REPORT

3115 HURONTARIO STREET

MISSISSAUGA, ONTARIO

NOISE AND VIBRATION IMPACT STUDY

RWDI #2200840

July 5, 2024

SUBMITTED TO

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VERSION HISTORY

Index	Date	Description	Prepared by	Reviewed by
1	June 23, 2022	Draft	CAL	GER
2	September 8, 2022	Final	CAL	GER
3	July 3, 2024	Addressing City Comments	GER	ASN

EXECUTIVE SUMMARY

RWDI was retained to prepare a Noise and Vibration Impact Study for the proposed 3115 Hurontario Street development located in Mississauga, Ontario. The proposed development will consist of a 42-storey residential building on top of a 4-storey stepped podium. This assessment was completed to support the Zoning-By-Law Amendment as required by the City of Mississauga.

The following noise control measures are recommended for the proposed development:

1. Suite bedroom window glazing with sound isolation performance up to STC 34.
2. Suite bedroom balcony doors with sound isolation performance up to STC 28.
3. Installation of central air-conditioning so that all-suite windows can remain closed.
4. Construction of perimeter noise barriers along the outdoor amenity areas.
5. The inclusion of noise warning clauses related to:
    - Transportation sound levels at the plane of windows and in outdoor amenity areas (OLAs)

The potential for vibration influences on the site due to the adjacent future Hurontario LRT line was evaluated using the FTA vibration screening model. The screening assessment predicted levels of LRT passes below the applicable limits. Thus, no mitigation measures for vibration are required.

At this stage in design, the impact of the development on itself and its surroundings could not be quantitatively assessed. However, the impact on both the building itself and its surroundings is expected to be feasible to meet the applicable criteria. We recommend that the building design is evaluated prior to the detailed design to ensure that the acoustical design is adequately implemented in order to meet the applicable criteria.

Based on the results of the analysis including implementation of the recommendations included with this assessment, the proposed development is predicted to meet the applicable sound and vibration criteria.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

RWDI was retained to prepare a Noise and Vibration Impact Study in support of the Zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) for the proposed 3115 Hurontario Street development located in Mississauga, Ontario. The proposed development will consist of a 42-storey residential development with a 4-storey podium. The context site plan is shown in **Figure 1** and the site layout is shown in **Figure 2**.

The site is exposed to noise from road traffic on Hurontario Street to the southwest, Kirwin Avenue to the northwest and northeast, Dundas Street to the southeast, and Hillcrest Avenue to the southwest. Other roadways were not included in the assessment due to low traffic volume or separation distance. The site is exposed to rail traffic from the CP Galt subdivision approximately 285 m to the west which includes freight and passenger train traffic. The predicted impact of the future Hurontario LRT is included in the assessment.

A screening level assessment of nearby stationary sources was conducted, and it was deemed that there are no sources of concern for this development.

This assessment was completed to support the ZBA as required by the City of Mississauga. This assessment was based on design drawings dated June 1, 2022.

2 APPLICABLE CRITERIA

Applicable criteria for transportation noise sources (road and rail), stationary noise sources and rail vibration are adopted from the Ontario Ministry of the Environment, Conservation and Parks (MECP) NPC-300 Environmental Noise Guideline (MOE, 2013), with a summary of the applicable criteria included with **Appendix A**.

The proposed development site would be characterized as a “Class 1 Area”, which is defined according to NPC-300 as an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as "urban hum."

3 IMPACT OF THE ENVIRONMENT ON THE PROPOSED DEVELOPMENT

3.1 Transportation Source Assessment

3.1.1 Road Traffic Volume Data

The Annual Ultimate Daily Traffic (AUDT) volumes, vehicle type breakdown, and day-night split were obtained from the City of Mississauga.

A summary of the traffic data used is included in **Table 1** below with more detailed information included in **Appendix D**.

Table 1: Road Traffic Volumes

Roadway	Future Traffic (AUDT)	% Day/Night	Speed Limit (km/hr.)	% Trucks
Hurontario Street	53,200	90% /10%	60	7%
Dundas Street East	37,700	90% /10%	60	6%
Kirwin Avenue	12,500	90% /10%	50	3%
Hillcrest Avenue	28,400	90% /10%	50	3%

3.1.1 Rail Traffic Volume Data

Future Milton GO rail service traffic on CN Galt Subdivision, located approximately 300 m northwest of the site, was received from Metrolinx on May 26th, 2022. CN Rail traffic data was not available at the time of the study. In lieu of data from CN, a database of CN rail volumes and configurations has been referenced from the publicly available data on rail operations (LAS 2017). The day/night split of CN rail volumes has been approximated based on an assumed equal distribution over a 16-hour day and 8-hour night.

Traffic on the future Hurontario LRT was included in the assessment. The publicly available information (Mississauga, 2014) indicates that the LRT will be designed for up to 5-minute interval service during peak hours. It was conservatively assumed that during the daytime a total of 96 trains will run and at nighttime 14 trains will run, averaging 10- to 15-minute service respectively, with the understanding the LRT does not operate from 1:30 AM to 5:00 AM.

The data used for the analysis is summarized in Error! Not a valid bookmark self-reference., with details of the data used included in **Appendix D**.

Table 2: Rail Volumes and Configuration

Train Type	Daytime	Nighttime	Type of Locomotive	No of Locomotives	No of Cars	Speed (km/h)
Milton Go	38	6	Diesel	1	12	105
CN Rail	22	10	Diesel	2	100	110
LRT Hurontario	96	14	LRT	1	12	70

3.1.2 Representative Receptors

The selection of receptors affected by transportation noise sources was based on the drawings reviewed for this assessment. Using the "building evaluation" feature of Cadna/A, each façade of the residential buildings was assessed.

Outdoor Living Areas (OLAs) would include outdoor areas intended and designed for the quiet enjoyment of the outdoor environment and which are readily accessible from the building. OLAs may include any common outdoor amenity spaces associated with a multi-unit residential development (e.g., courtyards, roof-top terraces), and/or private backyards and terraces with a minimum depth of 4m provided they are the only outdoor living area for the occupant. Daytime sound levels were assessed at the following OLAs:

- OLA_01: Ground-level amenity space northeast of the building
- OLA_02: Rooftop amenity space on the northeast corner of the 2nd storey of the podium
- OLA_03: Rooftop amenity space on the southwest corner of the 3rd storey of the podium

Please note that two outdoor amenity spaces on each corner of the south side of the 2nd storey podium have had depths of less than 4 m and were therefore not evaluated as OLAs.

The OLAs are indicated in **Figure 3**.

3.1.3 Analysis and Results

Sound levels due to the adjacent transportation (road and rail) sources were predicted using the RLS-90 standard (RLS,1990) and FTA method (FTA, 2018) as implemented in the Cadna/A software package.

To assess the impact of transportation noise on suites, the maximum sound level on each façade was determined with the results summarized in **Table** .

Table 3: Predicted Ground Transportation Source Sound Levels – Plane of Window

Façade	Road		Rail		LRT		Notes
	Day L_{EQ}, 16hr	Night L_{EQ}, 8hr	Day L_{EQ}, 16hr	Night L_{EQ}, 8hr	Day L_{EQ}, 16hr	Night L_{EQ}, 8hr	
North	57	50	60	59	38	33	2
East	67	61	49	49	53	48	2
South	73	65	59	59	57	52	2
West	69	62	62	62	52	47	2

Notes:

1. Applicable for low and medium-density developments: Provision for future installation of air-conditioning, warning clause "Type C". Applicable for high-density developments: Installation of air-conditioning to allow for windows and doors to remain closed, warning clause "Type D". Refer to **Appendix C** for guidance regarding air-conditioning as a noise mitigation measure.
2. The acoustical performance of building components must be specified to meet the indoor sound level criteria. Installation of air conditioning to allow for windows and doors to remain closed, warning clause "Type D". Refer to **Appendix C** for guidance regarding air-conditioning as a noise mitigation measure.

To assess the impact of transportation noise on the qualifying OLAs for the development, predicted sound level results are summarized in **Table 4**.

Table 4: Transportation Sound Levels in Outdoor Living Areas (OLAs)

Receptor	Description	Daytime L_{EQ}, 16hr	Notes
OLA_01	Ground Level Northeast Amenity	58 dBA	1
OLA_02	2nd Storey Northeast Rooftop Amenity	61 dBA	2
OLA_03	3rd Storey Northwest Rooftop Amenity	64 dBA	2

Notes:

1. For OLA sound levels >55 dBA and ≤60 dBA, noise controls may be applied to meet the 55 dBA criterion. If noise control measures are not provided, a warning clause "Type A" is recommended.
2. Noise mitigation is recommended to meet the ≤55 dBA OLA sound level criterion. If noise controls are not feasible to meet the 55 dBA criterion for technical, economic or administrative reasons, an exceedance of 5 dB may be acceptable (to a maximum sound level of 60 dBA). In this case, a warning clause "Type B" is recommended.

Due to the exposure to transportation sources along existing nearby roads and the future Hurontario LRT. The combined (road and rail) daytime average sound levels for the OLAs included in the assessment is > 55 dBA, therefore recommended mitigation has been included in **Figure 3**.

3.1.4 Vibration Assessment

Vibration analysis was completed for the design of the LRT and excerpts from the report are included in **Appendix D**. The document states the following two scenarios:

"Any sensitive receptor located at least:

- *20 m from the centerline line of the nearest track wherever the LRT travels at 60 km/h*
- *25m from the centerline line of the nearest track wherever the LRT travels at 80 km/h*

will meet the guidelines limit of 0.10 mm/s without any additional control measures".

The maximum design speed was described as 70 km/h in available documentation. The actual speed adjacent to the proposed development is expected to be lower as it is within 300 m of the future Cooksville Station. This speed was conservatively assumed for the vibration assessment. The setback to the proposed development from the closest future LRT track is 22 m. An FTA vibration screening model calculation was undertaken to assess the potential for perceptible LRT pass-by vibrations.

An FTA vibration calculation was carried out using an LRT speed of 70 km/h and a distance of 22 m, which resulted in a vertical vibration RMS velocity of 0.07 mm/s. As the predicted levels are below the 0.1 mm/s limits, detailed vibration analysis and mitigation measures are not required. The FTA calculation is presented in **Appendix E**.

3.2 Recommendations

Based on the noise and vibration impact assessment results, the following recommendations were determined for the project.

3.2.1 Transportation Sources

The following recommendations are provided to address transportation sources.

3.2.1.1 Building Façade Components

Due to the elevated transportation sound levels in the area, acoustical design of the façade components including spandrel, window glazing, and exterior doors, are recommended to be specified for the proposed development.

To assess the development's feasibility, preliminary window glazing, and exterior balcony door sound isolation requirements were determined. These were based on the following assumptions:

- Typical residential living room:
  - Glazing 60% of façade, Door: 20% of façade
  - 55% Façade to floor area Ratio
- Typical residential bedroom:
  - Glazing 80% of façade, Door: N/A
  - 81% Façade to floor area Ratio
- Acoustical character of rooms: High absorption finishes/furniture for bedrooms and intermediate absorption finishes/furniture for living rooms.

Based on the predicted plane of window sound levels and the assumptions listed above, recommendations for the minimum sound insulation ratings for the building components were determined using the National Research Council of Canada "BPN-56 method" (NRCC, 1985). The reported results are in terms of Sound Transmission Class (STC) ratings as summarized in **Table 5**. Locations of the indoor receptors evaluated are presented in **Figure 4**.

Table 5: Recommended Facade Component Minimum Sound Insulation Rating

Façade	Window Glazing	Exterior Door	Predicted Indoor Sound Level (dBA)	
			Day	Night
North Façade (R1)	STC 30	STC 25	37	35
East Façade (R2)	STC 30	STC 25	44	35
South Façade (R3)	STC 34	STC 28	42	33
West Façade (R4)	STC 34	STC 25	39	34

The maximum requirement for the window glazing was determined to be STC 34, and STC 28 for the exterior door, which is considered feasible as this can be achieved by various double-glazed configurations of insulated glazing units.

Taking into account the assumptions used as a basis to determine the glazing requirements, the applicable indoor transportation source sound level criteria are predicted to be achieved.

We recommend that the façade construction is reviewed during detailed design to ensure that the indoor sound level limits will be met and that the window/door supplier is requested to provide STC laboratory test reports as part of the shop drawing submittal to confirm that the glazing/door components will meet the minimum STC requirements.

3.2.1.2 Ventilation Recommendations

Due to the transportation sound levels at the plane of the façade, central air conditioning is recommended for the proposed development to allow for windows and doors to remain closed as a noise mitigation measure. Further, prospective purchasers or tenants should be informed by a warning clause "Type D".

3.2.1.3 Outdoor Living Areas

Due to exposure to transportation sources, the predicted sound levels in OLAs are predicted to be elevated. The combined (rail and road) daytime average sound levels for the OLAs included in the assessment are in the range of 58 to 64 dBA. To reduce the transportation sound levels in OLAs to meet the applicable criteria, noise barriers are recommended.

The recommended geometry of the noise barriers is included in **Figure 3**. The barrier heights are summarized in **Table 6**. General guidance with respect to noise barrier design is included in **Appendix C**. The specific construction of these barriers has not yet been designed but will follow the requirements as outlined in Appendix C.

Table 6: Barrier Height Recommendations for OLAs

Receptor	Description	Predicted OLA Sound Level	Barrier Height (m) to Meet Sound Level Criterion	
		Daytime L_{EQ}, 16hr	≤ 55 dBA[1]	≤ 60 dBA[2]
OLA_01	Ground Level Northeast Amenity	OLA_01	2.7	-
OLA_02	2nd Storey Northeast Rooftop Amenity	OLA_02	2.7	0.9
OLA_03	3rd Storey Northwest Rooftop Amenity	OLA_03	2.5	1.7

Notes:
1. Refer to Figure 3a for barrier geometry to meet 55 dBA.
2. Refer to Figure 3b for barrier geometry to meet 60 dBA. A warning clause "Type B" is recommended in cases where the OLA sound level is >55 dBA (to a maximum of 60 dBA).
3. If noise control measures are not provided, a warning clause "Type A" is recommended.

3.2.2 Warning Clauses

The following warning clauses are recommended for the proposed development:

1. NPC-300 Type A or B to address transportation sound levels in Outdoor Living Areas (OLAs)
2. NPC-300 Type D to address transportation sound levels at the plane of windows

Warning clauses are recommended to be included on all development agreements, offers of purchase and agreements of purchase and sale or lease. The wording of the recommended warning clauses is included in **Appendix B**.

4 IMPACT OF THE PROPOSED DEVELOPMENT ON ITS SURROUNDINGS AND ON ITSELF

On-site stationary sources for the development are expected to consist of HVAC-related equipment in the roof-top mechanical penthouse as well as various exhaust fans. Further, consideration should be given to controlling airborne and structure-borne noise generated within the proposed development.

Within the development itself, the main sources of noise that are likely to affect the uses of the building are the mechanical systems.

Provided that best practices for the acoustical design of the building are followed, noise from building services equipment associated with the development is expected to be feasible to meet the applicable sound level criteria due to the nature (residential) of the proposed development.

We recommend that the potential noise impact of the proposed development is reviewed during detailed design to ensure the applicable sound level criteria will be achieved.

5 CONCLUSIONS

RWDI was retained to prepare a Noise and Vibration Impact Study for the proposed residential development located in Mississauga, Ontario.

The following noise control measures are recommended for the proposed development:

1. Suite bedroom window glazing with sound isolation performance up to STC 34.
2. Suite bedroom balcony doors with sound isolation performance up to STC 28.
3. Installation of central air-conditioning so that all-suite windows can remain closed.
4. Construction of perimeter noise barriers along the outdoor amenity areas.
5. The inclusion of noise warning clauses related to:
    - Transportation sound levels at the plane of windows and in outdoor amenity areas (OLAs)

Vibration from the future Hurontario LRT on the proposed development is not expected, as indicated by conservative FTA vibration calculations. Thus, no mitigation measures for vibration are required.

At this stage in design, the impact of the development on itself and its surroundings could not be quantitatively assessed. However, the impact on both the building itself and its surroundings is predicted to meet the applicable criteria.

We recommend that the building design is evaluated prior to the building permit to ensure that the acoustical design is adequately implemented in order to meet the applicable criteria.

Based on the results of the analysis including implementation of the recommendations included with this assessment, the proposed development is predicted to meet the applicable sound and vibration criteria.

6 REFERENCES

1. Ontario Ministry of the Environment (MOE), August 2013, Publication NPC-300, Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning (MOE, 2013).
2. Richtlinien für den Lärmschutz an Strassen (RLS). BM für Verkehr, Bonn, 1990 (RLS, 1990).
3. Federal Transit Administration, U.S. Department of Transportation, Transit Noise and Vibration Impact Assessment, 2018 (FTA, 2018).
4. The Railway Association of Canada (RAC), Guidelines for New Development in Proximity to Railway Operations (RAC, 2013).
5. City of Mississauga, City of Brampton, and Metrolinx, Hurontario-Main LRT Project Preliminary Design TPAP Environmental Project Report (Mississauga, 2014).

7 STATEMENT OF LIMITATIONS

This report titled 3115 Hurontario Street dated July 5, 2024, was prepared by Rowan Williams Davies & Irwin Inc. ("RWDI") for Intentional Capital ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein 3115 Hurontario Street ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by the Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

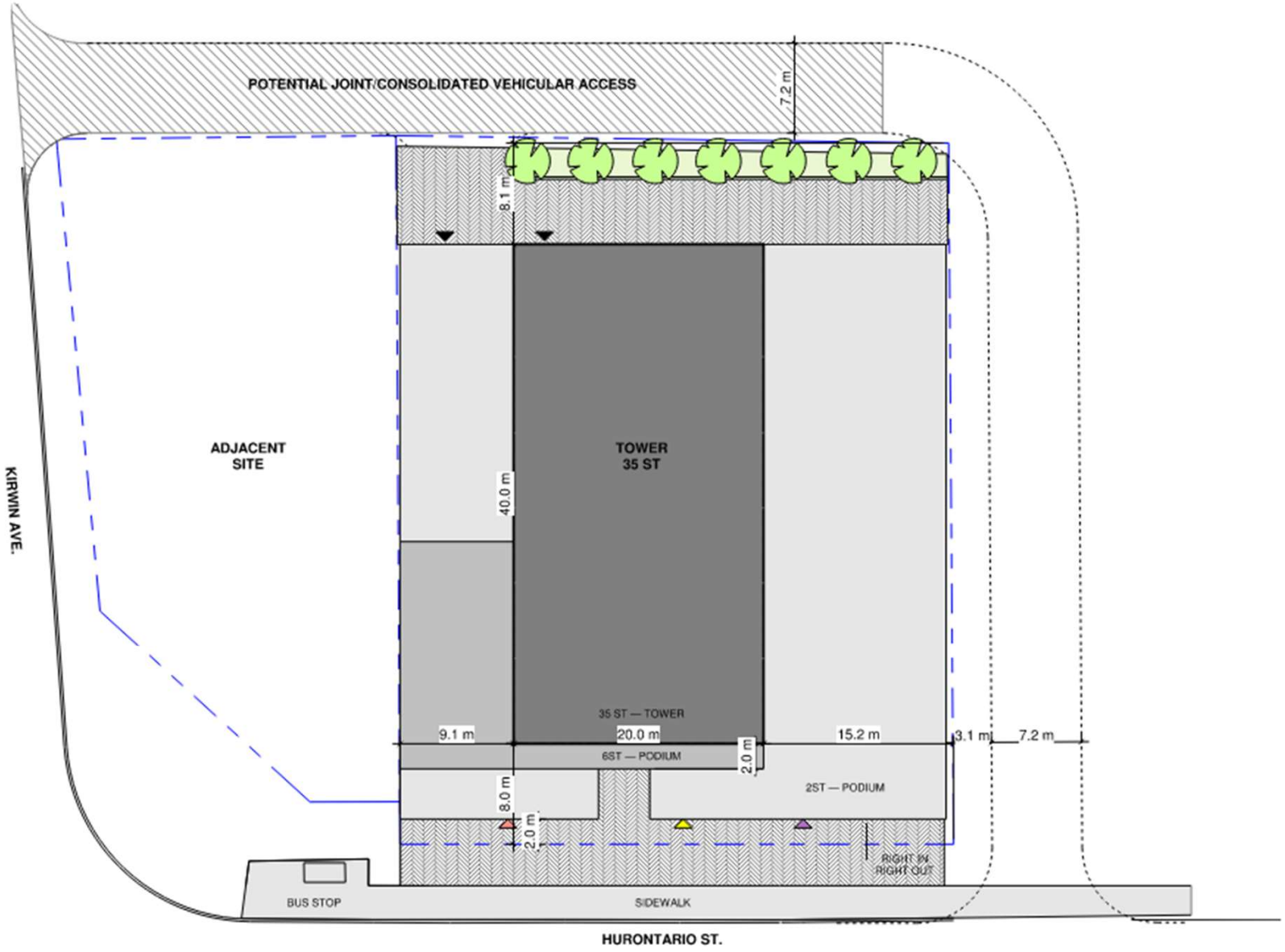
Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

FIGURES

Context Site Plan

3115 Hurontario Street, Mississauga, ON.

Drawn by:	CAL	Figure:	1
Project #:			2200840
Date:			2022-06-23

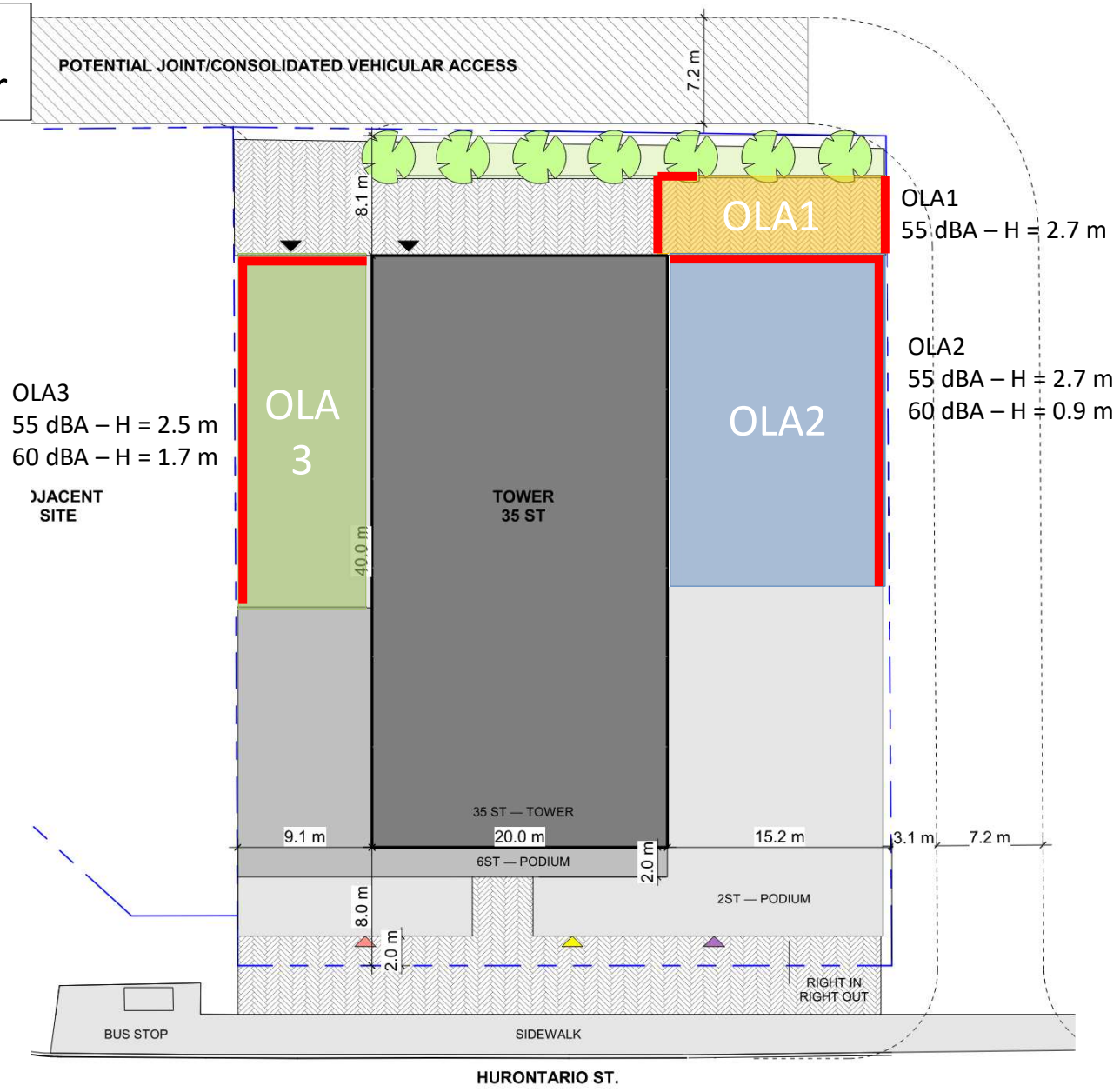


Site Layout

3115 Hurontario Street, Mississauga, ON.

Drawn by:	CAL	Figure:	2
Project #:			2200840
Date:			2022-06-23

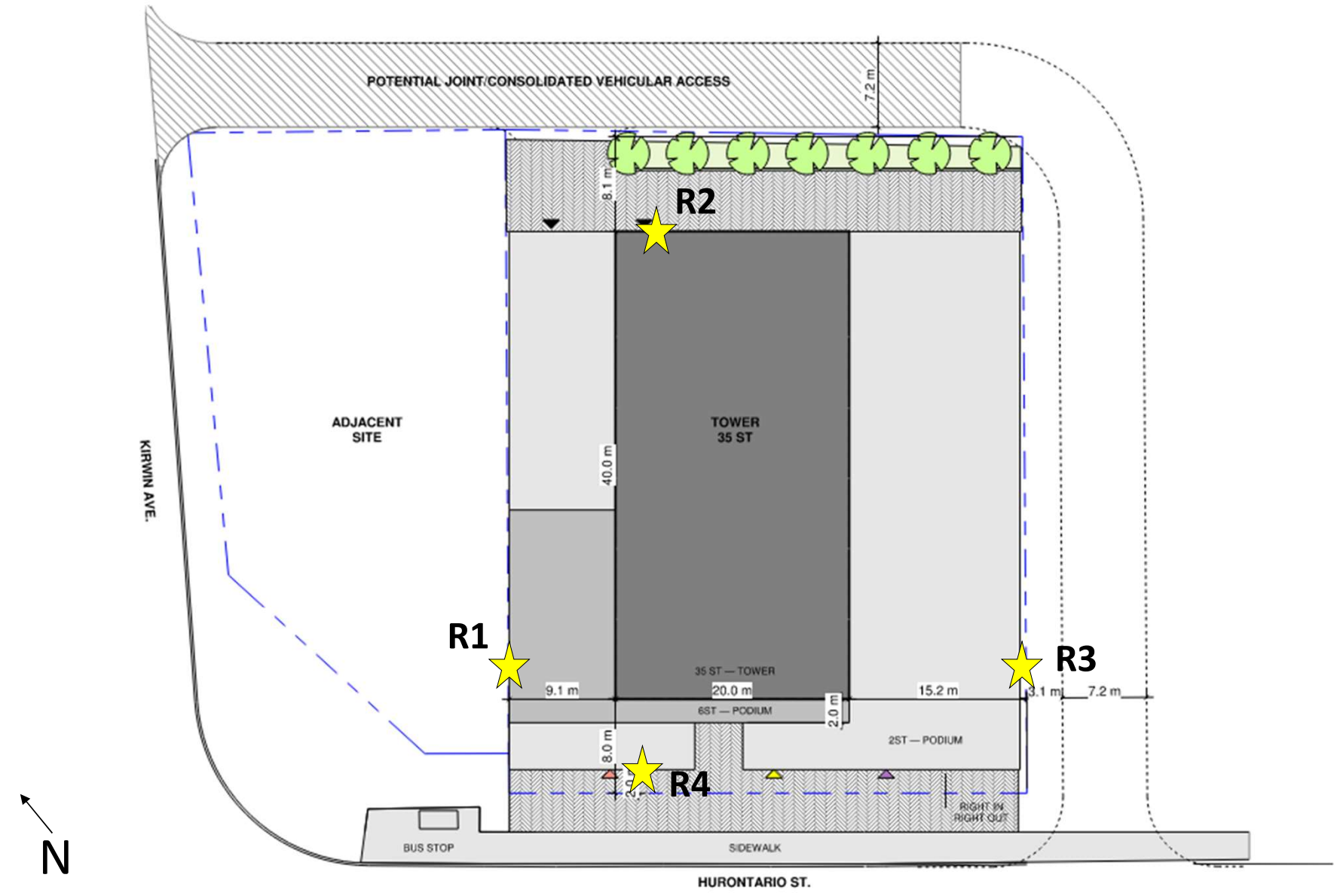
Legend
Noise Barrier



Outdoor Living Areas (OLAs) and Noise Barriers

3115 Hurontario Street, Mississauga, ON.

Drawn by: GER	Figure: 3
Project #:	2200840
Date:	2022-06-23



Locations of Evaluated Indoor Noise Receptors

3115 Hurontario Street, Mississauga, ON.

Drawn by:	GER	Figure:	4
Project #:			2200840
Date:			2024-07-03

APPENDIX A

APPENDIX A: CRITERIA

A.1 Transportation Sources

Guidance from the Ontario Ministry of the Environment, Conservation and Parks (MECP) NPC-300 Environmental Noise Guideline was used to assess environmental noise generated by transportation-related sources. There are three aspects to consider, which include the following:

i. Transportation source sound levels in indoor living areas (living rooms and sleeping quarters), which determines building façade elements (windows, exterior walls, doors) sound insulation design recommendations.
ii. Transportation source sound levels at the plane of the window, which determines air-conditioning and ventilation system recommendations and associated warning clauses which inform the future occupants that windows and doors must be closed in order to meet the indoor sound level criteria.
iii. Transportation source sound levels in Outdoor Living Areas (OLAs), which determines OLA noise mitigation and related warning clause recommendations.

A.1.1 Road and Rail

A.1.1.1 Indoor Sound Level Criteria

For assessing sound originating from transportation sources, NPC-300 defines sound level criteria as summarized in Table 1 for indoor areas of sensitive uses. The specified values are maximum sound levels and apply to the indicated indoor spaces with the windows and doors closed.

Table 1: Indoor Sound Level Criteria for Road and Rail Sources

Type of Space	Source	Sound Level Criteria (Indoors)	
		Daytime $L_{eq,16\text{-}hr}$ 07:00h – 23:00h	Nighttime $L_{eq,8\text{-}hr}$ 23:00h – 07:00h
Living Quarters Examples: Living, dining and den areas of residences, hospitals, nursing homes, schools and daycare centres	**Road**	45 dBA	
	Rail	40 dBA	
Sleeping Quarters	**Road**	45 dBA	40 dBA
	Rail	40 dBA	35 dBA

NPC-300 also provides guidelines for acceptable indoor sound levels that are extended to land uses and developments which are not normally considered noise sensitive. The guideline sound level criteria presented in Table 2 are provided to inform good-practice design objectives.

Table 2: Supplementary Indoor Sound Level Criteria for Road and Rail Sources

Type of Space	Source	Sound Level Criteria (Indoors)	
		Daytime $L_{eq,16\text{-}hr}$ 07:00h – 23:00h	Nighttime $L_{eq,8\text{-}hr}$ 23:00h – 07:00h
General offices, reception areas, retail stores, etc.	**Road**	50 dBA	-
	Rail	45 dBA	-
Theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.	**Road**	45 dBA	-
	Rail	40 dBA	-
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	**Road**	-	40 dBA
	Rail	-	35 dBA
Sleeping quarters of hotels/motels	**Road**	-	45 dBA
	Rail	-	40 dBA

A.1.1.2 Outdoor Living Areas (OLAs)

Outdoor Living Areas (OLAs) would include outdoor areas intended and designed for the quiet enjoyment of the outdoor environment and which are readily accessible from the building.

OLAs may include any common outdoor amenity spaces associated with a multi-unit residential development (e.g. courtyards, roof-top terraces), and/or private backyards and terraces with a minimum depth of 4m provided they are the only outdoor living area for the occupant. The sound level criteria for outdoor living areas is summarized in Table 3.

Table 3: Sound Level Criteria – Outdoor Living Area

Assessment Location	Sound Level Criteria (Outdoors)	
	Daytime $L_{eq,16\text{-}hr}$ 07:00h – 23:00h	Nighttime $L_{eq,8\text{-}hr}$ 23:00h – 07:00h
Outdoor Living Area (OLA) (Combined Road and Rail)	55 dBA	-

A.1.1.3 Outdoor and Plane of Window Sound Levels

In addition to the sound level criteria, noise control measures and requirements for ventilation and warning clauses requirements are recommended for residential land-uses based on predicted transportation source sound levels incident in the plane of window at bedrooms and living/dining rooms, and/or at outdoor living areas. These recommendations are summarized in Table 4 below.

Table 4: Ventilation, Building Component, and Warning Clauses Recommendations for Road/Rail Sources

Assessment Location	Transportation Sound Level (Outdoors)		Recommendations
	Daytime $L_{eq,16\text{-}hr}$ 07:00h – 23:00h	Nighttime $L_{eq,8\text{-}hr}$ 23:00h – 07:00h	
Plane of Window (Road)	> 65 dBA	> 60 dBA	Installation of air conditioning to allow windows to remained closed. The sound insulation performance of building components must be specified and designed to meet the indoor sound level criteria. Warning clause “Type D” is recommended.
	> 55 dBA	> 50 dBA	Applicable for low and medium density development: Forced-air ventilation system to allow for the future installation of air-conditioning. Warning clause “Type C” is recommended. Applicable for high density development: Air conditioning to allow windows to remained closed. Warning clause “Type D” is recommended.

Assessment Location	Transportation Sound Level (Outdoors)		Recommendations
	Daytime $L_{eq,16\text{-}hr}$ 07:00h – 23:00h	Nighttime $L_{eq,8\text{-}hr}$ 23:00h – 07:00h	
Plane of Window (Rail [1, 2])	> 60 dBA	> 55 dBA	The acoustical performance of building façade components should be specified such that the indoor sound level limits are predicted to be achieved. Warning clause "Type D" is recommended.
	> 60 dBA ($L_{eq,\ 24hr}$) and < 100m from tracks		Exterior walls consisting of a brick veneer or masonry equivalent for the first row of dwellings. Warning clause "Type D" is recommended.
Outdoor Living Area (Combined Road and Rail [3])	≤ 60 dBA > 55 dBA	-	If sound levels are predicted to exceed 55 dBA, but are less than 60 dBA, noise controls may be applied to reduce the sound level to 55 dBA. If noise control measures are not provided, a warning clause "Type A" is recommended.
	> 60 dBA	-	Noise controls (barriers) should be implemented to meet the 55 dBA criterion. If mitigation is not feasible to meet the 55 dBA criterion for technical, economic or administrative reasons, an exceedance of 5 dB may be acceptable (to a maximum sound level of 60 dBA). In this case a warning clause "Type B" would be recommended.

Notes:

1. Whistle noise is included (if applicable) in the determination of the sound level at the plane of window.
2. Some railway companies (e.g. CN, CP) may require that the exterior walls include a brick veneer or masonry equivalent for the façade facing the railway line, regardless of the sound level.
3. Whistle noise is not included in the determination of the sound level at the OLA.

A.1.1.4 Rail Layover Sites

NPC-300 provides a sound level limit for rail layover sites to be the higher of the background sound level or 55 dBA $L_{eq,1\text{-}hr,}$ for any one-hour period.

A.1.1.5 Rail Vibration Criteria

An assessment of rail vibration is generally recommended for developments within 75m of a rail corridor or rail yard, and adjacent to or within a setback of 15m of a transit (subway or light-rail) rail line.

The generally accepted vibration criterion for sensitive land-uses is the threshold of perception for human exposure to vibration, being a vibration velocity level of 0.14 mm/s RMS in any one-third octave band centre frequency in the range of 4 Hz to 200 Hz.

This vibration criterion is based on a one-second exponential time-averaged maximum hold root-mean-square (RMS) vibration velocity level and is consistent with the Railway Associations of Canada (RAC, 2013) guideline, the U.S. Federal Transit Authority (FTA, 2018) criterion for residential land-uses, the Toronto Transit Commission (TTC) guidelines for the assessment of potential vibration impact of future expansion (MOEE/TTC, 1993).

A.2 Stationary Sources

A.2.1 NPC-300 Sound Level Criteria – Stationary Sources

Guidance from the MECP NPC-300 Environmental Noise Guideline is used to assess environmental noise generated by stationary sources, for example industrial and commercial facilities.

Noise from stationary sources is treated differently from transportation sources and requires sound levels be assessed for the predictable worst-case one-hour average sound level (L_{eq}) for each period of the day. For assessing sound originating from stationary sources, NPC-300 defines sound level criteria for two types of Points of Reception (PORs): outdoor and plane of window.

The assessment criteria for all PORs is the higher of either the exclusion limit per NPC-300 or the minimum background sound level that occurs or is likely to occur at a POR. The applicable exclusion limit is determined based on the level of urbanization or "Class" of the area. The NPC-300 exclusion limits for continuously operating stationary sources are summarized in Table 9.

Table 9: NPC-300 Exclusion Limits – Continuous and Quasi-Steady Impulsive Stationary Sources (LAeq-1hr)

Time Period	Class 1 Area		Class 2 Area		Class 3 Area		Class 4 Area	
	Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window
Daytime 0700-1900h	50 dBA	50 dBA	50 dBA	50 dBA	45 dBA	45 dBA	55 dBA	60 dBA
Evening 1900-2300h	50 dBA	50 dBA	45 dBA	50 dBA	40 dBA	40 dBA	55 dBA	60 dBA
Nighttime 2300-0700h	--	45 dBA	--	45 dBA	--	40 dBA	--	55 dBA

Notes:

1. The applicable sound level criterion is the background sound level or the exclusion limit, whichever is higher.
2. Class 1, 2 and 3 sound level criteria apply to a window that is assumed to be open.
3. Class 4 area criteria apply to a window that is assumed closed. Class 4 area requires formal designation by the land-use planning authority.
4. Sound level criteria for emergency backup equipment (e.g. generators) operating in non-emergency situations such as testing or maintenance are 5 dB greater than the applicable sound level criteria for stationary sources.

For impulsive sound, other than quasi-steady impulsive sound, from a stationary source, the sound level criteria at a POR is expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}), and is summarized in Table 10.

Table 10: NPC-300 Exclusion Limits – Impulsive Stationary Sources (L_{LM})

Time Period	Number of Impulses in Period of One-Hour	Class 1 and 2 Areas		Class 3 Areas		Class 4 Areas	
		Outdoor	Plane of Window	Outdoor	Plane of Window	Outdoor	Plane of Window
Daytime (0700-2300h)	9 or more	50 dBAI	50 dBAI	45 dBAI	45 dBAI	55 dBAI	60 dBAI
Nighttime (2300–0700h)		-	45 dBAI	-	40 dBAI	-	55 dBAI
Daytime (0700-2300h)	7 to 8	55 dBAI	55 dBAI	50 dBAI	50 dBAI	60dBAI	65 dBAI
Nighttime (2300–0700h)		-	50 dBAI	-	45 dBAI	-	60 dBAI
Daytime (0700-2300h)	5 to 6	60 dBAI	60 dBAI	55 dBAI	55 dBAI	65 dBAI	70 dBAI
Nighttime (2300–0700h)		-	55 dBAI	-	50 dBAI	-	65 dBAI
Daytime (0700-2300h)	4	65 dBAI	65 dBAI	60 dBAI	60 dBAI	70 dBAI	75 dBAI
Nighttime (2300–0700h)		-	60 dBAI	-	55 dBAI	-	70 dBAI
Daytime (0700-2300h)	3	70 dBAI	70 dBAI	65 dBAI	65 dBAI	75 dBAI	80 dBAI
Nighttime (2300–0700h)		-	65 dBAI	-	60 dBAI	-	75 dBAI
Daytime (0700-2300h)	2	75 dBAI	75 dBAI	70 dBAI	70 dBAI	80 dBAI	85 dBAI
Nighttime (2300–0700h)		-	70 dBAI	-	65 dBAI	-	80 dBAI
Daytime (0700-2300h)	1	80 dBAI	80 dBAI	75 dBAI	75 dBAI	85 dBAI	90 dBAI
Nighttime (2300–0700h)		-	75 dBAI	-	70 dBAI	-	85 dBAI

Notes:

1. The applicable sound level criterion is the background sound level or the exclusion limit, whichever is higher.

APPENDIX B

APPENDIX B: WARNING CLAUSES

Warning clauses are recommended to be included on all development agreements, offers of purchase and agreements of purchase and sale or lease. Warning clauses may be used individually or in combination.

The following warning clauses are recommended based on the applicable guidelines; however, wording may be modified/customized during consultation with the planning authority to best suit the proposed development:

B.1 Transportation Sources

NPC-300 Type A: Recommended to address surface transportation sound levels in OLAs if sound level is in the range of >55 dBA but ≤ 60 dBA, and noise controls have not been provided.

"Purchasers/tenants are advised that sound levels due to increasing road traffic (rail traffic) (air 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."

NPC-300 Type B: Recommended to address surface transportation sound levels in OLAs if the sound level is in the range of >55 dBA but ≤ 60 dBA, and noise controls have been provided. Recommended to address outdoor aircraft sound levels ≥NEF 30.

"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 (rail traffic) (air 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."

NPC-300 Type C: Applicable for low and medium density developments only, recommended to address transportation sound levels at the plane of window.

"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."

NPC-300 Type D: Recommended to address transportation sound levels at the plane of window.

"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."

Proximity to Railway Line: Metrolinx/CN/CP/VIA Warning Clause for developments that are within 300 metres of the right-of-way

"Warning: [Canadian National Railway Company] [Metrolinx / GO] [Canadian Pacific Railway Company] [VIA Rail Canada Inc.] or its assigns or 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 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/Metrolinx/GO/CPR/VIA will not responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way."

B.2 Stationary Sources

NPC-300 Type E: Recommended to address proximity to commercial/industrial land-use

"Purchasers/tenants are advised that due to the proximity of the adjacent industrial/commercial land-uses, noise from the industrial/commercial land-uses may at times be audible."

NPC-300 Type F: Recommended to for Class 4 Area Notification

"Purchasers/tenants are advised that sound levels due to the adjacent industry (facility) (utility) are required to comply with sound level limits that are protective of indoor areas and are based on the assumption that windows and exterior doors are closed. This dwelling unit has been supplied with a ventilation/air conditioning system which will allow windows and exterior doors to remain closed."

APPENDIX C

APPENDIX C: NOISE MITIGATION GUIDANCE

C.1 Acoustic/Noise Barrier

Generally, noise controls to attenuate transportation sound levels at Outdoor Living Areas (OLAs) would consist of the implementation of acoustic/noise barriers with materials that would meet the guidance included in NPC-300, for example:

- A wall, berm, wall/berm combination or similar structure, used as a noise control measure, and high enough to break the line-of-sight between the source and the receptor.
- The minimum surface density (face weight) is 20 kg/m^2
    - Many materials could satisfy the surface density requirement, e.g. wood, glass, concrete, Plexiglas, Acrylite.
    - The required thickness can be determined by dividing the 20 kg/m^2 face weight by the material density (kg/m^3). Typically, this would imply:
        - 50 mm (2") thickness of wood
        - 13 mm (0.5") thickness of lighter plastic (like Plexiglas or PVC)
        - 6 mm (0.25") thickness of heavier material (like aluminum, glass, concrete)
- The barrier should be structurally sound, appropriately designed to withstand wind and snow load, and constructed without cracks or surface gaps. Joints between panels may need to be overlapped to ensure surfaces are free of gaps, particularly for wood construction.
- 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.
- If a sound absorptive face is to be included in the barrier design, the minimum noise reduction coefficient is recommended to be NRC 0.7.

C.2 Building Ventilation and Air Conditioning

The use of air conditioning itself is not a noise control measure; however, it allows for windows and doors to remain closed, thereby reducing the indoor sound levels.

NPC-300 provides the following guidance with respect to implementation of building ventilation and air conditioning:

a. the noise produced by the proposed ventilation system in the space served does not exceed 40 dBA. In practice, this condition usually implies that window air conditioning units are not acceptable;
b. the ventilation system complies with all national, provincial and municipal standards and codes;
c. the ventilation system is designed by a heating and ventilation professional; and
d. the ventilation system enables the windows and exterior doors to remain closed.

Air conditioning systems also need to comply with Publication NPC-216, and/or any local municipal noise by-law that has provisions relating to air conditioning equipment.

APPENDIX D

Date:	31-May-22

NOISE REPORT FOR PROPOSED DEVELOPMENT

REQUESTED BY:

Name:	Amy Patenaude
Company:	RWDI

PREPARED BY:

Name	Loudel Uy
Tel#:	(905) 615-3200

MISSISSAUGA

Location:	Hurontario Street, North of Dundas Street Dundas Street, East of Hurontario Street Kirwin Avenue between Hurontario St to Dundas Street
ID#	549

ON SITE TRAFFIC DATA

Specific	*Street Names*				
[redacted]	Hurontario Street	Dundas Street	Kirwin Avenue		
AADT:	53,200	37,700	12,500		
# of Lanes:	4 lanes	4 lanes	2 lanes		
% Trucks:	7%	6%	3%		
Medium/Heavy Trucks Ratio:	55/45	55/45	55/45		
Day/Night Split:	90/10	90/10	90/10		
Posted Speed Limit:	60km/h	60km/h	40 km/h		
Gradient Of Road:	<2%	<2%	<2%		
Ultimate R.O.W:	35m	42m	26m		

Comments:

- 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 Farhad Shala @ (905) 615-3200 ext. 3377 or farhad.shala@mississauga.ca for more info regarding LRT.
- Ultimate Traffic Data Only

LRT System Elements

LRT Operations

The objective of the operational design criteria was to set out specifications that will help ensure reliable service, even during downgraded operating conditions. The operations will also vary to cater to the expected demand throughout the hours of operation. On a daily basis, revenue service is expected to commence at 5:00 a.m. from both terminal stops and end at 1:30 a.m. on weekdays and Saturdays, and operate between 7:00 a.m. and midnight on Sundays. The headway will be adjusted throughout operational service in order to comply with scheduling demands, with a minimum headway of 5 minutes during peak periods and decreasing in off-peak periods. The current operations plan will result in an average operating speed of 27 km/h and a one-way journey time of 47 minutes between the two end stops. This is achieved through partial segregation from other vehicular traffic and providing priority to LRT vehicles at signalized intersections (through the implementation of Intelligent Transportation System components), and the system will operate on an LRT vehicle priority green signal basis. In order to achieve this, the traffic signal system will be optimized, including the installation of an integrated system of location sensors, with specialized traffic controllers that use logical algorithms to define optimum cycle times for an LRT priority system throughout the corridor.

Light Rail Vehicle

The light rail vehicles will be multi-section articulated low-floor vehicles, with a maximum width of 2.65 m (excluding rear-view cameras) and a length of about 30 m (although longer units around 40 m long are also possible). Initially, the vehicles will typically be operated in two-unit consists (60 m long). The system has been designed to operate with three-unit consists up to a length of 90 m in the long term. Peak carrying capacity will be in the order of 200 passengers/vehicle, or 600 passengers per 3-vehicle consist.

Maintenance and Storage Facility

It is proopsed that the HMLRT Maintenance and Storage Facility (MSF) be situated on the provincially-owned lands within the Parkway Belt West bounded by Highway 407 to the north, Hurontario Street to the west, the Hydro One Networks Inc. transmission line and utility corridor to the south and Kennedy Road to the east. It will be connected to Hurontario Street via a dedicated spur line that diverges from the Hurontario Street corridor and runs east on Topflight Drive and north on Edwards Boulevard. The 7 ha MSF will accommodate up to 56 LRVs initially, and 74 over the long term. The HMLRT Control Centre will also be located on the MSF site. The MSF layout is shown in Appendix A.1 of this EPR.

Power Supply and Distribution

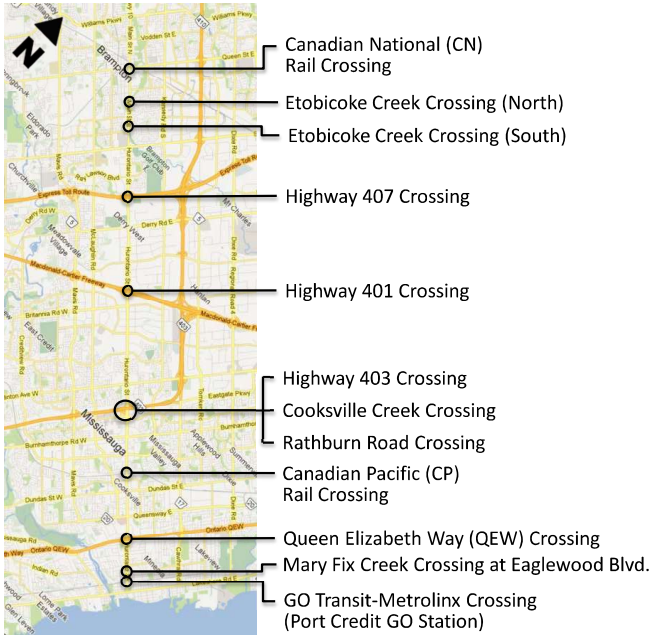
The system will be designed to provide the necessary power, as well as the voltage range, to ensure proper operation of the trains. The traction power system, consisting of traction power substations (TPSS) and the Overhead Contact System (OCS), will provide 750Vdc to power the trains. Due to concerns related to heritage attributes within the Main Street South Heritage Area and Downtown Brampton, (i.e., between the north crossing of Etobicoke Creek and the Brampton GO stop), an alternative power supply system (the option comprising battery packs or super/ultracapacitors installed on board the LRVs, with no Overhead Contact System) is being carried forward for further investigation of costs and benefits as part of the Detail Design phase. Its implementation is contingent upon final acceptability of financial and technical implications.

The system will be designed to allow for a single TPSS failure without any degradation of service. A preliminary estimate indicates that 15 TPSS would be needed for the mainline and one TPSS will be provided for the Maintenance and Storage Facility to meet the Service Level to 2031. The preliminary TPSS locations are shown in Appendix A.1 of this EPR.

Structures

A number of existing structures are affected by the proposed HMLRT design scheme. In addition, some new structures are proposed. The engineering investigations included an assessment of the condition of all existing structures in the LRT corridor, identified the new structures required, and offered recommendations for the structural work to be completed as part of the project. The structure locations are shown in Figure ES-3.

Figure ES-3: Key Plan for New and Upgraded Structures



The proposed structural work, as shown on the Preliminary Design plates in Appendix A.1, include:

- New bridges at:
  - GO Transit-Metrolinx Crossing (Port Credit GO Station) - immediately west of the existing bridge (box structure through the existing rail embankment);
  - Mary Fix Creek - Eaglewood Boulevard will be extended to Oriole Avenue (west of Hurontario Street) via a new bridge over the Mary Fix Creek channel;
  - Queen Elizabeth Way (QEW) - construction of a new bridge to carry the QEW over the realigned northbound lanes carrying general purpose traffic; and

Roadway	Intersection	2031 AM Peak Hour Traffic Volumes		Increase (dB)
		No Project	With Project	
Confederation Pkwy.	Hillcrest	1,623	1,735	0.3
Confederation Pkwy.	Dundas	1,259	1,232	-0.1
Confederation Pkwy.	King	583	812	1.4
Confederation Pkwy.	**Paisley**	**274**	**562**	**3.1**
Confederation Pkwy.	**Queensway**	**61**	**336**	**7.4**
Kennedy	Queen	1,331	1,375	0.1
Kennedy	Clarence	1,070	1,049	-0.1
Kennedy	Glidden	916	954	0.2
Kennedy	Steeles	706	680	-0.2
Kennedy	First Gulf Blvd.	943	1,068	0.5
Kennedy	Derry	808	934	0.6
Kennedy	Courtneypark	978	1,067	0.4
Kennedy	Matheson	676	721	0.3
Kennedy	Bristol	656	743	0.5
Central Pkwy.	Eglinton	1,038	1,140	0.4
Central Pkwy.	Rathburn	804	824	0.1
Central Pkwy.	Burnhamthorpe	675	645	-0.2
Central Pkwy.	Bloor	1,031	1,045	0.1
Central Pkwy.	Cliff	742	824	0.5
Central Pkwy.	Mississauga Valley South	685	815	0.8

As can be seen in the above table, the sound-level increases along parallel routes are quite minimal. Increases of less than 3 dB in the average sound levels are considered insignificant. The exceptions are shown in bold in Table 4-7, along a portion of Confederation Parkway. Here, the absolute sound levels increase between 3 and 7 dB. While this is a significant change, it should be taken in context with the absolute sound levels.

With peak-hour volumes of 336 vehicles per hour at Queensway, the sound levels at receptors along Confederation Parkway would be approximately 56 dB Leq during the daytime and 50 dBA Leq during the night-time. In comparing this to the MOEE/TTC draft protocol's baseline limit of 55 dBA during the daytime and 50 dBA during the night-time, the impacts are actually 1 dB and 0 dB, respectively.

Hence, overall, the diversion of traffic to parallel routes is minor and the acoustic effects are insignificant. Noise control measures are not warranted for any associated increases in traffic noise along the major parallel routes.

The potential vehicle wheel squeal has also been reviewed wherever the LRT corridor makes sharp turns. Generally, such turns occur at major intersections where the ambient sound levels are already quite high. Provided that the light rail vehicles are equipped with a wheel damping system, the increase in sound levels at the intersections is approximately 2-3 dB in the worst-case. Hence, further noise control measures to control wheel squeal are not required.

Maintenance and Storage Facility

A preliminary review of the MSF indicates that the noise from the facility will not be significant at the nearest sensitive receptors. The results of the modelling indicate that the sound level from the MSF will be approximately 55 dBA 1-hr Leq at the nearest sensitive receptor during the most sensitive hour. As the ambient sound level has been calculated to be 58 dBA at this location, an adverse impact is not expected.

The greatest contributors to the overall sound from the MSF are the noise from dust collector fans and the noise from wheel squeal. Also, there is some potential for noise from the paint booth fans, depending on the size of the fan selected.

Overall, given the distance between the MSF and the nearest sensitive receptor, and given the high ambient noise from Highway 407, a noise impact from the MSF is not expected.

Traction Power Substations

A preliminary review of the noise from the traction power substations (TPSS) has been completed. Based on measurements of similar transformers, it is assumed that each TPSS will produce a sound level of approximately 63 dBA at a distance of 3 m. The modelling indicates that, in most cases, the sound levels from the TPSS are well below the ambient sound levels at the nearest sensitive receptors and are also well below the MOE's minimum exclusion level of 45 dBA. Hence, noise control measures are not warranted for most of the TPSS. TPSS18, located near the Brampton GO Station, needs to be moved so that it is a minimum of 23 m from the nearest sensitive receptor to avoid the potential noise impacts. Alternatively, it should be ensured that the actual TPSS sound level output is less than or equal to 58 dBA at a distance of 3 m and that the sound level is not tonal.

Both the TPSS and the MSF will require ECAs from the MOE. A more detailed review of the noise affects of these facilities will be completed at that time.

Vibration

Based on the current design, the LRT will run as close as 5 to 10 m from the façades of some buildings. More typically, the LRT will run more than 20 m from the nearest building.

Any sensitive receptors located at least:

- 10 m from the centreline of the nearest track wherever the LRT travels at 40 km/h
- 15 m from the centreline of the nearest track wherever the LRT travels at 50 km/h
- 20 m from the centreline of the nearest track wherever the LRT travels at 60 km/h
- 25 m from the centreline of the nearest track wherever the LRT travels at 80 km/h

will meet the guideline limit of 0.10 mm/s without any additional vibration control measures. An additional 5 dB reduction (44% reduction) will be required for areas with residential receptors located closer than the minimum setbacks described above, in order to reduce the vibration levels to 0.10mm/s rms. For concrete embedded track, however, vibration control to limit vibration-induced noise is more critical and will supersede the requirements for ground-borne vibration mitigation.

The results of the assessment also suggest that some sensitive receptors (critical residential rooms) along the HMLRT corridor, including those within 50 m of special trackwork (crossovers, switches and pocket tracks) may experience levels of vibration-induced noise that require mitigation. Vibration levels immediately adjacent to special track structures can be up to 3 times (10 dB) greater than vibration levels on tangent track (assuming the speed remains the same).

Further to your request dated May 25, 2022, the subject lands (3115 Hurontario St.) are located within 300 metres of the CP Galt Subdivision (which carries Milton GO rail service).

It's anticipated that GO rail service on this Subdivision will be comprised of diesel trains. The GO rail fleet combination on this Subdivision will consist of up to 2 locomotives and 12 passenger cars. The typical GO rail weekday train volume forecast near the subject lands, including both revenue and equipment trips is in the order of 44 trains. The planned detailed trip breakdown is listed below:

	1 Diesel Locomotive	2 Diesel Locomotives		1 Diesel Locomotive	2 Diesel Locomotives
Day (0700-2300)	38	0	Night (2300-0700)	6	0

The current track design speed near the subject lands is 65 mph (105 km/h).

There are no *anti-whistling by-laws* in affect near the subject lands.

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

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

Date:	24-Mar-22

NOISE REPORT FOR PROPOSED DEVELOPMENT

REQUESTED BY:

Name:	Amy Patenaude
Company:	RWDI

PREPARED BY:

Nam	Steven Guan
Tel#:	905-615-3200 ext. 5933

MISSISSAUGA

Location: Confederation Parkway - Hillcrest Avenue to Dundas Street West
Hillcrest Avenue - Confederation Parkway to Hurontario Street

ID 538

ON SITE TRAFFIC DATA

Specific	*Street Names*				
[redacted]	Confederation Pkwy	Hillcrest Ave			
AADT:	19,700	28,400			
# of Lanes:	4 Lanes	4 Lanes			
% Trucks:	3%	3%			
Medium/Heavy Trucks Ratio:	55/45	55/45			
Day/Night Split:	90/10	90/10			
Posted Speed Limit:	50 km/h	50 km/h			
Gradient Of Road:	<2%	<2%			
Ultimate R.O.W:	30 m	26 m			

Comments: Ultimate Traffic Data Only

APPENDIX E

U.S. DoT Federal Transit Administration - "Transit Noise and Vibration Impact Assessment"

"FTA Vibration Screening Model"

Job No. 2200840
Job Name 3115 Hurontario Stt

Scenario

Note: All vibration levels in dB are VdB re: 1 μin/s

1a. Define Train

			Resulting Adjustments
Train Type	L	(F) reight, (L)RT/Rapid Transit, (B)us	
Train Speed	70	km/h	-1.2
Stiff Suspension?	n	Vertical resonance frequency greater than 15 Hz (y/n, usually n)	0
Resilient Wheels?	n	No effect on vibration, included to match standard (y/n)	0
Worn wheels?	n	Worn wheels or wheels with flats (y/n, usually no for new or well maintained system)	0

1b. Define Track Type

Rail Type	CWR	Jointed Track (J) or Continuous Welded Rail (CWR)	0
Worn or Corrugated track?	n	Worn track (y/n, usually n for new or well maintained system)	0
Special Trackwork?	n	Crossovers, diamonds, frogs, etc. (y/n)	0

Mitigation Features

Floating slab trackwork?	n	Concrete floating slab on spring isolators (y/n)	0	
High Resilience Fasterners?	n	Used with concrete track slabs (y/n)	0	0
Resiliently Supported Ties?	n	Concrete ties on rubber blocks, with resilient fasteners (y/n)	0	
Ballast mats?	n	Rubber mat placed over concrete, under the ballast (y/n)	0	

TTC Streetcar System Only (Based on RWDI Measurements W07-5120C)

New Track Tech. Max vibration	n	For maximum vibration from TTC new track tech (apply no other mit feature)	Mutually exclusive choices	0
New Track Tech., Avg Vibration	n	For average vibration from TTC new track tech (apply no other mit feature)	May also both be "n"	0

Other Path Features

Elevated Structure?	n	On berm or bridge (y/n)	0
In open cut?	n	No effect on vibration, included to match standard (y/n)	0

Subway Systems Only

Relative to bored tunnel:

Station	n	0
Cut and Cover	n	0
Rock-Based	n	0

Base Vibration Level at 3 m	81.5	VdB, FTA base curve levels at 3 m from track
Total Train and Track Type Adjustments	-1.2	VdB
Adjusted Vibration Level at 3 m	**80.3**	VdB, including train type and track type adjustements above.

2. Define Path

Efficient propagation in soil	n	Accounts for clay soils or other mediums with efficient propagation (y/n)	Mutually exclusive choices	0
Propagation in rock layer	n	Accounts for lower attenuation with distance in rock versus soil (y/n)	May also both be "n"	0.0
Total Path Type Adjustments	0.0	VdB		

3a. Vibration Level at Given Receptor

Source-Receiver distance	**22**	m, from track to receptor (DISTANCE should be less than 100 m)		-11.3
Total distance and path adjustments	-11.3	VdB		
Vibration Level at distance	**69.0**	VdB	**0.072** mm/s r.m.s.	

Notes:

The above value can be used in general for rail vibration assessment, and represents the "free field" value of vibration at the foundation.
Vibration levels within the structure will depend on ground coupling to the building foundation, and effects within the structure (resonances, etc.).
For typical residential houses (woodframe buildings), these generally cancel out. (-5 VdB for coupling, -2 dB for 2nd storey, +6 dB for resonances = -1 VdB for typical bedroom)
For commercial buildings, hotels, hospitals, etc., these effects can be significant.