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Noise and Vibration Feasibility Study
Proposed Mixed-Use Development
"Radiator"
340-376R Dufferin Street & 2 Melbourne Avenue
Toronto, Ontario

Prepared for:

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VERSION CONTROL

Noise and Vibration Feasibility Study,

"Radiator", 340-376R Dufferin Street & 2 Melbourne Avenue,

Toronto, Ontario.

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Table of Contents

1 INTRODUCTION AND SUMMARY

Howe Gastmeier Chapnik Limited (HGC Engineering) was retained by Hullmark Developments to complete a Noise and Vibration Feasibility Study of a proposed residential development to be known as "Radiator", located at 340-376R Dufferin Street & 2 Melbourne Avenue, in Toronto, Ontario. This study is based on the architectural plans dated July 15, "Issued for OPA/ZBA/SPA", prepared by Sweeny & Co Architects.

The subject property is located on the west side of Dufferin Street, south of Queen Street West, and north of Melbourne Avenue. The drawings provide for the construction of two residential towers connected by a 4 to 6-storey podium, as well as an 11-storey mid-rise building.

Road traffic on Queen Street West and Dufferin Street, and rail traffic on the Metrolinx rail corridor to the northeast of the site are the primary sources of noise with potential impact on the proposed development. Secondary sources of noise include road traffic on Melbourne Avenue and streetcar traffic on Queen Street West. Road, rail, and streetcar traffic data was used to predict future traffic sound levels at the locations of the proposed building façades. The predicted sound levels were evaluated with respect to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP).

Typical daytime and nighttime noise levels from the surrounding traffic sources require that the building envelope components have reasonable sound insulation properties to limit traffic noise transmitted into the residential suites to acceptable levels. Preliminary acoustical specifications for the building envelope and barriers to shield outdoor amenity terraces are outlined herein.

This assessment also considers the potential impact of ground-borne vibration from trains operating on the Metrolinx rail corridor to the east, with the closest track located approximately 50 m northeast of the proposed development. Site measurements and analysis of ground-borne vibration from trains indicate that the transmitted vibrations impacting the proposed development will be within the associated criteria for perception and re-radiated noise, and accordingly vibration mitigation measures are not expected to be required for the proposed development.

Streetcars on Queen Street were not operating at the time of the visit. Information on the TTC website indicates that the streetcars on this route are out-of-service while track repair is in

progress. In any case, Queen Street is far enough away that vibrations from this streetcar line are not expected to be significant at the subject site.

2 SITE DESCRIPTION

The site is located on the west side of Dufferin Street, south of Queen Street West, and north of Melbourne Avenue, at 340-376R Dufferin Street and 2 Melbourne Avenue, in Toronto, Ontario. A key plan is attached as Figure 1, and the site plan is attached as Figure 2.

The proposed development will consist of two towers, one mid-rise building, and one podium structure: the North Tower (25-storeys), South Tower (21-storeys), South Midrise building (11-storeys) and West Podium building (6-storeys), all connected on the lower levels, with two levels of underground parking beneath the entire site. The buildings will feature indoor amenity spaces on the 2nd floor of the South Tower, 2nd, and 10th floors of the South Midrise building, and the 3rd and 5th floors of North Tower. Outdoor amenity areas are shown on the 3rd and 5th floor of the podium, and on the 10th floor of the South Midrise building. There is also a central courtyard on the ground floor, surrounded by the buildings. Studio/flex spaces are located on the ground and second levels of the West Podium, and commercial/flex areas are located on the ground and second levels of the towers. Their exact use has not been determined yet, and as such, they are conservatively assessed as residential uses herein. The remainder of the buildings will be comprised of residential suites, with the exception of the mechanical penthouses on the roof of each tower.

A site visit was made by HGC Engineering personnel in March of 2022, to make observations of the acoustical environment, to identify the significant noise sources in the vicinity, and to perform ground-borne vibration measurements from the rail corridor to the east. The rail line is located approximately 50 m from the proposed east foundation wall of the North Tower.

In terms of the classifications provided for in Ministry of the Environment (MECP) guidelines, this area is considered to be a Class 1 "urban" acoustical environment. There is a mix of residential and commercial uses along Dufferin Street, between Queen Street West and Melbourne Avenue. As noted above, the primary sources of noise in the vicinity of the site were confirmed to be the nearby transportation sources. In general, sounds from nearby commercial

facilities were not discernable over traffic sounds during our visit, and no other sources of particular concern were identified.

3 NOISE AND VIBRATION CRITERIA

3.1 Road and Rail Traffic Noise

Criteria for acceptable levels of traffic noise are contained in the Ontario Ministry of Environment, Conservation and Parks' (MECP) publication NPC-300, "Environmental Noise Guideline: Stationary and Transportation Sources - Approval and Planning", October 2013. Sound level limits from road and rail traffic sources are summarized in Table 1 below. Streetcar traffic on Queen Street West is assessed as a road traffic source herein.

Table 1: Road/Rail Traffic Noise Criteria [dBA]

Area	Daytime L_{EQ} (16 hour)	Night-time L_{EQ} (8 hour)
Outdoor Living Area	**55**	**--**
Living or dining areas of residences	**45 / 40**	**45 / 40**
Sleeping Quarters (bedrooms)	**45 / 40**	**40 / 35**

Daytime refers to the period between 07:00 and 23:00. Night-time refers to the period between 23:00 and 07:00. Living areas include dining rooms, dens, studies, etc. Corridors and washrooms are usually not considered to be noise-sensitive areas.

The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace, a playground, or common areas associated with high-rise multi-unit buildings where passive outdoor recreation is expected to occur. Balconies with a depth of less than 4 meters (measured perpendicular to the building façade) are not considered OLAs under MECP guidelines, and accordingly the noise criteria are not applicable there. Larger private terraces require consideration only if they are the only OLA for the occupant; in general, common outdoor amenity terraces associated with high-rise buildings are the only OLA that require consideration.

In cases where a minor excess (up to 5 dB) over the sound level limit in an OLA is anticipated, MECP guidelines allow the excess to be addressed by including a warning clause in the titles,

deeds or tenancy agreements for the affected dwellings. Where OLA sound levels exceed 60 dBA (road and rail noise combined), physical noise control measures, such as an acoustical barrier, are required. Note that not all OLAs necessarily require protection, if there are other protected outdoor areas accessible to the residents.

With respect to the building envelope, no controls are required where levels are under 50 dBA. Where the road or rail traffic noise level (L_{EQ}) is greater than 60 dBA or 55 dBA respectively at night, or greater than 65 dBA or 60 dBA respectively during the day, windows must be designed to achieve the indoor sound level criteria listed above. Otherwise, any glazing meeting the Ontario Building Code is considered adequate under MECP guidelines. Where the predicted nighttime and/or daytime sound levels exceed these thresholds, central air conditioning is required so that windows can remain closed against the noise.

The indoor sound level limits for rail sources are 5 dB more stringent than for road sources, to account for the additional low-frequency (rumble) components of locomotives, hence the façade sound insulation requirements are calculated separately and then combined.

Warning clauses to notify future residents of possible noise excesses are also required when nighttime sound levels exceed 50 dBA at the plane of the bedroom or living/dining room window and daytime sound levels exceed 55 dBA in the outdoor living area and/or at the plane of the bedroom or living/dining room window due to road and/or rail traffic.

3.2 Ground-Borne Vibration

Vibration from the passage of the trains may be transmitted via the ground and then transferred up through the structure. Vibration intrusions that are potentially unacceptable in the residential suites could take the form of either vibration which is clearly perceptible to the touch and/or which produces radiated noise levels in excess of the ambient acoustic environment. From a vibration impact perspective, the lower residential suites in the building are the critical receptors.

Vibration levels are typically measured in terms of oscillatory velocity or acceleration. The levels discussed herein are presented in dBG, which refers to decibels of acceleration relative to the acceleration of gravity, as a function of one-third octave band frequencies (Hz). The levels have been plotted against American National Standards Institute (ANSI) and International Standards

Organization (ISO) criteria – ANSI-S3.29/ISO-2631-2 – for human perception of tactile vibration while seated. Conformance with these criteria does not guarantee that vibration levels will be imperceptible to all individuals under all conditions, but is nonetheless a reasonable standard for acceptability. Note that these criteria are for the base structure only and do not account for amplification by lightweight structures, finishes, furniture, etc.

The ANSI/ISO criteria do not address noise; vibrations at frequencies over 20 Hz are also of concern for re-radiated noise, even at levels well below the tactile perceptibility threshold. To illustrate this, the measured vibration levels have been plotted against equivalent Noise Criterion (NC) curves. Experience suggests that while the train pass-bys will be audible in the building to some extent even within enclosed space away from the building envelope, if the levels are confined to about NC-30 (35 dBA) or lower in the residential towers, the audibility of the pass-bys may be considered reasonable. This criterion level is similar to what is used by the TTC to assess the potential for intrusions from future undertakings (subway expansions), and similar to criteria used by the US Federal Transit Administration to assess ground-borne noise intrusions from subways and trains. In retail/commercial spaces, levels of NC-40 (45 dBA) or even higher could be acceptable, depending on the specific uses.

4 TRANSPORTATION NOISE

4.1 Road Traffic Data

Traffic data summaries for the key roads surrounding the site were obtained from the City of Toronto Traffic Safety Unit (see Appendix A). Traffic data for Dufferin Street, Queen Street West and Melbourne Street were provided in the form of AM-peak turning movement counts. In order to obtain 24-hour traffic volumes for surrounding roadways to predict future sound levels during both the 16-hour daytime and 8-hour nighttime periods, the following assumptions were made:

- The 24-hour traffic volumes were assumed to be ten-times the obtained AM-daily peak volumes,
- The prediction considered traffic that will exist in 10 years (2032), assuming annual traffic growth of 2.5% on all roadways, as required by the MECP,

- Daytime (7:00 – 23:00) vs nighttime (23:00 – 7:00) road traffic volumes were determined based on an assumed 90% day / 10% night split.

The resulting future road traffic volumes for the roads considered in this assessment are listed in Table 3, in addition to commercial vehicle (truck) percentages and the posted speed limit for each roadway.

Table 3: 2032 Projected Road Traffic Data

Road Name	AADT	Day / Night Split (% / %)	Commercial Vehicle Percentages		Posted Speed Limit (km/h)
			Medium Truck %	Heavy Truck %	
Dufferin Street	13,207	90 / 10	10.5	6.8	40
Queen Street West	14,740	90 / 10	8.5	5.5	40
Melbourne Street	1,188	90 / 10	1.9	1.9	40

4.2 Streetcar Traffic Data

Traffic data for the 501 and 301 Queen streetcar routes was obtained from the TTC and is provided in Appendix A. The streetcar traffic volumes have been escalated to the year 2032 using a conservative growth rate of 2.5% per year. The estimated future daytime and nighttime streetcar traffic volumes are 553 and 160, respectively. Streetcars were assumed to be travelling at a speed of 40 km/h.

4.3 Rail Traffic Data

Forecasted rail traffic data for the Metrolinx Weston Subdivision was obtained from Metrolinx personnel and is provided in Appendix A. The maximum permissible train speed and the maximum number of cars and locomotives per train were used in the analysis to yield a worst-case estimate of train noise in conformance with Metrolinx assessment requirements.

Although relatively few in number, CN trains also operate on this line. For freight trains, data from our files was used, previously obtained from AECOM personnel in 2009 (included in

Appendix A), and has been grown at a standard rate of 2.5% per year. Table 4 summarises the rail traffic data used in the analysis.

Table 4: 2032 Forecasted Rail Traffic Data*

Type of Train	Number of Trains Day/Night	Number of locomotives	Number of cars	Max Speed (km/h)
UP Express	328 / 92	1	3	129
GO Train	387 / 82	1	12	129
GO Train	77 / 3	2	12	129
CN	65 / 11	1	15	96

* all trains modelled as diesel trains as per direction from Metrolinx.

4.4 Prediction Methodology and Results

To assess the levels of traffic noise that will impact the site, an acoustic model of the development was created, and predictions were made using a numerical computer modelling package (*CadnaA version 2021 MR1 build: 187.5163*). The model is based on the methods from ISO Standard 9613-2.2, "*Acoustics - Attenuation of Sound During Propagation Outdoors*", which accounts for reduction in sound level with distance due to geometrical spreading, air absorption, ground attenuation and acoustical shielding by intervening structures.

The road and streetcar sources were included in the model as line sources producing equivalent sound pressure levels at a reference distance to those predicted by STAMSON 5.04, a computer algorithm developed by the MECP, based on the daytime and nighttime traffic volumes presented in Table 3. Sample calculations from STAMSON are included in Appendix B. The rail lines were modelled as line sources with sound power levels equivalent to those published by the US Department of Transportation Federal Transit Administration (FTA) in the publication entitled, "Transit Noise and Vibration Impact Assessment Manual", published September, 2018, based on the daytime and nighttime traffic volumes presented in Table 4.

The model was used to predict traffic noise levels at each of the residential building facades. Predicted daytime and night-time sound levels at the façades are shown in Figures 4 and 5. A breakdown of the maximum sound levels from each traffic source, and the total maximum sound level, are shown for each façade in Table 5 below.

Table 5: Road / Streetcar / Rail / Total Traffic Sound Level Predictions,

Typical Daytime and Nighttime Hours [dBA]

Tower	Façade	Daytime $L_{EQ-16hr}$	Night-time L_{EQ-8hr}
North Tower Ground-3F	North	64 / <55 / 67 / 69	57 / 50 / 63 / 64
	East	69 / <55 / 71 / 72	60 / 49 / 66 / 67
	South	<55 / <55 / <55 / <55	<45 / <45 / <45 / <45
	West	N/A	N/A
North Tower 4F-Above	North	59 / <55 / 65 / 69	54 / 49 / 63 / 64
	East	64 / <55 / 67 / 68	57 / 48 / 64 / 65
	South	59 / <55 / 62 / 63	50 / <45 / 57 / 58
	West	<55 / <55 / 60 / 61	48 / 49 / 56 / 57
West Podium	North	56 / <55 / 62 / 63	50 / 49 / 59 / 59
	East	<55 / <55 / <55 / <55	<45 / <45 / 49 / 49
	South	<55 / <55 / <55 / <55	<45 / <45 / <45 / <45
	West	<55 / <55 / 58 / 59	47 / 48 / 54 / 55
South Tower Ground-2F	North	N/A	N/A
	East	69 / <55 / 67 / 71	61 / 48 / 62 / 65
	South	N/A	N/A
	West	<55 / <55 / <55 / <55	<45 / <45 / <45 / <45
South Tower 3F-Above	North	60 / <55 / 64 / 65	54 / 47 / 60 / 60
	East	66 / <55 / 65 / 67	59 / 45 / 61 / 62
	South	57 / <55 / 59 / 61	51 / 47 / 55 / 56
	West	<55 / <55 / <55 / 55	<45 / <45 / 49 / 51
South Midrise Ground-4F	North	N/A	N/A
	East	66 / <55 / 61 / 68	60 / <45 / 57 / 62
	South	63 / <55 / <55 / 63	56 / <45 / <45 / 46
	West	<55 / <55 / <55 / <55	<45 / <45 / <45 / 46
South Midrise 5F-Above	North	N/A	N/A
	East	64 / <55 / 61 / 65	59 / <45 / 56 / 61
	South	60 / <55 / <55 / 60	53 / <45 / 48 / 54
	West	<55 / <55 / <55 / <55	<45 / <45 / 46 / 47

The drawings show three distinct outdoor amenity areas on the third floor (R1), and fifth floor (R2) of the podium between the North and South Towers, and on the tenth floor of the South Midrise (R3), represented by prediction locations R1 through R3. The central courtyard is surrounded by the buildings of this site; while this area is not considered an amenity space, it is represented as R4 in any event. Prediction locations are indicated in Figure 3, and the predicted sound levels at each location are summarized in Table 6 below.

Table 6: Predicted Traffic Sound Levels [dBA] at Outdoor Living Areas

Location	Description	Sound Level ($L_{Aeq,16hr}$)
R1	Podium on East Side, 3/F	62*
R2	Podium Between North and South Towers, 5/F	57*
R3	South Midrise, 10/F	<55*
R4	Courtyard	<55

* Including the effect of a standard 1.07 m high parapet or solid railing.

4.5 Traffic Noise Recommendations

The sound levels from traffic noise at the residential façades of the proposed development were predicted to be up to 72 dBA during daytime hours, and up to 67 dBA during nighttime hours. The following discussion outlines recommendations for air conditioning, upgraded building façade constructions, and warning clauses to achieve the noise criteria stated in Table 1.

4.5.1 Building Constructions

Given the projected future sound levels at the most impacted building facades, MECP guidelines recommend that the building envelope be designed so that indoor sound levels comply with the MECP noise criteria.

Preliminary calculations have been performed to determine the building envelope constructions likely to be required to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the maximum predicted future sound levels at the building façades, and the anticipated areas of the façade components (walls, doors and windows) relative to the floor area of the adjacent room.

Acoustical Requirements for Glazing

The minimum building façade constructions to address transportation noise are calculated independently for road and streetcar traffic, and rail traffic, and subsequently combined logarithmically to determine the overall building construction.

Detailed floor plans and building elevations were not available for this development at the time of this report. For the purposes of this preliminary analysis, typical window-to-floor areas were conservatively assumed to be 80% (i.e., 60% fixed, 20% operable elements relative to floor area). Preliminary minimum STC requirements for the proposed buildings are indicated in Table 7, based on these assumptions and the maximum predicted sound levels at each facade. Operable patio doors and windows can be two to three points lower, provided that they have limited areas as per the above assumptions. Note that in an urban environment such as this, in order to account for occasional noises that are not modelled (e.g., street music, urban hum), we do not typically recommend less than STC-33, which can be achieved using properly selected standard glazing assemblies; therefore, the requirements at the table are limited to a minimum of STC-33.

Table 7: Preliminary Required Minimum Sound Transmission Class of the Proposed Buildings (STC)

Building	Façade	Preliminary Minimum Glazing STC[1,2,3]
North Tower Ground-3F	North	37
	East	39*
	South	33
	West	N/A
North Tower 4F-Above	North	36
	East	37
	South	33
	West	33
West Podium	North	33
	East	33
	South	33
	West	33
South Tower Ground-2F	North	N/A
	East	36
	South	N/A
	West	33
South Tower 3F-Above	North	34
	East	35
	South	33
	West	33
South Midrise Ground-4F	North	N/A
	East	33
	South	33
	West	33
South Midrise 5F-Above	North	N/A
	East	33
	South	33
	West	33

Note:

[1] Based on 80% window to floor area ratio for bedrooms/living/dining rooms.
[2] STC requirement refers to installed performance, including sound transmitted through mullions in window-wall systems and seals on operable windows and doors. Test data should be provided where available.
[3] The calculated STC requirements assume insignificant sound transmission through the walls in comparison with the windows.

* Applies only at windows of one 3-bedroom suite on one facade; in detail design, reduced glazing could be considered in this location to reduce this requirement.

Exterior Wall Constructions

These calculations assume insignificant sound transmission through the walls in comparison with the windows. Exterior walls that are not glazed should have sufficient acoustical insulation value such that the noise transmitted through is negligible in comparison with the windows; to achieve this, exterior wall assemblies with a rating of at least 5-10 STC points above the surrounding window STC requirements are typically required, depending on the amount of wall area relative to window. In most cases, the wall sound insulation is much higher than this; sections of poured or pre-cast concrete will typically have a sound insulation rating of STC-55 or more, and can be discounted. Insulated spandrel or metal panels backed by a drywall assembly generally have sound insulation ratings in the range of STC-45 to STC-55.

Detailed Analysis

When detailed floor plans and elevations are available for the proposed buildings, a detailed noise study should be performed to specify wall and window requirements based on actual window to floor area ratios, to help ensure sufficient acoustical insulation for the dwelling units.

4.5.2 Ventilation Requirements

Predicted sound levels at the façade of the proposed buildings exceed 65 dBA during the daytime and 60 dBA during the nighttime. Central air conditioning is required and is expected to be included in any event.

4.5.3 Outdoor Amenity Areas

The preliminary building plans show three outdoor amenity areas; on the third floor (R1) of the podium, on the fifth floor (R2) of the podium between the North and South Towers, and on the tenth floor of the South Midrise (R3). The central courtyard (R4) is similarly shown, but not referred to as an outdoor amenity area.

The outdoor amenity area on third floor of the podium between the North and South Towers (R1) would require barriers at least 2 m in height to reduce sound levels to less than 60 dBA. Given that there are other OLAs in the development where reasonably low levels will be achieved, slightly higher levels at this location are not likely to be of concern. If this terrace is used for

outdoor activities or is reduced in depth to less than 4 m, no barrier would be needed. If required, an appropriate barrier for this terrace could be coordinated during detail design, in consultation with the wind and landscape consultants.

Assuming a standard minimum 1.07 m high solid safety guard or parapet around fifth floor of the podium between the North and South Towers (R2), and the tenth floor of the South Midrise space (R3), predicted sound levels are expected to be 57 dBA and less than 55 dBA, respectively. According to MECP guidelines, the minor excess at R2 (up to 5 dB) may be addressed by including a warning clause in sale and lease agreements for the development.

The central courtyard is not considered an outdoor amenity, but in any case is expected to experience traffic sound levels of less than 55 dBA. Accordingly, additional mitigation is not required.

5 VIBRATION ASSESSMENT

5.1 Site Measurements

The potential ground-borne vibration impact on the proposed development due to rail traffic on the Metrolinx rail corridor to the east was assessed based on vibration measurements conducted at the site in March 2022. The closest track is located approximately 50 m from the west foundation wall of the North Tower. Vibration levels were measured at four locations (indicated on Figure 2):

- V1: On the sidewalk of Dufferin Street just south of Milky Way
- V2: On the sidewalk of Dufferin Street, just north of Phase 2
- V3: The existing building basement in the northeast corner of the site
- V4: The existing building basement in the east side, near the proposed Phase 2 location

Streetcars on Queen Street were not operating at the time of the visit. Information on the TTC website indicates that the streetcars on this route are out-of-service while track repair is in progress.

Vibration levels were measured using two PCB type J353B52 accelerometers and recorded using two Hewlett Packard 3569A two channel real-time frequency analyzers. The instrumentation was verified to be in calibration before the measurements were conducted.

From the measured data, the maximum vibration levels, as a function of one-third octave frequency (Hz), were extracted for each pass-by measurement. The measured levels are presented in dBG, which refers to decibels of acceleration relative to the acceleration of gravity, as a function of one-third octave band frequencies (Hz). A curve is plotted on the figures representing the ANSI criteria for human perception of vibration in structures up to a frequency of 80 Hz, and equivalent NC curves for audible sound at frequencies above that. This is shown in Figures 6a through 6d.

The actual degree of vibration transmission into the new structure will depend on the design of the foundation. In order to estimate future vibration levels, the vibration levels measured at the locations noted above were extrapolated by including expected reductions due to heavier below-grade foundation systems, in accordance with FTA guidelines. These predictions are shown graphically in Figures 7a through 7d. The maximum predicted ground-borne vibration levels are below the ANSI criteria for tactile human perception of vibration. Predicted re-radiated noise levels are below the NC-30 target criteria. Thus, control measures to address ground-borne vibration and noise are not expected to be required.

As outlined above, the criteria for both sound and vibration are considered to be reasonable standards for acceptability. However, conformance with these standards does not imply that vibration levels will be imperceptible and/or sound levels will be inaudible. Therefore, appropriate warning clauses should be included in all purchase or lease agreements, and/or in Development Agreements with the municipality.

5.2 Vibration Control

Re-radiated sound produced by train pass-bys was slightly audible in the existing building, and may be audible to some extent in the proposed building as well. While the predicted levels are expected to be low, further consideration could be given at the design stage to including some additional isolation materials against the foundation walls in the north-east corner of the site.

As outlined above, the criteria for both sound and vibration are considered to be reasonable standards for acceptability. However, conformance with these standards does not imply that vibration levels will be imperceptible and/or sound levels will be inaudible. Therefore, appropriate warning clauses should be included in all purchase or rental agreements, and in Development Agreements. Recommended wording for warning clauses is outlined in Section 8.

6 IMPACT OF THE DEVELOPMENT ON THE ENVIRONMENT

Sound levels from stationary (non-traffic) sources of noise such as rooftop air-conditioners, cooling towers, exhaust fans, etc. should not exceed the minimum one-hour L_{EQ} ambient (background) sound level from road traffic, at any potentially impacted residential point of reception (on or off site), to comply with City of Toronto Municipal Code 591. Typical minimum ambient sound levels in the area are expected to be up to 55 dBA during the day and about 5 dB less at night, at nearby residential receptors. Thus, any electro-mechanical equipment associated with this development (e.g. cooling towers, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges. The proposed building will be taller than the existing neighboring buildings, thus noise from the mechanical equipment on the roof of this building are not expected to substantially impact the neighboring buildings, provided that reasonable typical control measures are included. Mechanical equipment can be reviewed during the detail design stage to help ensure that any noise radiated to the environment is reasonably limited. Noises from activities in the courtyard and maker spaces are anticipated to be moderate and unlikely to cause any concern at receptors beyond the limits of the development. Further review can be undertaken during the detailed design process once more specific information about the anticipated activities is available.

7 IMPACT OF THE DEVELOPMENT ON ITSELF

Section 5.8.1.1 of the Ontario Building Code (OBC), released on January 1, 2020, specifies the minimum required sound insulation characteristics for demising partitions of dwelling units, in terms of Sound Transmission Class (STC) or Apparent Sound Transmission Class (ASTC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls must meet or exceed STC-50 or ASTC-47. Suite separation from a

refuse chute, or elevator shaft, must meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity, commercial or other mechanical spaces also meet or exceed STC-55. Tables 1 and 2 in Section SB-3 of the Supplementary Guideline to the OBC provide a comprehensive list of constructions that will meet the above requirements.

The loading bay on the ground floor of the buildings is enclosed, and is therefore not expected to be a significant noise concern.

The courtyard and maker spaces are surrounded by the buildings, and are not expected to be a significant noise concern for homes west of the site. This will be reviewed as the application progresses into detailed design.

Tarion's Builder Bulletin B19R requires the internal design of condominium projects to integrate suitable acoustic features to insulate the suites from noise from each other and amenities in accordance with the OBC, and limit the potential intrusions of mechanical and electrical services in the development on its residents. If B19R certification is needed, an acoustical consultant is required to review the mechanical and electrical drawings and details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself is maintained within acceptable levels.

8 WARNING CLAUSES

MECP guidelines recommend that appropriate warning clauses be used in the Development Agreements and in purchase, sale and lease agreements (typically by reference to the Development Agreements), to inform future owners and occupants about potential noise concerns from sources in the area. The following clauses are recommended:

(a) 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, rail and streetcar traffic, may on occasion interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Ministry of the Environment, Conservation and Parks.

(b) 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 Ministry of Environment, Conservation and Parks.

(c) Purchasers/tenants are advised that due to the proximity of this development to nearby retail/commercial facilities, sound levels from these facilities may at times be audible.

(d) This development is located near the Toronto Transit Commission's 501 Queen streetcar line on Queen Street West. Noise and vibration from streetcar operations may occasionally be perceptible and/or audible in the building.

These sample clauses are provided only as examples, and can be modified by the owner's legal representative, in consultation with the Municipality, in order to suit site-specific requirements.

In addition, Metrolinx generally requires specific warning clauses to protect their interests where noise-sensitive uses are located next to a major railway corridor. Wording for such a clause may read as follows:

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

9 SUMMARY OF RECOMMENDATIONS

The following list summarizes the conclusions and recommendations made in this report. The reader is referred to the previous sections of the report where these recommendations are discussed in more detail:

1. Upgraded glazing elements for the building envelope are required, to ensure adequate indoor sound levels from transportation sources and other noises in the surrounding environment, as outlined in Section 4.5.1. When architectural drawings are available for the dwellings, an acoustical consultant should review the drawings and provide revised glazing recommendations based on actual window-to-floor area ratios. Exterior wall constructions should also be reviewed.

2. Central air conditioning systems are recommended, and assumed to be provided in any event, as outlined in Section 4.5.2.

3. Perimeter barriers or parapets are required to achieve MECP criteria around some of the outdoor amenity areas. Details regarding outdoor amenity spaces are outlined in Section 4.5.3.

4. Vibration levels from train pass-bys are expected to be below the tactile vibration threshold and the suggested design criteria for re-radiated noise on the nearest residential floors. Vibration control measures are therefore not expected to be required for the proposed development.

5. Warning clauses should be included in the property and tenancy agreements. Recommended wording for these clauses is provided in Section 8. Such clauses are often included by reference to the Development Agreements in which they are contained.

6. Demising assemblies must be selected to meet the minimum requirements of the Ontario Building Code (OBC). Where B19R certification is needed, an acoustical consultant is required to review details of demising constructions and mechanical/electrical equipment, when available, to help ensure that the noise impact of the development on itself are maintained within acceptable levels. Outdoor sound emissions should also be checked to ensure that any potential impacts on adjacent properties are suitably minimized and comply with the requirements of the City of Toronto noise by-law (Chapter 591).

10 CONCLUSIONS

Acoustic modelling has been undertaken to assess the noise impact of surrounding transportation sources on the proposed development. The results of this study indicate that the proposed "Radiator" development at 340-376R Dufferin Street & 2 Melbourne is feasible on this site from a noise and vibration impact perspective, with the inclusion of appropriate acoustical features. Preliminary recommendations for appropriate building envelope sound insulation values are provided. Vibration impacts from the nearby existing Metrolinx rail line are not expected to be significant. In any case, warning clauses are recommended to advise residents of increasing noise from road, rail, and streetcar traffic, and from other potential noise sources in the area. Noises from activities in the courtyard and maker spaces are anticipated to be moderate and unlikely to cause any concern at receptors beyond the limits of the development. Further review can be undertaken during the detailed design process once more specific information about the anticipated activities is available.

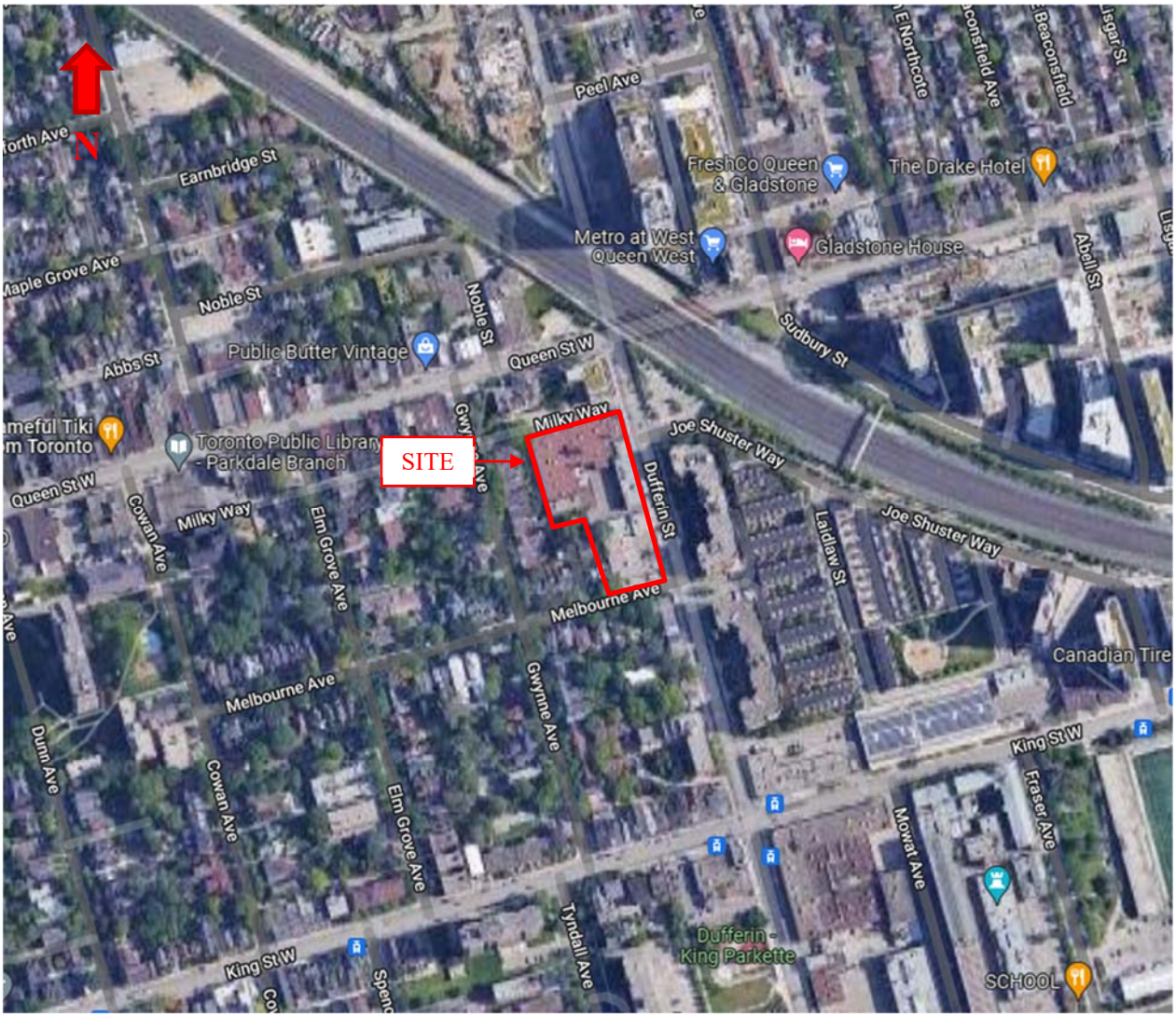

Figure 1: Key Plan

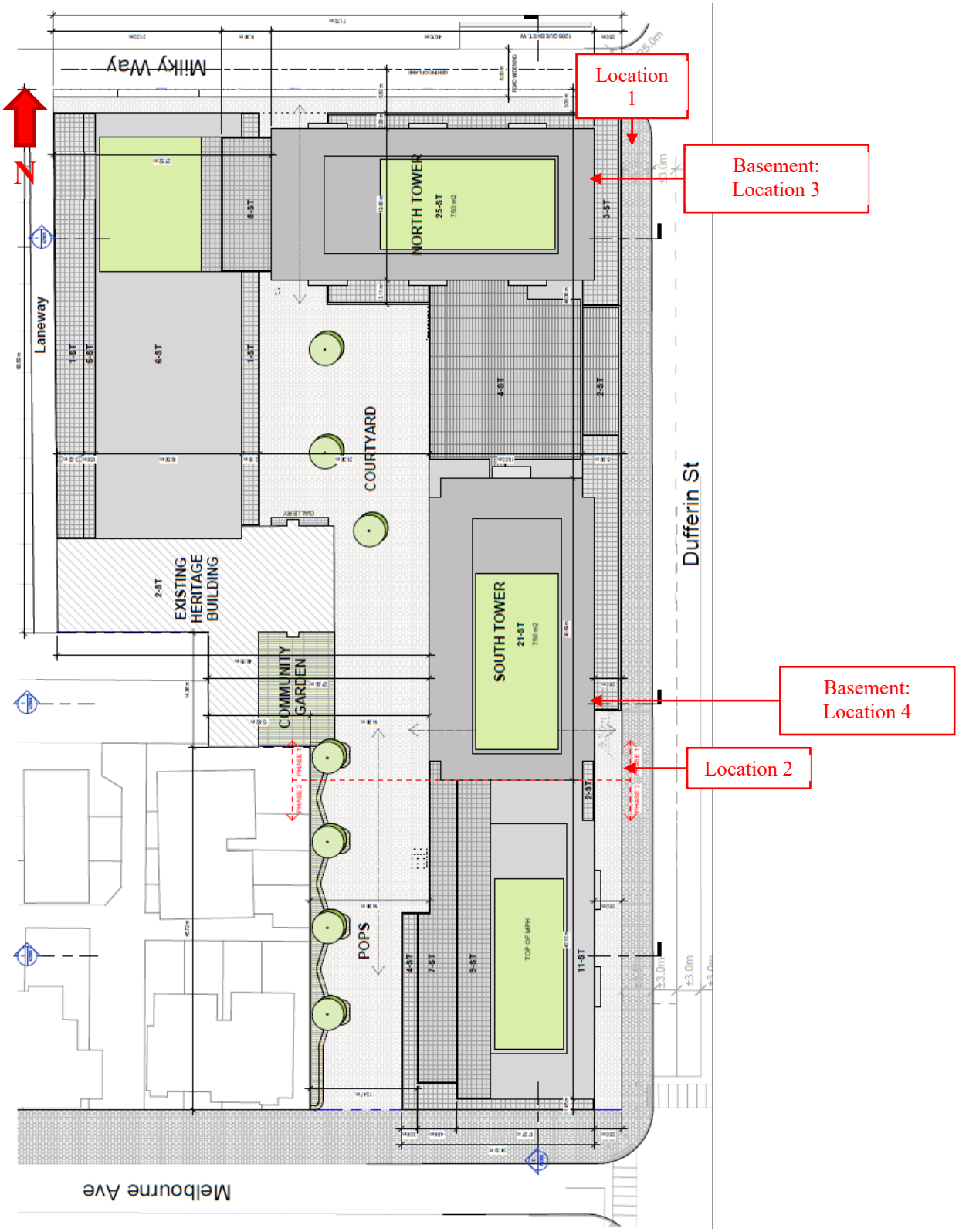

Figure 2: Site Plan

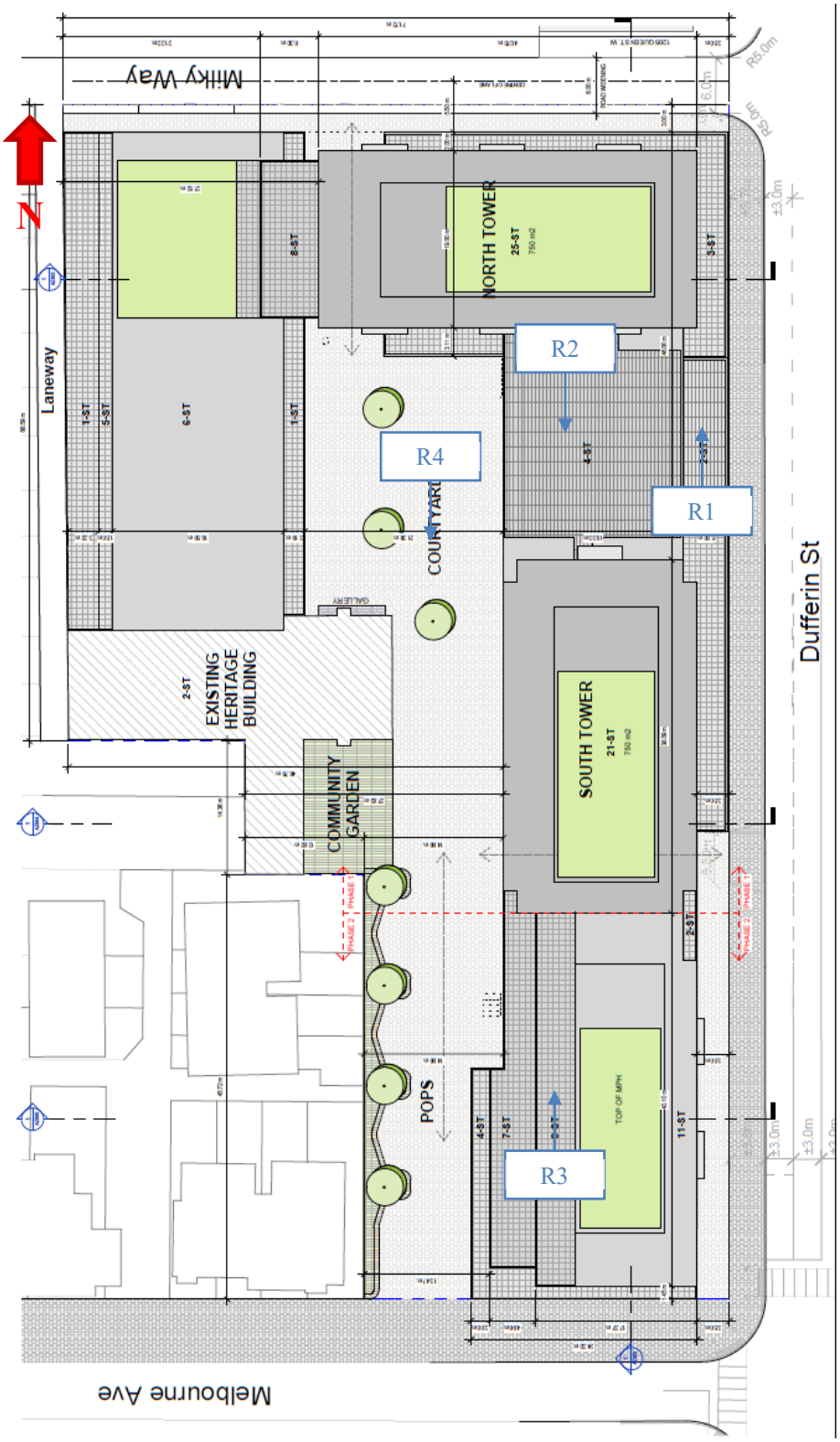

Figure 3: Receptor Locations for Outdoor Living Areas

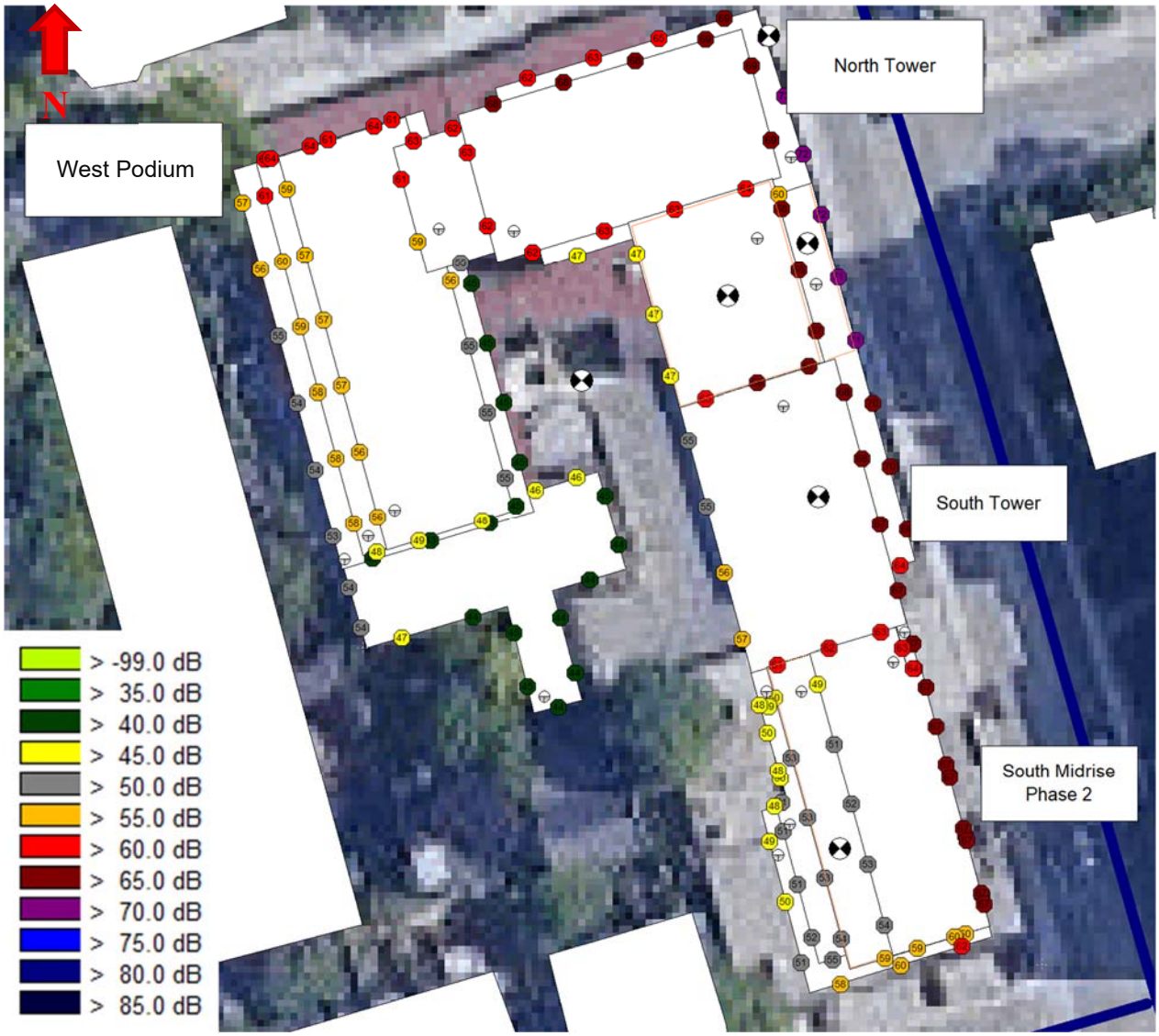

Figure 4: Daytime Sound Level Predictions from Transportation Noise Sources

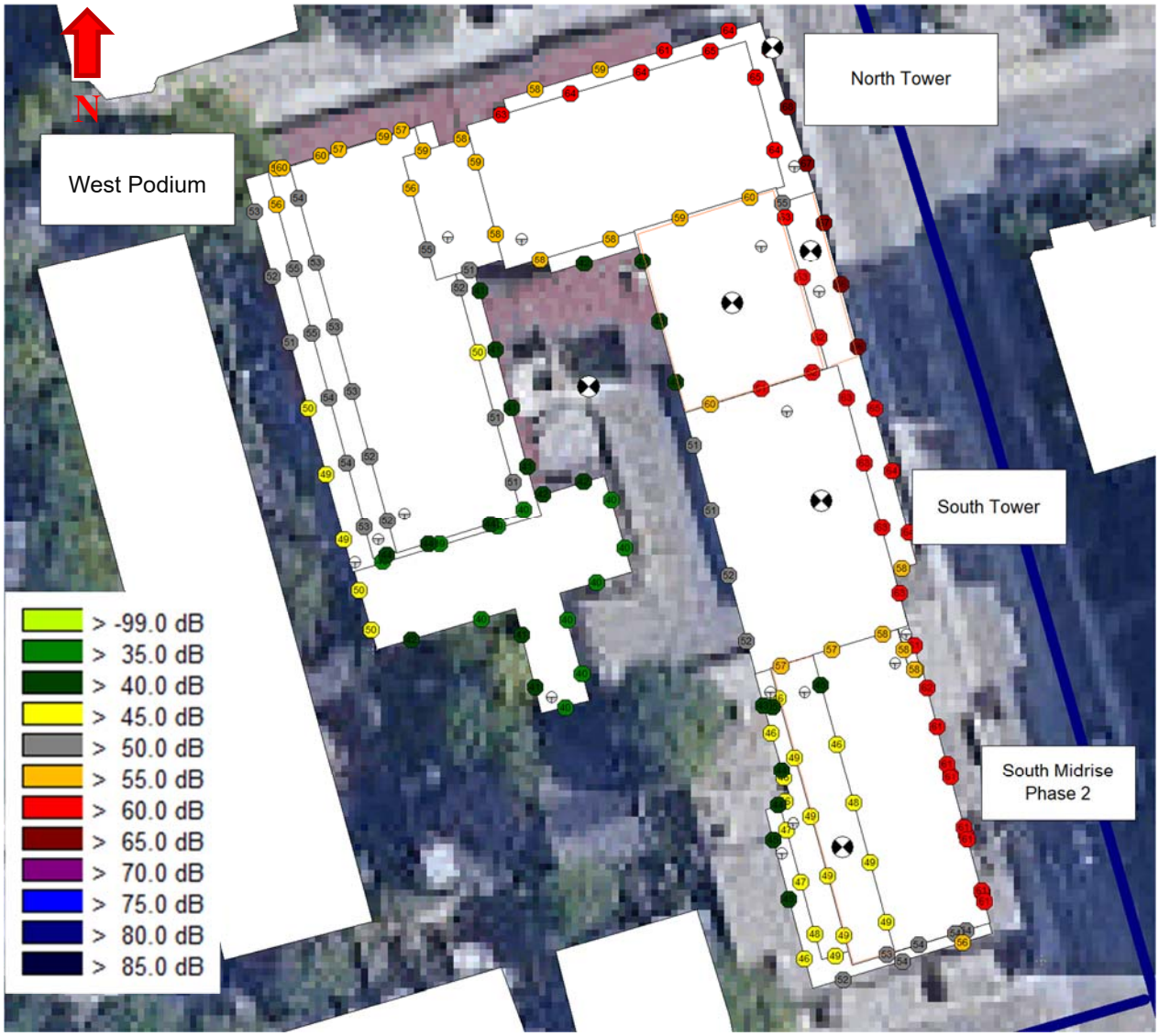

Figure 5: Nighttime Sound Level Predictions from Transportation Noise Sources

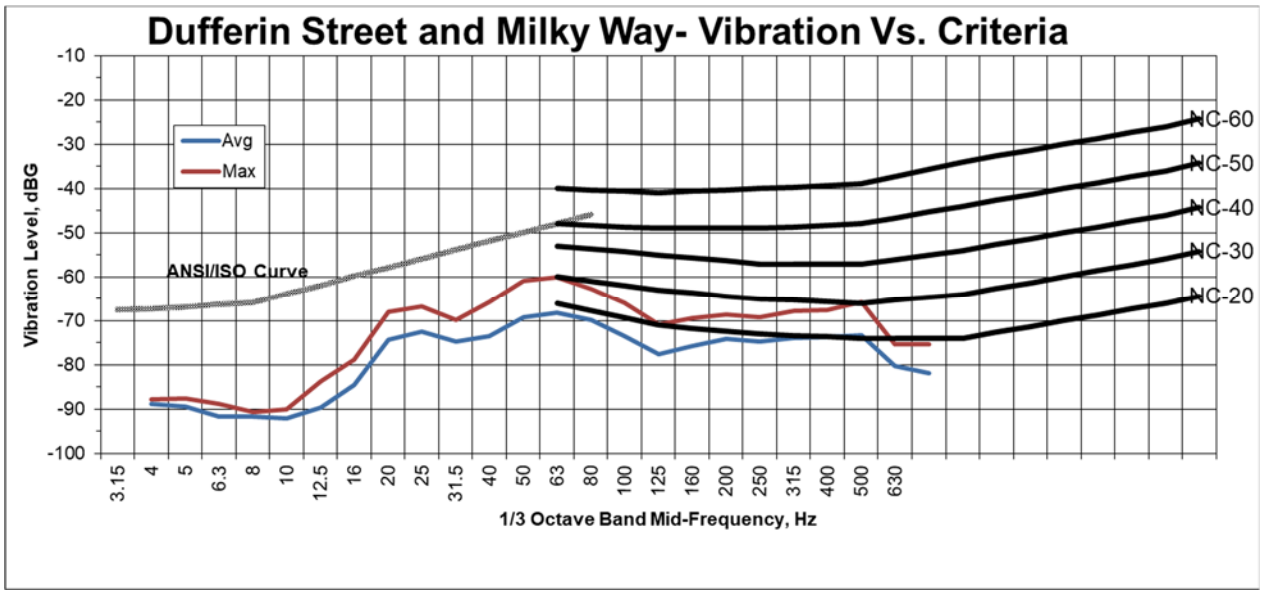

Figure 6a: Maximum Measured Vibration vs Criteria for Dufferin Street and Milky Way

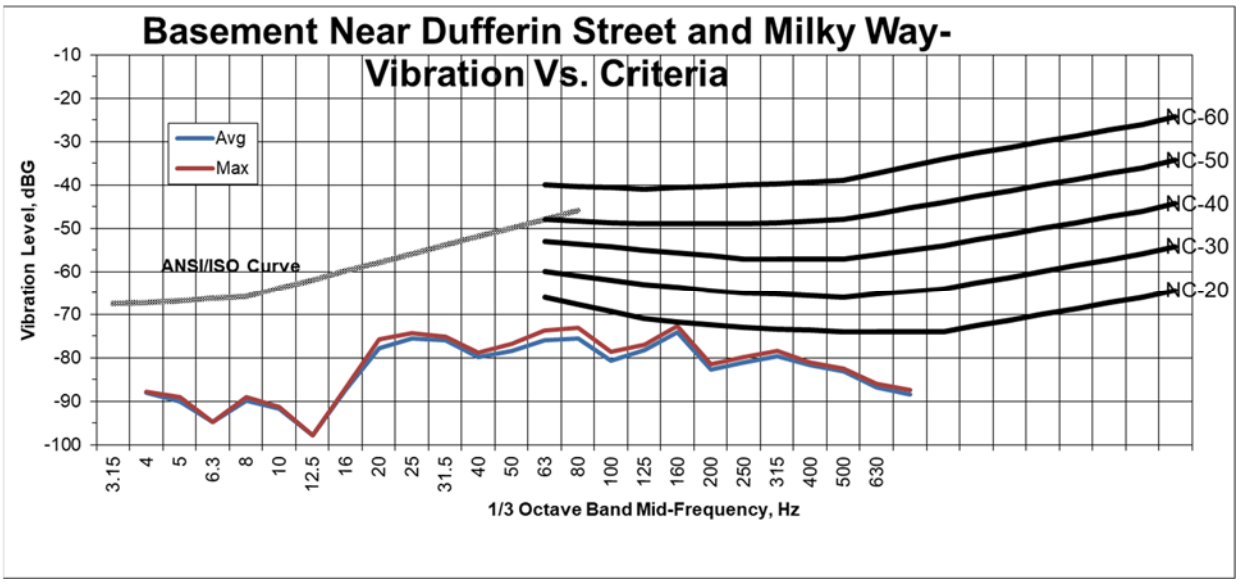

Figure 6b: Maximum Measured Vibration vs Criteria for the Basement Near Dufferin Street and Milky Way

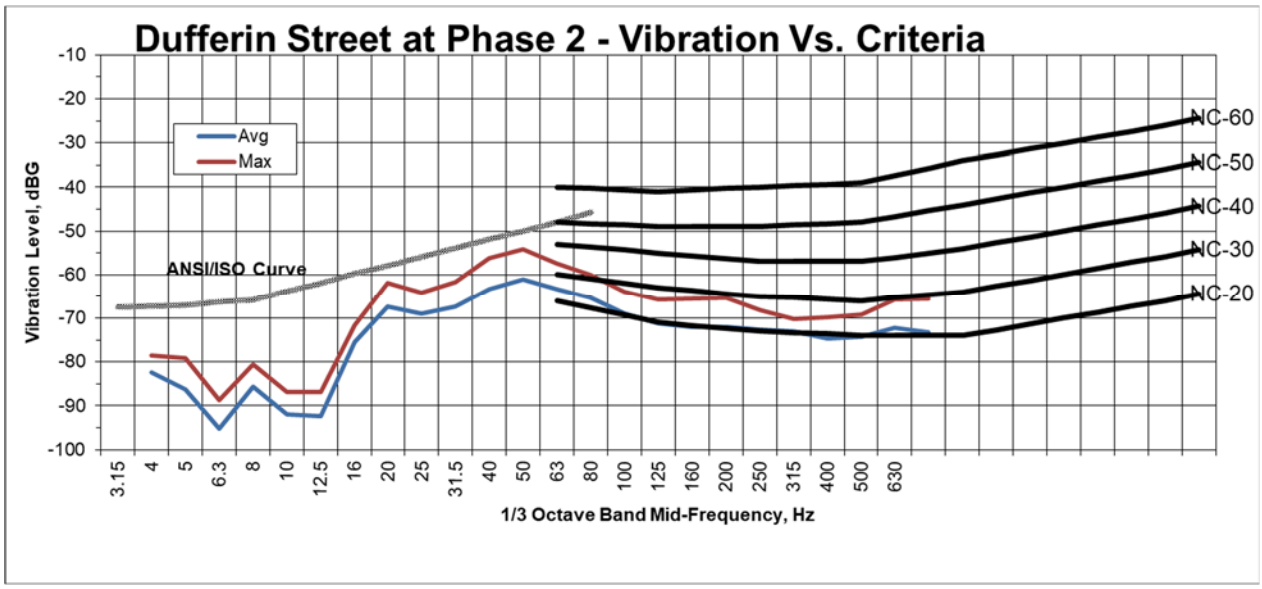

Figure 6c: Maximum Measured Vibration vs Criteria for Dufferin Street at Phase 2

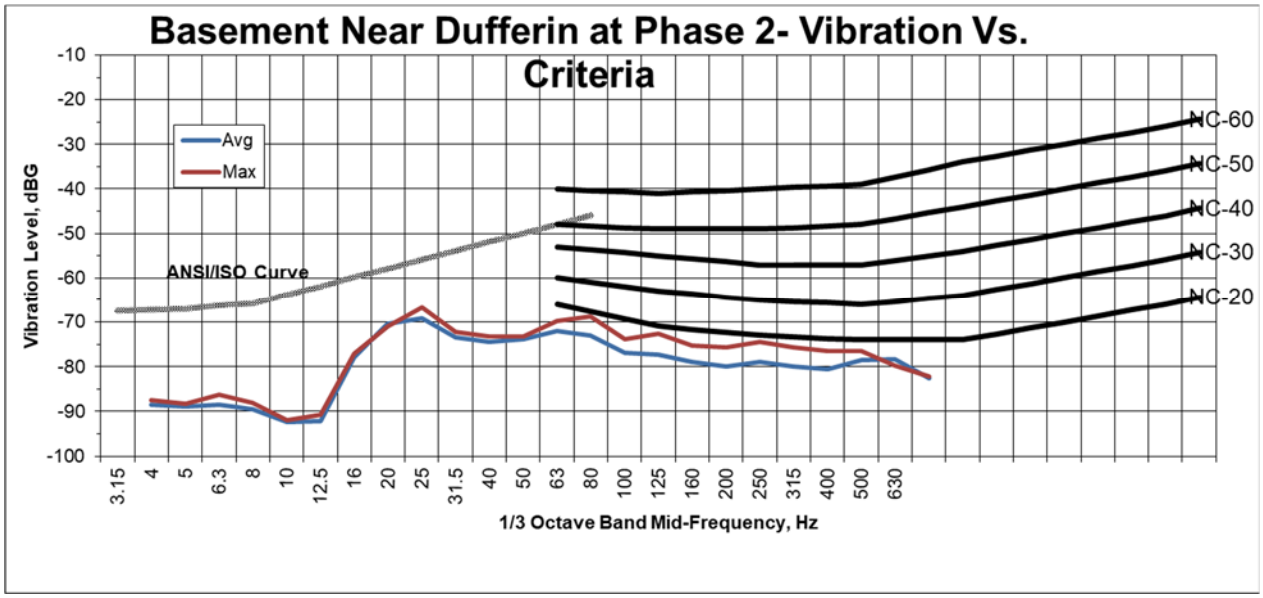

Figure 6d: Maximum Measured Vibration vs Criteria for the Basement Near Dufferin Street at Phase 2

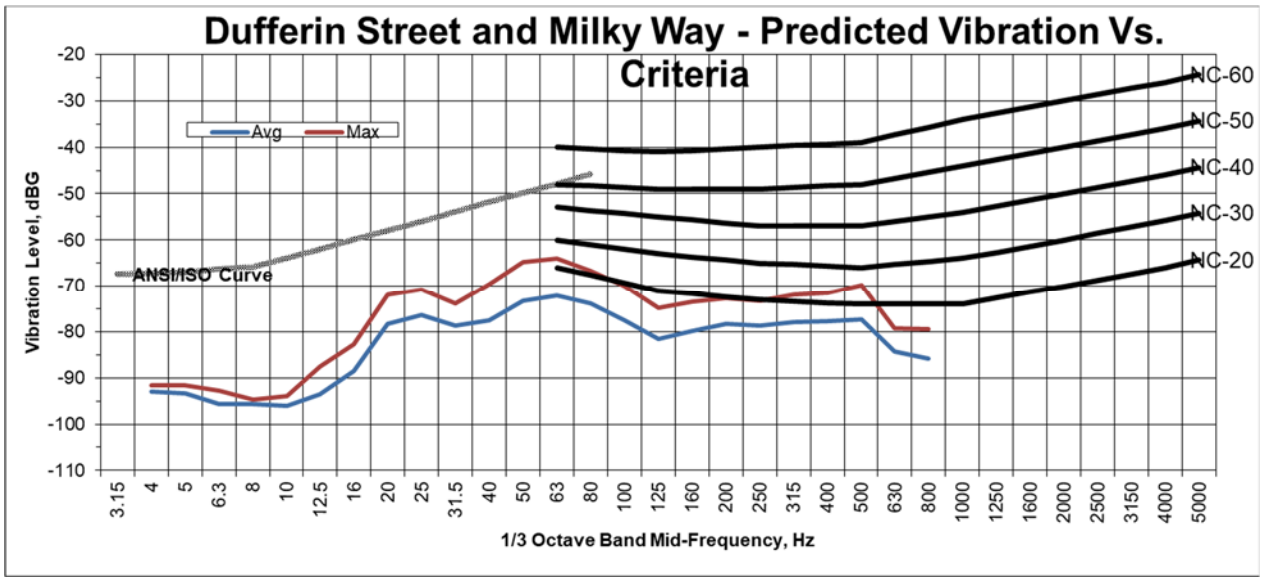

Figure 7a: Predicted Vibration vs. Criteria for Dufferin Street and Milky Way

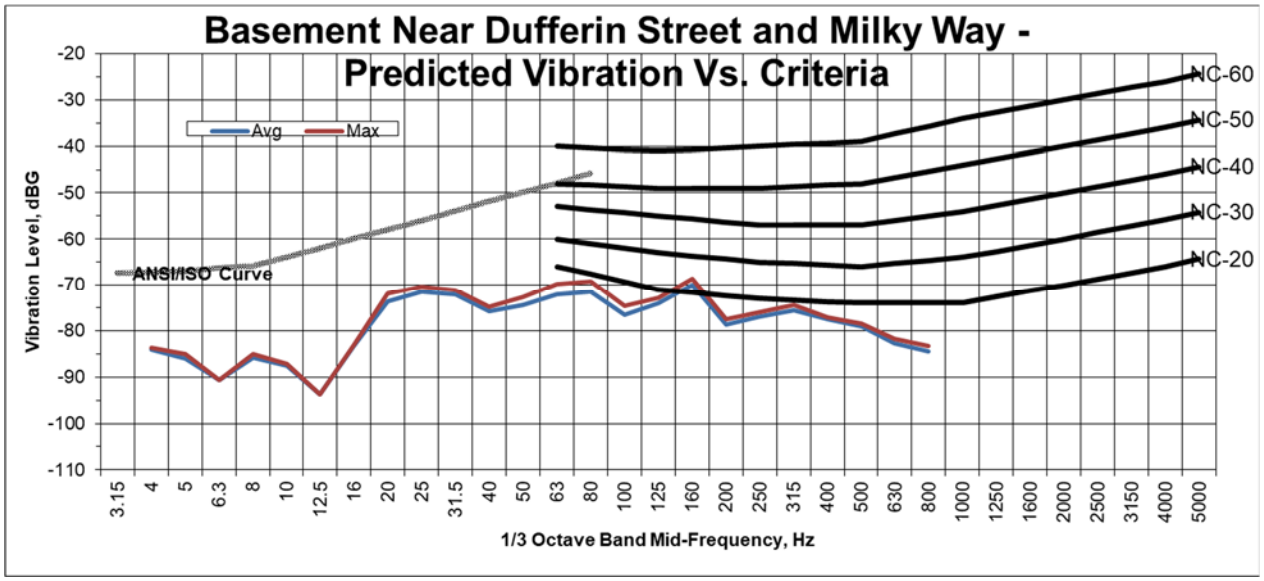

Figure 7b: Predicted Vibration vs. Criteria for the Basement Near Dufferin Street and Milky Way

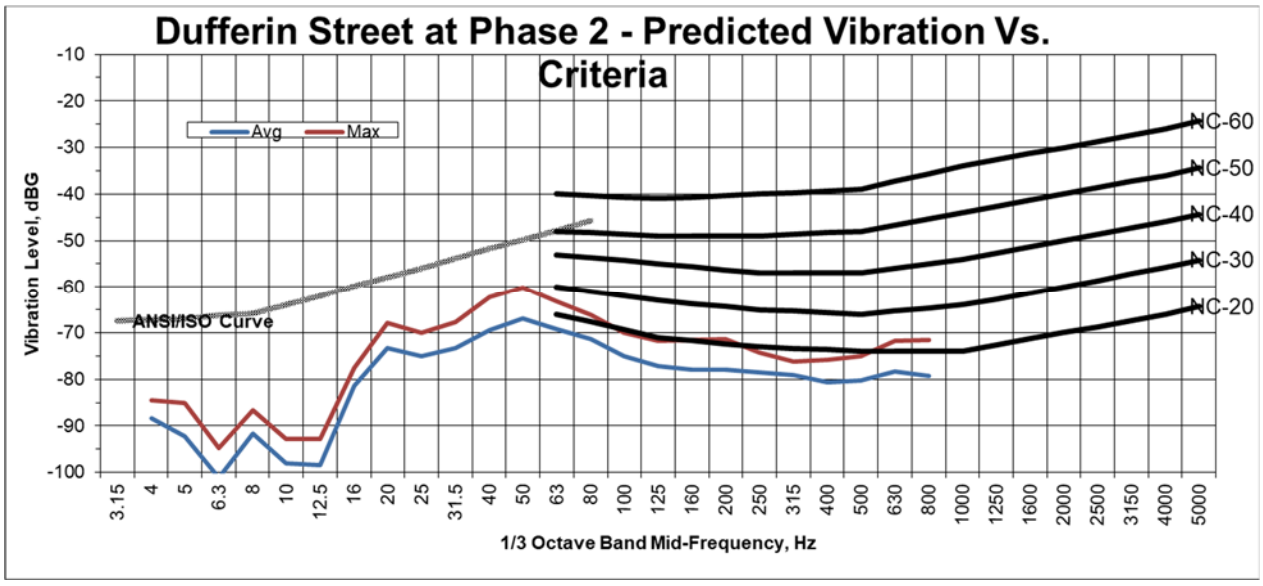

Figure 7c: Predicted Vibration vs. Criteria for Dufferin Street at Phase 2

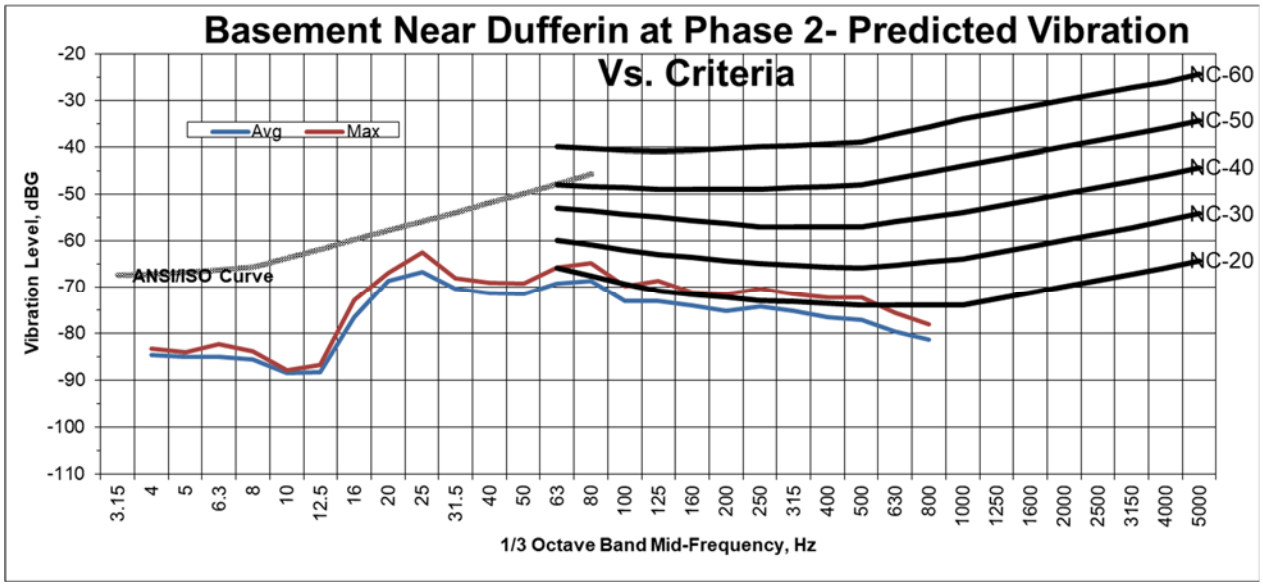

Figure 7d: Predicted Vibration vs. Criteria for the Basement Near Dufferin Street at Phase 2

APPENDIX A
TRAFFIC DATA

Transportation Services

TMC Detailed Report

Date	Study Hours	Traffic Signal Number
2017-11-21 (Tue)	Routine	None

Total Volume	Total Vehicles	Total Cyclists	Total Pedestrians
8,515	7,192	261	1,062

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
07:30–07:45	CAR	0	57	4	2	0	6	0	106	0	7	2	4	PED	0	11	5	10
	TRUCK	0	8	0	0	1	0	0	1	0	0	0	0	BIKE	6	0	1	1
	BUS	0	6	0	1	0	0	0	4	0	0	0	0	OTHER	0	0	0	0
07:45–08:00	CAR	1	73	4	1	0	10	3	103	2	2	0	5	PED	0	14	10	8
	TRUCK	0	7	0	1	0	0	0	8	0	1	0	0	BIKE	4	0	4	1
	BUS	0	5	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
08:00–08:15	CAR	3	72	3	3	0	8	0	114	4	2	0	3	PED	0	11	8	7
	TRUCK	0	7	0	0	0	0	0	6	0	0	0	0	BIKE	2	0	2	2
	BUS	0	5	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
08:15–08:30	CAR	4	52	5	4	0	10	4	114	1	5	0	4	PED	0	15	15	9
	TRUCK	0	4	1	0	0	0	0	3	0	0	0	1	BIKE	3	0	2	2
	BUS	0	3	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
08:30–08:45	CAR	4	56	5	5	0	9	3	118	4	5	1	5	PED	0	16	6	12
	TRUCK	0	3	0	0	0	0	0	4	1	0	0	0	BIKE	2	0	3	3
	BUS	0	4	0	0	0	0	0	4	0	0	0	0	OTHER	0	0	0	0
08:45–09:00	CAR	0	52	5	5	0	14	5	131	0	5	0	2	PED	0	19	12	10
	TRUCK	0	2	0	2	0	1	0	3	0	0	0	0	BIKE	2	0	2	5
	BUS	0	6	0	0	0	0	0	4	0	0	0	0	OTHER	0	0	0	0
09:00–09:15	CAR	6	63	4	6	1	10	3	116	3	6	0	3	PED	0	17	10	11
	TRUCK	0	3	0	0	0	0	0	5	0	0	0	0	BIKE	4	0	2	7
	BUS	0	5	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
09:15–09:30	CAR	2	56	4	3	0	8	3	109	2	5	0	3	PED	0	12	2	8
	TRUCK	0	2	0	0	0	0	0	3	0	0	0	0	BIKE	2	0	2	4
	BUS	0	4	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
10:00–10:15	CAR	1	76	1	2	0	4	0	78	4	3	0	1	PED	0	19	5	11
	TRUCK	0	4	0	0	0	0	0	3	0	0	0	0	BIKE	2	0	2	4
	BUS	0	6	0	0	0	0	0	9	0	0	0	0	OTHER	0	0	0	0
10:15–10:30	CAR	3	81	3	2	0	6	0	74	3	4	1	3	PED	0	15	3	23
	TRUCK	0	4	0	0	0	2	0	5	0	0	0	0	BIKE	4	0	1	2
	BUS	0	6	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
10:30–10:45	CAR	6	94	1	5	0	3	1	80	2	2	0	3	PED	0	14	6	8
	TRUCK	0	3	0	0	0	0	0	6	0	0	0	1	BIKE	3	0	2	2
	BUS	0	9	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
11:45–12:00	CAR	2	86	2	6	1	5	2	108	4	2	0	2	PED	0	8	7	10
	TRUCK	0	6	0	0	0	1	0	7	1	0	0	0	BIKE	3	0	3	2
	BUS	0	5	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
13:00–13:15	CAR	3	90	2	6	1	4	2	112	3	2	0	3	PED	0	9	6	12
	TRUCK	0	4	0	0	0	0	0	6	0	0	0	0	BIKE	3	0	2	1
	BUS	0	6	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
13:15–13:30	CAR	2	86	2	4	0	2	0	103	2	4	0	4	PED	0	14	3	9
	TRUCK	0	5	0	0	0	0	0	6	1	0	0	0	BIKE	3	0	3	1
	BUS	0	6	0	0	0	0	0	7	0	0	0	0	OTHER	0	0	0	0
13:30–13:45	CAR	2	88	1	4	0	3	1	98	2	3	0	2	PED	0	12	6	9
	TRUCK	0	4	0	0	0	0	0	6	0	0	0	0	BIKE	2	0	2	1
	BUS	0	7	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
13:45–14:00	CAR	1	78	0	2	0	1	1	96	3	3	0	2	PED	0	10	2	6
	TRUCK	0	3	0	0	0	0	0	4	0	0	0	0	BIKE	4	0	2	1
	BUS	0	4	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
14:00–14:15	CAR	3	82	4	6	0	3	4	81	6	2	0	3	PED	0	13	13	16
	TRUCK	0	2	0	0	0	0	0	4	0	0	0	0	BIKE	8	0	6	1
	BUS	0	5	0	0	0	0	0	7	0	0	0	0	OTHER	0	0	0	0
14:15–14:30	CAR	2	79	5	4	0	3	6	85	5	1	0	2	PED	0	14	5	19
	TRUCK	0	2	0	0	0	0	0	3	0	0	0	0	BIKE	4	0	4	0
	BUS	0	6	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
14:30–14:45	CAR	4	105	4	3	0	7	4	56	1	2	1	4	PED	0	14	4	14
	TRUCK	0	3	0	0	0	0	0	6	0	0	0	0	BIKE	3	0	2	0
	BUS	0	5	0	0	0	0	0	8	0	0	0	0	OTHER	0	0	0	0
14:45–15:00	CAR	4	104	3	3	0	5	5	62	6	2	0	3	PED	0	12	7	14
	TRUCK	0	3	0	0	0	0	0	3	0	0	0	0	BIKE	4	0	3	1
	BUS	0	5	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
16:00–16:15	CAR	0	128	2	6	0	5	4	88	5	5	1	6	PED	0	9	7	13
	TRUCK	0	1	0	0	0	0	0	4	0	0	0	0	BIKE	2	0	2	1
	BUS	0	6	0	0	0	0	0	4	0	0	0	0	OTHER	0	0	0	0
16:15–16:30	CAR	1	131	6	2	0	3	5	90	5	6	0	8	PED	0	2	13	8
	TRUCK	0	1	0	0	0	0	0	0	0	0	0	0	BIKE	4	0	3	4
	BUS	0	4	0	0	0	0	0	7	0	0	0	0	OTHER	0	0	0	0
16:30–16:45	CAR	1	116	6	0	0	3	4	86	3	6	0	5	PED	0	17	4	18
	TRUCK	0	0	0	0	0	0	0	2	0	0	0	0	BIKE	3	0	5	1
	BUS	0	6	0	0	0	0	0	4	0	0	0	0	OTHER	0	0	0	0
16:45–17:00	CAR	0	128	5	2	0	4	6	86	2	6	0	5	PED	0	10	4	17

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
	TRUCK	0	2	0	0	0	0	0	2	0	0	0	0	BIKE	2	0	3	2
	BUS	0	6	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
17:00–17:15	CAR	5	95	2	4	0	4	0	81	1	4	0	3	PED	0	14	12	10
	TRUCK	0	4	0	0	0	2	0	5	0	0	0	0	BIKE	2	0	5	1
	BUS	0	8	0	0	0	0	0	9	0	0	0	0	OTHER	0	0	0	0
17:15–17:30	CAR	4	68	4	1	0	4	0	76	4	1	0	2	PED	0	8	4	12
	TRUCK	0	4	0	1	0	0	0	5	0	0	0	0	BIKE	4	0	8	2
	BUS	0	6	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
17:30–17:45	CAR	6	71	3	5	0	5	3	82	3	3	1	4	PED	0	15	10	11
	TRUCK	0	4	0	0	0	0	0	7	0	0	0	0	BIKE	2	0	7	1
	BUS	0	7	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
17:45–18:00	CAR	0	80	1	4	0	5	1	84	2	4	0	1	PED	0	14	9	11
	TRUCK	0	5	0	1	0	0	0	5	0	0	0	0	BIKE	2	0	5	2
	BUS	0	5	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
22:45–23:00	CAR	4	83	1	3	0	6	1	85	1	4	0	2	PED	0	12	5	14
	TRUCK	0	5	0	0	0	0	0	5	0	0	0	1	BIKE	5	0	3	1
	BUS	0	4	0	0	0	0	0	5	0	0	0	0	OTHER	0	0	0	0
23:00–23:15	CAR	2	86	1	5	0	5	2	102	1	0	1	2	PED	0	16	13	13
	TRUCK	0	6	0	0	0	0	0	3	0	0	0	0	BIKE	3	0	2	1
	BUS	0	6	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
23:15–23:30	CAR	2	83	2	4	0	5	0	96	1	5	1	2	PED	0	20	14	27
	TRUCK	0	6	0	0	0	0	0	6	0	0	0	0	BIKE	2	0	3	1
	BUS	0	5	0	0	0	0	0	6	0	0	0	0	OTHER	0	0	0	0
23:30–23:45	CAR	2	85	1	6	0	6	2	102	1	6	0	3	PED	0	16	4	26
	TRUCK	0	4	0	0	0	0	0	7	0	0	0	0	BIKE	2	0	5	1
	BUS	0	6	0	0	0	0	0	4	0	0	0	0	OTHER	0	0	0	0

Transportation Services

TMC Summary Report

Date
2017-11-21 (Tue)

Study Hours
Routine

Traffic Signal Number
None

Total Volume
8,515

Total Vehicles
7,192

Total Cyclists
261

Total Pedestrians
1,062

Time Period	Vehicle Type	NORTHBOUND					EASTBOUND					SOUTHBOUND					WESTBOUND						N	E	S	W	Total
		Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total						
07:30–23:45	CAR	2,906	80	2,684	96	2,860	174	118	3	176	297	3,295	75	3,002	86	3,163	175	117	9	104	230	PED	0	422	234	406	1,062
TOTAL SUM	TRUCK	129	0	121	1	122	2	5	1	6	12	150	0	143	3	146	3	1	0	3	4	BIKE	101	0	101	59	261
	BUS	178	0	177	0	177	0	1	0	0	1	180	0	180	0	180	0	0	0	0	0	OTHER	0	0	0	0	0
8,515	TOTAL	3,213	80	2,982	97	3,159	176	124	4	182	310	3,625	75	3,325	89	3,489	178	118	9	107	234	7,192					
08:15–09:15	CAR	257	14	223	19	256	35	20	1	43	64	543	15	479	8	502	23	21	1	14	36	PED	0	67	43	42	152
AM PEAK	TRUCK	15	0	12	1	13	1	2	0	1	3	16	0	15	1	16	1	0	0	1	1	BIKE	11	0	9	17	37
	BUS	18	0	18	0	18	0	0	0	0	0	18	0	18	0	18	0	0	0	0	0	OTHER	0	0	0	0	0
1,116	TOTAL	290	14	253	20	287	36	22	1	44	67	577	15	512	9	536	24	21	1	15	37	927					
15:00–16:00	CAR	1,239	27	1,154	34	1,215	62	42	0	55	97	1,163	28	1,058	29	1,115	60	50	4	43	97	PED	0	153	99	180	432
PM PEAK	TRUCK	45	0	42	0	42	0	2	0	2	4	53	0	51	0	51	0	0	0	1	1	BIKE	33	0	51	18	102
	BUS	69	0	69	0	69	0	0	0	0	0	67	0	67	0	67	0	0	0	0	0	OTHER	0	0	0	0	0
3,292	TOTAL	1,353	27	1,265	34	1,326	62	44	0	57	101	1,283	28	1,176	29	1,233	60	50	4	44	98	2,758					
10:00–15:00	CAR	376	11	350	9	370	19	16	1	15	32	370	9	344	14	367	25	10	1	11	21	PED	0	51	22	50	124
OFF HOUR AVG	TRUCK	15	0	14	0	14	0	0	0	1	1	21	0	20	1	20	1	0	0	0	0	BIKE	14	0	11	5	30
	BUS	23	0	23	0	23	0	0	0	0	0	25	0	25	0	25	0	0	0	0	0	OTHER	0	0	0	0	0
1,028	TOTAL	414	11	387	9	408	19	16	1	16	33	415	9	389	14	412	26	10	1	11	22	874					
07:30–09:30	CAR	539	20	481	34	535	56	29	1	75	105	1,023	21	911	16	948	39	37	3	29	69	PED	0	115	68	75	258
2 HOUR AM	TRUCK	40	0	36	1	37	2	3	1	1	5	35	0	33	1	34	1	1	0	1	2	BIKE	25	0	18	25	68
	BUS	39	0	38	0	38	0	1	0	0	1	38	0	38	0	38	0	0	0	0	0	OTHER	0	0	0	0	0
2,138	TOTAL	618	20	555	35	610	58	33	2	76	111	1,096	21	982	17	1,020	40	38	3	30	71	1,812					
16:00–18:00	CAR	875	17	817	29	863	52	24	0	33	57	741	23	673	25	721	44	35	2	34	71	PED	0	89	63	100	252
2 HOUR PM	TRUCK	23	0	21	0	21	0	2	0	2	4	32	0	30	0	30	0	0	0	0	0	BIKE	21	0	38	14	73
	BUS	48	0	48	0	48	0	0	0	0	0	46	0	46	0	46	0	0	0	0	0	OTHER	0	0	0	0	0
2,186	TOTAL	946	17	886	29	932	52	26	0	35	61	819	23	749	25	797	44	35	2	34	71	1,861					

Date
2020-02-19 (Wed)

Study Hours
Routine

Traffic Signal Number
1329

Total Volume
19,377

Total Vehicles
14,875

Total Cyclists
207

Total Pedestrians
4,295

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
07:30–07:45	CAR	2	67	25	14	66	4	7	88	0	36	48	4	PED	16	2	15	16
	TRUCK	1	5	5	0	16	4	3	10	0	4	6	1	BIKE	1	0	0	3
	BUS	0	3	0	0	2	0	1	4	0	0	3	0	OTHER	0	0	0	0
07:45–08:00	CAR	1	59	30	7	88	14	6	84	3	51	48	9	PED	25	0	36	26
	TRUCK	0	8	1	4	12	5	0	7	1	0	6	0	BIKE	0	1	1	7
	BUS	0	5	0	0	4	0	0	5	1	0	3	0	OTHER	0	0	0	0
08:00–08:15	CAR	7	56	13	15	101	17	5	85	6	41	52	7	PED	21	1	32	20
	TRUCK	0	7	7	3	12	1	0	13	3	2	3	1	BIKE	0	0	1	6
	BUS	0	4	2	0	3	0	0	7	0	0	3	0	OTHER	0	0	0	0
08:15–08:30	CAR	10	58	11	12	107	14	5	85	4	37	67	7	PED	22	3	48	32
	TRUCK	0	9	7	8	14	1	1	11	0	4	5	0	BIKE	1	0	0	8
	BUS	1	6	0	0	5	1	0	3	0	2	4	0	OTHER	0	0	0	0
08:30–08:45	CAR	6	67	25	18	98	12	13	88	7	35	70	2	PED	45	0	48	53
	TRUCK	0	9	7	6	18	1	5	11	1	4	3	1	BIKE	2	1	0	9
	BUS	0	4	1	0	3	0	0	4	0	1	3	0	OTHER	0	0	0	0
08:45–09:00	CAR	6	56	26	9	136	20	13	82	4	38	52	4	PED	35	2	41	36
	TRUCK	0	6	4	3	17	2	3	16	1	1	5	0	BIKE	2	0	0	3
	BUS	0	6	0	0	2	0	0	3	0	0	3	0	OTHER	0	0	0	0
09:00–09:15	CAR	1	65	19	9	132	28	4	87	10	41	55	2	PED	30	1	39	54
	TRUCK	1	11	2	2	14	4	4	19	2	4	4	0	BIKE	2	0	0	9
	BUS	0	2	0	1	4	0	0	5	0	0	6	0	OTHER	0	0	0	0
09:15–09:30	CAR	9	66	26	13	101	16	11	78	14	26	36	4	PED	29	1	32	31
	TRUCK	1	15	5	3	17	1	1	12	3	5	3	1	BIKE	2	0	0	3
	BUS	0	5	0	0	2	0	0	5	0	0	4	0	OTHER	0	0	0	0
10:00–10:15	CAR	9	70	16	12	67	16	5	74	8	33	45	2	PED	21	0	37	18
	TRUCK	0	11	4	3	10	4	5	8	3	3	6	1	BIKE	0	1	0	5
	BUS	0	5	0	0	3	0	0	7	0	0	4	0	OTHER	0	0	0	0
10:15–10:30	CAR	1	75	21	13	49	14	10	70	6	21	31	3	PED	31	0	33	33
	TRUCK	4	11	4	2	8	3	1	18	1	2	5	1	BIKE	1	0	0	3
	BUS	0	4	0	0	2	0	0	4	0	0	2	0	OTHER	0	0	0	0
10:30–10:45	CAR	8	68	14	13	71	16	9	56	11	50	41	4	PED	30	0	39	28
	TRUCK	0	22	1	4	9	1	0	12	2	2	7	1	BIKE	0	1	0	3
	BUS	0	6	0	0	2	0	0	5	0	0	3	0	OTHER	0	0	0	0

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
10:45–11:00	CAR	4	67	25	6	50	9	9	50	8	43	42	6	PED	35	5	30	33
	TRUCK	3	19	5	0	7	3	3	10	0	6	6	2	BIKE	1	1	1	3
	BUS	0	3	0	0	2	0	0	3	0	0	2	0	OTHER	0	0	0	0
11:00–11:15	CAR	17	83	24	6	62	15	6	63	8	24	36	4	PED	31	8	32	25
	TRUCK	1	15	4	7	9	4	1	11	0	6	11	0	BIKE	1	0	0	2
	BUS	0	3	1	0	1	0	0	3	0	0	2	0	OTHER	0	0	0	0
11:15–11:30	CAR	5	85	25	5	43	10	4	74	8	26	48	1	PED	38	12	30	23
	TRUCK	1	12	4	4	11	2	1	7	0	4	12	4	BIKE	1	1	0	3
	BUS	0	5	0	0	1	0	0	4	0	0	2	0	OTHER	0	0	0	0
11:30–11:45	CAR	5	68	24	4	60	14	9	73	11	20	33	7	PED	36	9	46	27
	TRUCK	1	13	5	3	5	2	3	12	2	3	6	1	BIKE	2	0	0	5
	BUS	0	3	0	0	7	0	0	4	0	0	1	0	OTHER	0	0	0	0
11:45–12:00	CAR	11	73	26	10	46	11	9	65	8	30	45	8	PED	27	6	30	32
	TRUCK	1	17	6	3	12	4	3	18	2	3	9	2	BIKE	1	2	0	3
	BUS	0	3	0	0	0	0	0	3	0	0	3	0	OTHER	0	0	0	0
13:00–13:15	CAR	6	68	22	16	46	12	6	76	4	22	47	3	PED	40	14	68	40
	TRUCK	0	16	6	2	15	3	0	20	1	6	9	2	BIKE	2	1	0	3
	BUS	0	3	0	0	1	0	0	4	0	0	2	0	OTHER	0	0	0	0
13:15–13:30	CAR	10	80	30	13	68	13	5	64	10	25	40	4	PED	35	20	57	21
	TRUCK	0	12	5	3	10	2	1	17	1	5	7	2	BIKE	2	0	1	3
	BUS	0	5	0	0	3	0	0	5	0	0	2	0	OTHER	0	0	0	0
13:30–13:45	CAR	8	66	23	8	34	17	4	67	3	32	34	8	PED	51	19	53	51
	TRUCK	1	21	5	4	5	4	1	13	0	4	7	0	BIKE	2	2	1	4
	BUS	0	3	0	0	1	0	0	6	0	0	3	0	OTHER	0	0	0	0
13:45–14:00	CAR	8	80	30	4	48	15	3	66	13	29	57	4	PED	48	19	35	34
	TRUCK	0	11	1	2	6	2	0	14	1	6	7	3	BIKE	1	1	2	1
	BUS	0	6	0	0	4	0	0	4	0	0	1	0	OTHER	0	0	0	0
14:00–14:15	CAR	8	78	28	8	49	9	8	62	11	28	57	8	PED	40	10	47	20
	TRUCK	4	17	3	1	6	1	2	14	1	8	8	1	BIKE	1	1	1	1
	BUS	0	7	0	0	2	0	0	3	0	0	2	0	OTHER	0	0	0	0
14:15–14:30	CAR	12	81	25	3	47	14	4	59	11	29	39	6	PED	55	12	46	34
	TRUCK	1	12	3	1	2	3	1	13	2	7	8	1	BIKE	0	0	0	2
	BUS	0	4	0	0	2	0	0	5	0	0	3	0	OTHER	0	0	0	0
14:30–14:45	CAR	7	92	25	10	45	7	7	58	11	43	61	4	PED	41	18	63	27
	TRUCK	1	13	6	2	7	1	5	11	2	5	4	0	BIKE	1	3	1	3
	BUS	0	5	0	0	2	0	0	7	0	0	3	0	OTHER	0	0	0	0
14:45–15:00	CAR	7	113	22	9	52	14	9	49	6	38	58	5	PED	41	13	40	25

Time Period	Vehicle Type	NORTHBOUND			EASTBOUND			SOUTHBOUND			WESTBOUND							
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		N	E	S	W
	TRUCK	1	11	3	2	4	2	1	9	2	1	8	1	BIKE	3	1	1	2
	BUS	0	7	0	0	2	1	0	3	0	0	2	0	OTHER	0	0	0	0
16:00–16:15	CAR	5	104	28	13	46	19	4	93	9	26	70	4	PED	42	18	69	33
	TRUCK	0	13	2	0	4	1	1	12	0	3	10	1	BIKE	2	1	0	2
	BUS	0	3	0	0	6	0	1	4	0	0	3	0	OTHER	0	0	0	0
16:15–16:30	CAR	8	101	27	11	68	12	8	72	11	20	85	6	PED	61	27	64	21
	TRUCK	2	7	2	3	7	3	2	7	0	4	12	0	BIKE	2	0	0	0
	BUS	0	3	0	0	2	0	0	4	0	1	2	0	OTHER	0	0	0	0
16:30–16:45	CAR	9	126	33	6	60	13	6	67	12	28	76	7	PED	49	16	51	46
	TRUCK	1	10	2	4	5	0	1	3	0	3	5	1	BIKE	2	3	0	1
	BUS	0	5	0	0	3	0	0	6	0	0	1	0	OTHER	0	0	0	0
16:45–17:00	CAR	5	114	34	16	67	12	5	72	9	21	80	3	PED	38	14	60	48
	TRUCK	1	8	1	1	4	2	0	6	0	2	9	0	BIKE	1	2	0	4
	BUS	0	4	0	0	4	1	0	2	0	0	4	0	OTHER	0	0	0	0
17:00–17:15	CAR	11	160	31	12	72	9	9	80	12	23	100	5	PED	55	28	67	42
	TRUCK	1	13	2	1	5	1	0	7	3	3	11	0	BIKE	2	3	1	3
	BUS	0	3	0	0	3	0	0	3	0	0	1	0	OTHER	0	0	0	0
17:15–17:30	CAR	6	142	39	15	86	18	9	83	12	49	111	6	PED	100	40	69	59
	TRUCK	1	7	4	1	7	0	0	4	1	3	9	1	BIKE	2	2	0	4
	BUS	0	4	0	0	2	0	0	3	1	0	2	0	OTHER	0	0	0	0
17:30–17:45	CAR	12	131	33	14	73	21	12	76	8	18	82	12	PED	59	41	83	46
	TRUCK	0	9	1	1	4	2	1	4	1	3	5	0	BIKE	0	4	3	2
	BUS	0	3	0	0	2	0	0	3	0	0	5	0	OTHER	0	0	0	0
17:45–18:00	CAR	10	124	34	22	77	14	15	69	13	27	92	5	PED	76	50	67	42
	TRUCK	1	7	2	1	6	1	0	8	0	1	6	0	BIKE	2	6	0	3
	BUS	0	4	0	0	2	0	0	3	0	0	4	0	OTHER	0	0	0	0

Transportation Services

TMC Summary Report

Date	Study Hours	Traffic Signal Number
2020-02-19 (Wed)	Routine	1329

Total Volume	Total Vehicles	Total Cyclists	Total Pedestrians
19,377	14,875	207	4,295

Time Period	Vehicle Type	NORTHBOUND					EASTBOUND					SOUTHBOUND					WESTBOUND						N	E	S	W	Total
		Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total	Exits	Left	Thru	Right	Total							
07:30–18:00	CAR	3,253	234	2,743	814	3,791	3,268	346	2,215	449	3,010	3,774	239	2,315	271	2,825	2,343	1,010	1,838	164	3,012	PED	1,303	409	1,507	1,076	4,295
TOTAL SUM	TRUCK	490	29	377	119	525	457	84	288	70	442	544	50	357	36	443	287	117	222	29	368	BIKE	42	38	14	113	207
	BUS	137	1	136	4	141	90	1	84	3	88	141	2	134	2	138	91	4	88	0	92	OTHER	0	0	0	0	0
19,377	TOTAL	3,880	264	3,256	937	4,457	3,815	431	2,587	522	3,540	4,459	291	2,806	309	3,406	2,721	1,131	2,148	193	3,472	14,875					
08:15–09:15	CAR	309	23	246	81	350	589	48	473	74	595	567	35	342	25	402	292	151	244	15	410	PED	132	6	176	175	489
AM PEAK	TRUCK	55	1	35	20	56	96	19	63	8	90	78	13	57	4	74	22	13	17	1	31	BIKE	7	1	0	29	37
	BUS	19	1	18	1	20	15	1	14	1	16	19	0	15	0	15	17	3	16	0	19	OTHER	0	0	0	0	0
2,604	TOTAL	383	25	299	102	426	700	68	550	83	701	664	48	414	29	491	331	167	277	16	460	2,078					
15:00–16:00	CAR	1,159	66	1,002	259	1,327	876	109	549	118	776	942	68	612	86	766	848	212	696	48	956	PED	480	234	530	337	1,581
PM PEAK	TRUCK	89	7	74	16	97	63	12	42	10	64	83	5	51	5	61	79	22	67	3	92	BIKE	13	21	4	19	57
	BUS	29	0	29	0	29	25	0	24	1	25	30	1	28	1	30	23	1	22	0	23	OTHER	0	0	0	0	0
5,884	TOTAL	1,277	73	1,105	275	1,453	964	121	615	129	865	1,055	74	691	92	857	950	235	785	51	1,071	4,246					
10:00–15:00	CAR	366	32	312	95	438	331	35	209	52	296	431	27	257	34	318	244	123	179	19	321	PED	150	41	172	118	481
OFF HOUR AVG	TRUCK	75	5	58	16	79	55	11	32	10	53	80	7	52	5	64	40	18	30	6	53	BIKE	5	4	2	12	22
	BUS	18	0	18	0	18	9	0	9	0	9	18	0	18	0	18	9	0	9	0	9	OTHER	0	0	0	0	0
2,178	TOTAL	459	36	388	112	536	395	46	250	62	357	529	34	326	39	399	293	141	218	25	384	1,675					
07:30–09:30	CAR	630	42	494	175	711	1,068	97	829	125	1,051	1,107	64	677	48	789	518	305	428	39	772	PED	223	10	291	268	792
2 HOUR AM	TRUCK	103	3	70	38	111	175	29	120	19	168	142	17	99	11	127	49	24	35	4	63	BIKE	10	2	2	48	62
	BUS	36	1	35	3	39	29	1	25	1	27	40	1	36	1	38	31	3	29	0	32	OTHER	0	0	0	0	0
4,782	TOTAL	769	46	599	216	861	1,272	127	974	145	1,246	1,289	82	812	60	954	598	332	492	43	867	3,928					
16:00–18:00	CAR	1,159	66	1,002	259	1,327	876	109	549	118	776	942	68	612	86	766	848	212	696	48	956	PED	480	234	530	337	1,581
2 HOUR PM	TRUCK	89	7	74	16	97	63	12	42	10	64	83	5	51	5	61	79	22	67	3	92	BIKE	13	21	4	19	57
	BUS	29	0	29	0	29	25	0	24	1	25	30	1	28	1	30	23	1	22	0	23	OTHER	0	0	0	0	0
5,884	TOTAL	1,277	73	1,105	275	1,453	964	121	615	129	865	1,055	74	691	92	857	950	235	785	51	1,071	4,246					

System Engineering
Engineering Services

1 Administration Road
Concord, ON, L4K 1B9
T: 905.669.3264
F: 905.760.3406

Train Count Data

TRANSMITTAL

To: *Destinataire :*	HGC Engineering 2000 Argentia Rd Plaza, Suite 203 Mississauga ON L5N 1P7	*Project :*	WTN-2.46- Queen Street W, Toronto ON
Att'n:	Bryan Kurzman	*Routing:*	bkurzman@hgcengineering.com
From: *Expéditeur :*	Umair Naveed	*Date:*	2022/05/13
Cc:	Adjacent Development CN via e-mail		

☐ Urgent ☐ For Your Use ☐ For Review ■ For Your Information ☐ Confidential

Re: Train Traffic Data – CN Weston Subdivision near Queen Street West in Toronto, ON

Please find attached the requested Train Traffic Data; this data does not reflect GO Metrolinx Traffic. The application fee in the amount of **$500.00** +HST will be invoiced.

Should you have any questions, please do not hesitate to contact the undersigned at permits.gld@cn.ca.

Sincerely,

Umair Naveed

Umair Naveed
Project Officer Public Works - Eastern Canada
Permits.gld@cn.ca

Date: 2022/05/13 Project Number: WTN– 2.46 –Queen St. W, Toronto ON

Dear Bryan:

Re: Train Traffic Data – CN Weston Subdivision near Queen St in Toronto, ON

The following is provided in response to Bryan's 2022/04/11 request for information regarding rail traffic in the vicinity of Queen St. in Toronto at approximately Mile 2.46 on CN's Weston 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	0	140	15	4
Way Freight	1	25	15	4
Passenger	5	10	75	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	0	140	15	4
Way Freight	0	25	15	4
Passenger	0	10	75	2

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

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There is one (1) at-grade crossing in the immediate vicinity of the study area at Mile 1.59 (Strachan Ave). Anti-whistling bylaws are in effect at this crossing. 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,

Umair Naveed

Umair Naveed
Project Officer Public Works - Eastern Canada
Permits.gld@cn.ca

APPENDIX B

STAMSON CALIBRATION OUTPUT

STAMSON 5.0 NORMAL REPORT Date: 24-03-2022 12:28:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Rail data, segment # 1: GO1 (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1.	387.0/82.0	129.0	1.0	12.0	Diesel	No

Data for Segment # 1: GO1 (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 15.00 / 15.00	m
Receiver height	: 1.50 / 1.50	m
Topography	: 0	(Define your own alpha.)
No Whistle		
Barrier angle1	: -90.00 deg	Angle2 : 90.00 deg
Barrier height	: 0.00	m
Barrier receiver distance	: 10.00 / 10.00	m
Source elevation	: 0.00	m
Receiver elevation	: 0.00	m
Barrier elevation	: 0.00	m
Alpha	: 0.20	
Reference angle	: 0.00	

Rail data, segment # 2: GO2 (day/night)

Train Type	Trains	Speed (km/h)	# loc / Train	# Cars / Train	Eng type	Cont weld
1.	77.0/3.0	129.0	2.0	12.0	Diesel	No

Data for Segment # 2: GO2 (day/night)

Angle1 Angle2	-90.00 deg	90.00 deg	
Wood depth	0	(No woods.)	
No of house rows	0 / 0		
Surface	1	(Absorptive ground surface)	
Receiver source distance	15.00 / 15.00	m	
Receiver height	1.50 / 1.50	m	
Topography	0	(Define your own alpha.)	
No Whistle			
Barrier angle1	-90.00 deg	Angle2 : 90.00 deg	
Barrier height	0.00	m	
Barrier receiver distance	10.00 / 10.00	m	
Source elevation	0.00	m	
Receiver elevation	0.00	m	
Barrier elevation	0.00	m	
Alpha	0.20		
Reference angle	0.00		

Rail data, segment # 3: UPS (day/night)

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1.	328.0/92.0	129.0	1.0	3.0	Diesel	No

Data for Segment # 3: UPS (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg	
Wood depth	: 0	(No woods.)	
No of house rows	: 0 / 0		
Surface	: 1	(Absorptive ground surface)	
Receiver source distance	: 15.00 / 15.00	m	
Receiver height	: 1.50 / 1.50	m	
Topography	: 0	(Define your own alpha.)	
No Whistle			
Barrier angle1	: -90.00 deg	Angle2 : 90.00 deg	
Barrier height	: 0.00	m	
Barrier receiver distance	: 10.00 / 10.00	m	
Source elevation	: 0.00	m	
Receiver elevation	: 0.00	m	
Barrier elevation	: 0.00	m	
Alpha	: 0.20		
Reference angle	: 0.00		

Results segment # 1: GO1 (day)

LOCOMOTIVE (0.00 + 81.59 + 0.00) = 81.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	82.13	0.00	-0.54	0.00	0.00	0.00	81.59

WHEEL (0.00 + 77.48 + 0.00) = 77.48 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	78.01	0.00	-0.54	0.00	0.00	0.00	77.48

Segment Leq : 83.01 dBA

Results segment # 2: GO2 (day)

LOCOMOTIVE (0.00 + 76.69 + 0.00) = 76.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	77.23	0.00	-0.54	0.00	0.00	0.00	76.69

WHEEL (0.00 + 70.79 + 0.00) = 70.79 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	71.32	0.00	-0.54	0.00	0.00	0.00	70.79

Segment Leq : 77.68 dBA

Results segment # 3: UPS (day)

LOCOMOTIVE (0.00 + 79.53 + 0.00) = 79.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	80.06	0.00	-0.54	0.00	0.00	0.00	79.53

WHEEL (0.00 + 71.64 + 0.00) = 71.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	72.18	0.00	-0.54	0.00	0.00	0.00	71.64

Segment Leq : 80.18 dBA

Total Leq All Segments: 85.60 dBA

Results segment # 1: GO1 (night)

LOCOMOTIVE (0.00 + 77.87 + 0.00) = 77.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	78.40	0.00	-0.54	0.00	0.00	0.00	77.87

WHEEL (0.00 + 73.75 + 0.00) = 73.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	74.29	0.00	-0.54	0.00	0.00	0.00	73.75

Segment Leq : 79.29 dBA

Results segment # 2: GO2 (night)

LOCOMOTIVE (0.00 + 65.61 + 0.00) = 65.61 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	66.15	0.00	-0.54	0.00	0.00	0.00	65.61

WHEEL (0.00 + 59.70 + 0.00) = 59.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	60.24	0.00	-0.54	0.00	0.00	0.00	59.70

Segment Leq : 66.60 dBA

Results segment # 3: UPS (night)

LOCOMOTIVE (0.00 + 77.02 + 0.00) = 77.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	77.55	0.00	-0.54	0.00	0.00	0.00	77.02

WHEEL (0.00 + 69.13 + 0.00) = 69.13 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	69.67	0.00	-0.54	0.00	0.00	0.00	69.13

Segment Leq : 77.67 dBA

Total Leq All Segments: 81.70 dBA

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

Car traffic volume : 9834/1093 veh/TimePeriod
Medium truck volume : 1248/139 veh/TimePeriod
Heavy truck volume : 804/89 veh/TimePeriod
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 0 (Define your own alpha.)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Alpha : 0.20
Reference angle : 0.00

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

Car traffic volume : 11413/1268 veh/TimePeriod
Medium truck volume : 1130/126 veh/TimePeriod
Heavy truck volume : 723/80 veh/TimePeriod
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: Queen W (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 0 (Define your own alpha.)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Alpha : 0.20
Reference angle : 0.00

Road data, segment # 3: Melbourne (day/night)

Car traffic volume	1029/320	veh/TimePeriod
Medium truck volume	20/2	veh/TimePeriod
Heavy truck volume	20/2	veh/TimePeriod
Posted speed limit	40 km/h	
Road gradient	0 %	
Road pavement	1 (Typical asphalt or concrete)	

Data for Segment # 3: Melbourne (day/night)

Angle1 Angle2	-90.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	15.00 / 15.00	m
Receiver height	1.50 / 1.50	m
Topography	0	(Define your own alpha.)
Barrier angle1	-90.00 deg	Angle2 : 90.00 deg
Barrier height	0.00 m	
Barrier receiver distance	10.00 / 10.00	m
Source elevation	0.00 m	
Receiver elevation	0.00 m	
Barrier elevation	0.00 m	
Alpha	0.20	
Reference angle	0.00	

Results segment # 1: Dufferin (day)

Source height = 1.61 m

ROAD (0.00 + 66.71 + 0.00) = 66.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	67.25	0.00	0.00	-0.54	0.00	0.00	0.00	66.71

Segment Leq : 66.71 dBA

Results segment # 2: Queen W (day)

Source height = 1.53 m

ROAD (0.00 + 66.38 + 0.00) = 66.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	66.92	0.00	0.00	-0.54	0.00	0.00	0.00	66.38

Segment Leq : 66.38 dBA

Results segment # 3: Melbourne (day)

Source height = 1.17 m

ROAD (0.00 + 51.63 + 0.00) = 51.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	52.17	0.00	0.00	-0.54	0.00	0.00	0.00	51.63

Segment Leq : 51.63 dBA

Total Leq All Segments: 69.63 dBA

Results segment # 1: Dufferin (night)

Source height = 1.61 m

ROAD (0.00 + 60.17 + 0.00) = 60.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	60.71	0.00	0.00	-0.54	0.00	0.00	0.00	60.17

Segment Leq : 60.17 dBA

Results segment # 2: Queen W (night)

Source height = 1.53 m

ROAD (0.00 + 59.84 + 0.00) = 59.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	60.38	0.00	0.00	-0.54	0.00	0.00	0.00	59.84

Segment Leq : 59.84 dBA

Results segment # 3: Melbourne (night)

Source height = 0.89 m

ROAD (0.00 + 46.98 + 0.00) = 46.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	47.52	0.00	0.00	-0.54	0.00	0.00	0.00	46.98

Segment Leq : 46.98 dBA

Total Leq All Segments: 63.13 dBA

RT/Custom data, segment # 1: Streetcar (day/night)
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1 - CLRV:
Traffic volume : 553/160 veh/TimePeriod
Speed : 40 km/h

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 1.50 m
Topography : 0 (Define your own alpha.)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 10.00 / 10.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Alpha : 0.20
Reference angle : 0.00

Results segment # 1: Streetcar (day)

Source height = 0.50 m

RT/Custom (0.00 + 63.10 + 0.00) = 63.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	63.64	0.00	-0.54	0.00	0.00	0.00	63.10

Segment Leq : 63.10 dBA

Total Leq All Segments: 63.10 dBA

Results segment # 1: Streetcar (night)

Source height = 0.50 m

RT/Custom (0.00 + 60.73 + 0.00) = 60.73 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.20	61.26	0.00	-0.54	0.00	0.00	0.00	60.73

Segment Leq : 60.73 dBA

Total Leq All Segments: 60.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 85.73
(NIGHT): 81.80