     4 %
Road pavement       :     1 (Typical asphalt or concrete)
```

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

```
    24 hr Traffic Volume (AADT or SADT):  25400
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   2.00
    Medium Truck % of Total Volume     :   3.85
    Heavy Truck  % of Total Volume     :   3.25
    Day (16 hrs) % of Total Volume     :  90.00
```

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

```
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
```

```
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.34 m

ROAD (0.00 + 61.14 + 0.00) = 61.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  69.71   0.00  -5.56  -3.01   0.00   0.00   0.00
61.14
-------------------------------------------------------------------------
--

Segment Leq : 61.14 dBA

Total Leq All Segments: 61.14 dBA


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

Source height = 1.34 m

ROAD (0.00 + 54.62 + 0.00) = 54.62 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  63.20   0.00  -5.56  -3.01   0.00   0.00   0.00
54.62
-------------------------------------------------------------------------
--

Segment Leq : 54.62 dBA

Total Leq All Segments: 54.62 dBA


RT/Custom data, segment # 1: LRT (day/night)
---------------------------------------------
1 - Custom (76.0 dBA):
Traffic volume    :   560/88    veh/TimePeriod
Speed             :    60 km/h
```

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

Angle1 Angle2	: -13.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 40.00 / 40.00	m
Receiver height	: 1.50 / 15.00	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 + 53.74 + 0.00) = 53.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-13	90	0.00	60.42	-4.26	-2.42	0.00	0.00	0.00	53.74

Segment Leq : 53.74 dBA

Total Leq All Segments: 53.74 dBA

Results segment # 1: LRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 48.71 + 0.00) = 48.71 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-13	90	0.00	55.39	-4.26	-2.42	0.00	0.00	0.00	48.71

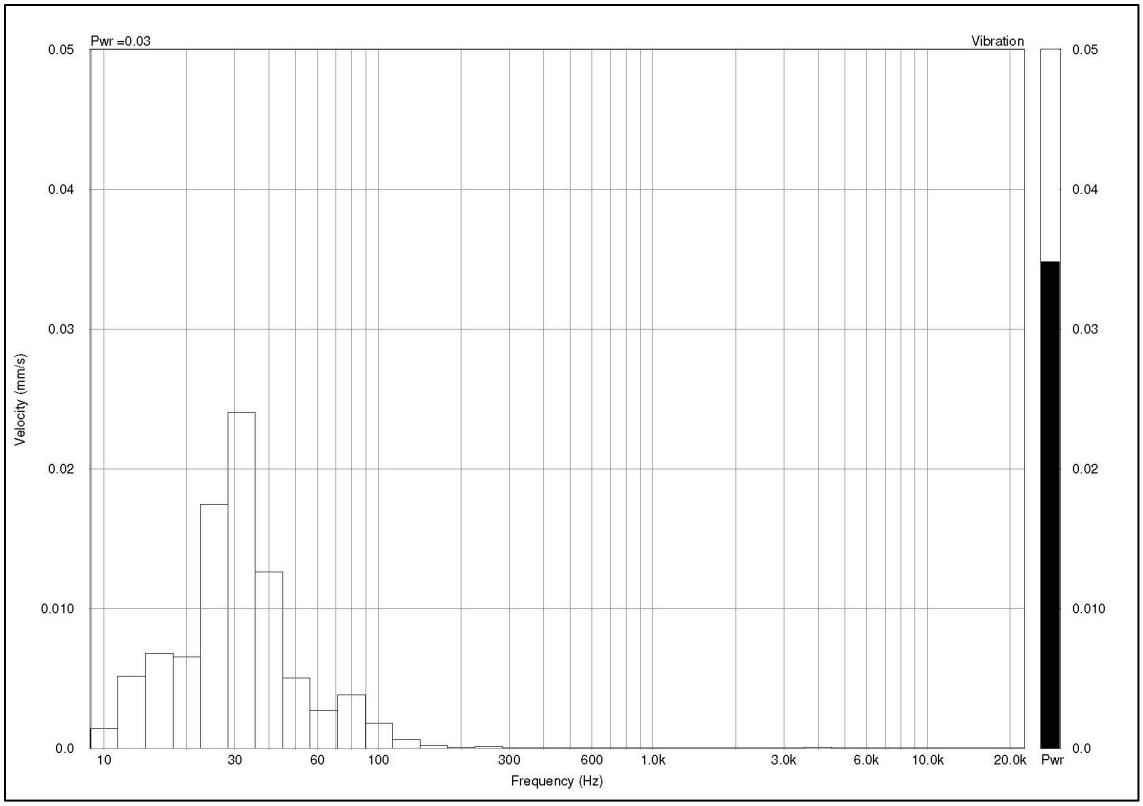
Segment Leq : 48.71 dBA

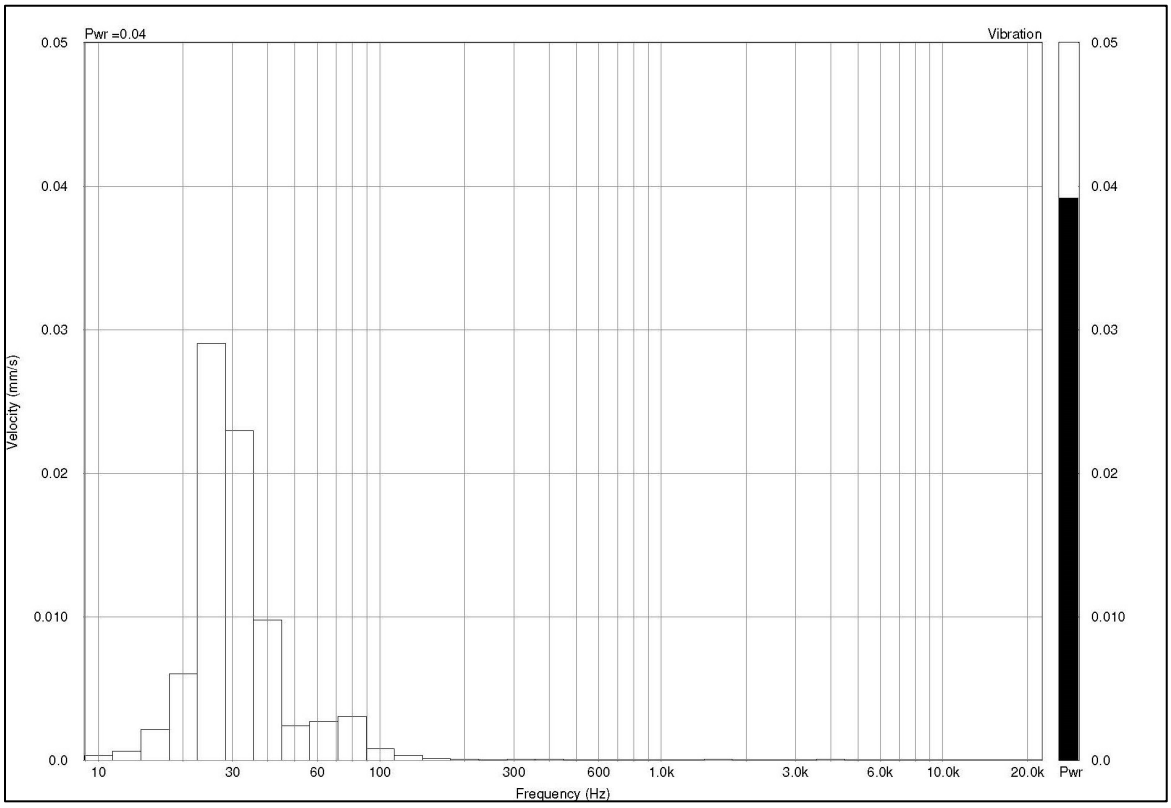
Total Leq All Segments: 48.71 dBA

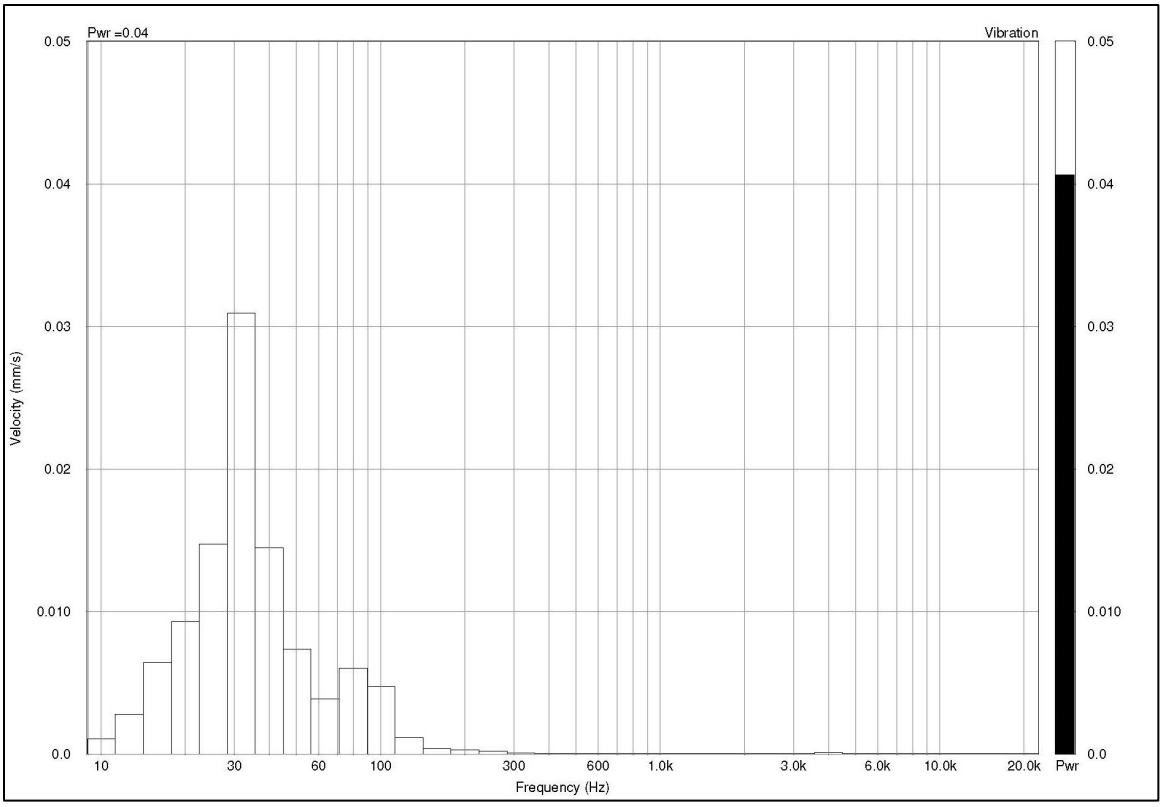
TOTAL Leq FROM ALL SOURCES (DAY): 76.02
(NIGHT): 72.60

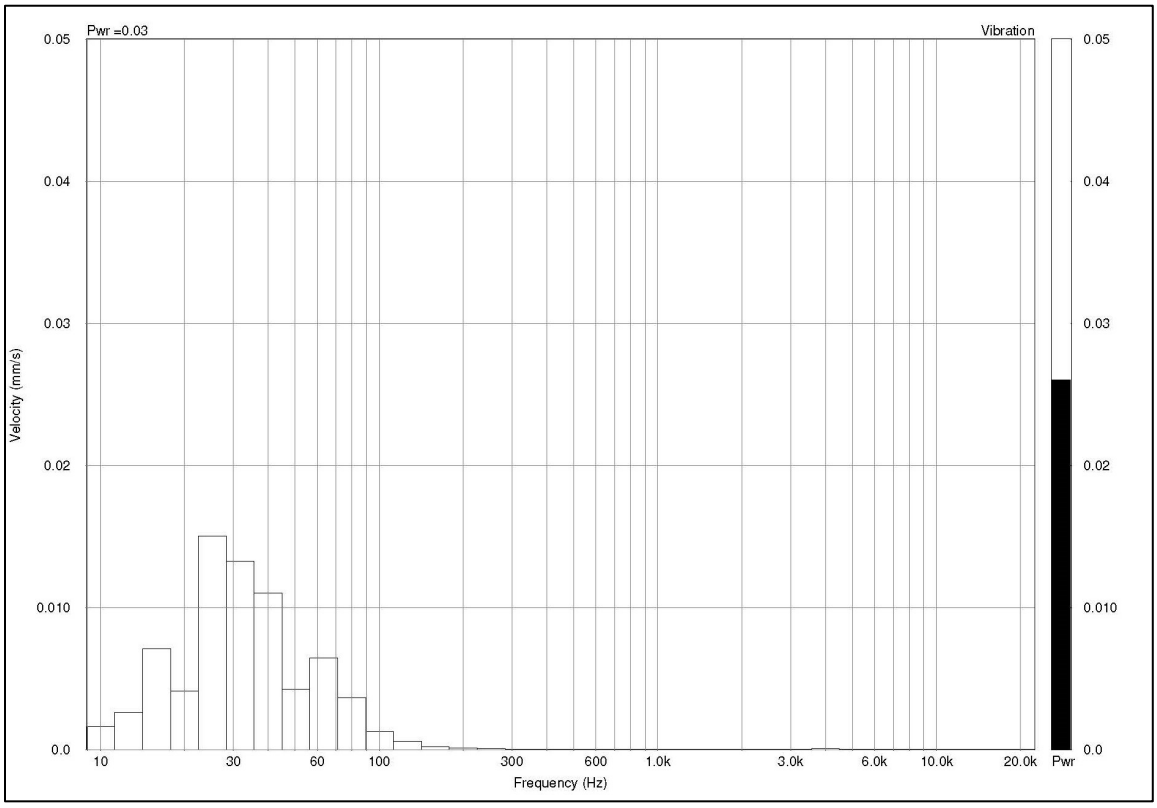
VIBRATION MEASUREMENT LOCATION AND DATA


Vibration Measurement Location
Oriole Ave
Sandham Rd
Eaglewood Blvd
Park St E


Pwr =0.03
Vibration
Velocity (mm/s)
0.05
0.04
0.03
0.02
0.010
0.0
10
30
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr


Pwr =0.04
Vibration
Velocity (mm/s)
0.05
0.04
0.03
0.02
0.010
0.0
10
30
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr


Pwr =0.04
Vibration
0.05
0.04
0.03
0.02
0.010
0.0
Velocity (mm/s)
10
30
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr


Pwr =0.03
Vibration
0.05
0.04
0.03
0.02
0.010
0.0
Velocity (mm/s)
10
30
60
100
300
600
1.0k
3.0k
6.0k
10.0k
20.0k
Frequency (Hz)
Pwr

APPENDIX C: WARNING CLAUSES

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

TYPE B: "Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic and rail traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

TYPE C: "This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

TYPE D: "This dwelling unit has been supplied with a central air-conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."

TYPE E: "Purchasers/tenants are advised that due to the proximity of the adjacent industry, noise from the industry may at times be audible."

CN: "Warning: Canadian National Railway Company or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject thereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

Metrolinx: "Metrolinx, carrying on business as GO Transit, and its assigns and successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the rail facilities on such right-of-way in the future including the possibility that GO Transit or any railway entering into an agreement with GO Transit to use the right-of-way or their assigns or successors as aforesaid may expand their operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). Metrolinx will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

APPENDIX D: REFERENCES

1. Ministry of the Environment, “Model Municipal Noise Control By-Law, Final Report,” August 1978.

2. Ontario Ministry of the Environment, Environmental Approvals and Land Use Planning Branch, “Guidelines for Road Traffic Noise Assessment,” July 1986.

3. Ministry of the Environment’s *STAMSON* Computer Programme (Version 5.03) for the IBM PC.

4. Ministry of the Environment, *ORNAMENT*, “Ontario Road Noise Analysis Method for Environment and Transportation,” November 1988.

5. Quirt, D.J., “Controlling Sound Transmission into Buildings,” National Research Council, Building Practice Note 56, Update 1.1.

6. Ministry of the Environment, *STEAM* “Sound from Trains Environmental Analysis Method,” July 1990.

7. Ministry of the Environment, “Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning,” Publication *NPC-300*, August 2013.

8. J.E. Coulter Associates Limited, “Noise and Vibration Impact Assessment, Hurontario-Main Light Rail Transit,” June 2014.