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Noise and Vibration Feasibility Study
Proposed Residential Development
Millcroft Greens Corporation
Burlington, Ontario

Prepared for:

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1 Introduction and Summary

HGC Engineering was retained by Millcroft Greens Corporation to conduct a noise and vibration feasibility study for their proposed residential development to be located along portions of the Millcroft Golf Course in Burlington, Ontario. The development will include single detached dwellings and a 6-storey condo building along with associated roadways around the golf course site.

This study has been updated to incorporate the responses to the City of Burlington's Comments dated November 6, 2020, included in Appendix E.

The primary sources of noise in the area are rail traffic on the Canadian National (CN) railway and road traffic on Dundas Street West and Upper Middle Road. A secondary source of noise is road traffic on Millcroft Park Drive. Rail traffic data for the CN railway was obtained from CN personnel. Road traffic data for Dundas Street West, Upper Middle Road, and Millcroft Park Drive was obtained from the Region of Halton and City of Burlington, respectively. The data was used to predict future traffic sound levels at various locations around the development. The predicted sound levels were compared to the guidelines of the Ministry of the Environment, Conservation and Parks (MECP), Region of Halton, the City of Burlington and CN.

The sound level predictions indicate that the future road and rail traffic sound levels will exceed MECP guidelines in the proposed development. Acoustic barriers are required for the rear yards of dwellings with backing exposure to Upper Middle Road. An earth safety berm with an acoustic wall on top exists along and in parallel to the railway line. Central air conditioning is required for dwellings closest to the railway, Dundas Street West, and Upper Middle Road and protects the proposed rear yards of lots adjacent to the railway lines. Forced air ventilation with ducts sized for the future installation of air conditioning by the occupant is required for dwellings further from the railway, and Upper Middle Road, or with exposure to Millcroft Park Drive. Brick exterior construction is required for the façades of the proposed dwellings with direct exposure to the railway. Upgraded glazing constructions are required for dwellings closest to the railway, Upper Middle Road, and Dundas Street West. Ground-borne vibration measurements indicate that measured levels were below CN criteria and vibration is not required for the subject site. The MECP guidelines

recommend that warning clauses be used to inform future residents of the traffic noise, the presence of nearby commercial facilities and to address the presence of the adjacent railway and roadways.

At the SPA stage and prior to building permit, an acoustical consultant should review the mechanical drawings, mechanical specifications and details of demising constructions, when available, to help ensure that the noise impact of the development on the environment, and of the development on itself, are maintained within acceptable levels.

2 Site Description and Sources of Sound

Figure 1a is a key plan showing the location of the proposed development. Figure 1b shows the key plan showing "Areas" of development. The development is located along various sections of the Millcroft Golf Course in Burlington, Ontario. Figures 2a – 2c are proposed development concept plans (Areas A, B, C, D, E) prepared by Gerrard Design dated October 5, 2020 and indicates the sound level prediction locations. The proposed development will consist of single detached dwellings and a 6-storey condo building along with associated roadways.

A site visit was made by HGC Engineering personnel on January 9 and 18, and October 9, 2019, to make observations of the acoustical environment and to perform ground-borne vibration measurements. During the site visit, it was observed that the CN railway to the northeast, Dundas Street West, and Upper Middle Road are primary sources of noise. Millcroft Park Drive is a secondary source of noise. The development blocks are considered to be Class 1.

Site along Upper Middle Road (Refer to Figure 2a) – Areas A and B

A large berm and acoustic fence totalling approximately 5 m in height is located along the easterly property line between the subject site and the railway right-of-way. To the north and west of the site are existing 2-storey residences. To the southeast of the site and to the east of Upper Middle Road is the Millcroft Professional Centre, as noted on Figure 1a. To the east, southeast and northeast of the site are existing commercial and retail facilities including a Metro and RONA, among others. The loading bays for the Metro are located on the southwest side of the building and are approximately 2 m below the elevation of the railway tracks. The Metro site includes an earth berm and retaining wall. As noted previously, there is a large earth safety berm with an acoustic wall on top between the

subject site and the railway line. There are existing 2-storey residential dwellings at a similar distance from the Metro as the subject site. Sounds from the commercial uses were not audible at the subject site during the site visit, however a noise warning clause is included in Section 5.5 to inform the occupants of the presence of the nearby commercial facilities.

Site along Dundas Street West (Refer to Figure 2b) – Area E

To the northwest of the proposed 6-storey condo building is Norton Park, Haber Recreation Centre, Dr. Frank J. Hayden Secondary School, and Burlington Public Library. Further to the north of the site are existing residential lands. To the south, west, and east of the site are existing residential dwellings. Sounds from the recreation centre were not audible at the site at the time of the site visit, however a warning clause is included in Section 5.5 to inform the occupants of the presence of the nearby institutional facility.

Sites along Millcroft Park Drive or Country Club Drive (Refer to Figure 2c) – Areas C and D

For the sites flanking onto Millcroft Park Drive or Country Club Drive, the surrounding lands are existing residential.

3 Criteria for Acceptable Sound Levels

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are given in the MECP publication NPC-300, "Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning", Part C release date October 21, 2013 and are listed in Table 1 below. The values in Table 1 are energy equivalent (average) sound levels [L_{EQ}] in units of A weighted decibels [dBA].

Table 1: Road and Rail Traffic Noise Criteria

Space	Daytime $L_{EQ(16\ hour)}$ Road / Rail	Nighttime $L_{EQ(8\ hour)}$ Road / Rail
Outdoor Living Areas	55 dBA	--
Inside Living/Dining Rooms	45 dBA / 40 dBA	45 dBA / 40 dBA
Inside Bedrooms	45 dBA / 40 dBA	40 dBA / 35 dBA

Daytime refers to the period between 07:00 and 23:00, while nighttime refers to the period between 23:00 and 07:00. The term "Outdoor Living Area" (OLA) is used in reference to an outdoor patio, a backyard, a terrace or other area where passive recreation is expected to occur. Balconies that are less than 4 m in depth are not considered to be outdoor living areas under MECP guidelines.

The guidelines in the MECP publication allow the sound level in an OLA to be exceeded by up to 5 dBA, without mitigation, if warning clauses are placed in the purchase and rental agreements to the property. Where OLA sound levels exceed 60 dBA, physical mitigation is required to reduce the OLA sound level to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible.

Indoor guidelines are 5 dBA more stringent for rail noise than for road noise, to account for the low frequency (rumbling) character of locomotive sound, and its greater potential to transmit through exterior wall/window assemblies.

A central air conditioning system as an alternative means of ventilation to open windows is required for dwellings where nighttime sound levels at the façade exceed 60 dBA or daytime sound levels at the façade exceed 65 dBA. Forced-air ventilation with ducts sized to accommodate the future installation of air conditioning is required when nighttime sound levels at the façade are in the range of 51 to 60 dBA or when daytime sound levels at the façade are in the range of 56 to 65 dBA.

Building components such as walls, windows and doors must be designed to achieve indoor sound level criteria when the plane of bedroom/living/dining room window sound level is greater than 60 dBA or the daytime sound level is greater than 65 dBA due to road traffic noise and greater than 55 dBA due to nighttime or greater than 60 dBA during the daytime hours due to rail traffic noise.

Railway guidelines recommend brick exterior walls from foundation to rafters as a minimum construction for any dwellings with a 24 hour L_{EQ} that is greater than 60 dBA, and which are within 100 m of the right of way of the railway.

The railways also provide minimum requirements for safety as well as sound and vibration for proposed residential developments located adjacent to their rights-of-way. These refer to minimum required setbacks, berms, fencing and warning clauses. The reader is referred to a copy of CN

requirements for a new development adjacent to a principal main rail line, which is located in Appendix A.

3.1 Ground-borne Vibration from Rail Traffic

MECP and CN guidelines require measurements of ground-borne vibration when dwelling units are to be located within 75 metres of a principal mainline such as the CN Halton Subdivision. Vibration is typically measured in terms of oscillatory velocity or acceleration. The CN vibration guidelines are given in terms of ground-borne velocity. In this report, vibration levels are quoted in terms of RMS velocity levels (L_V) in units of decibels [dB] relative to 1 mm/s (i.e., 1 mm/s = 0 dB). The CN guideline limit is 0.14 mm/s, which is equivalent to -17 dB re 1 mm/s. For ease of reference, in this report the CN limit of -17 dB re 1 mm/s is identified on velocity plots in this report. These plots are provided in Figures 4 to 8.

4 Traffic Sound Level Assessment

4.1 Road Traffic Data

Road traffic data for Upper Middle Road was obtained from the Region of Halton. The data is provided as ultimate annual average daily traffic (AADT) and is provided in Appendix B. A commercial vehicle percentage for Upper Middle Road of 4% was provided and split into 2% medium trucks and 2% heavy trucks. A day/night split of 85%/15% was used in the analysis. A posted speed limit of 60 km/h was used for Upper Middle Road.

Road traffic data for Dundas Street West was obtained from the Region of Halton. The data is provided as ultimate annual average daily traffic (AADT) and is provided in Appendix B. A commercial vehicle percentage for Dundas Street West of 3.1% was provided and split into 1.7% medium trucks and 1.4% heavy trucks. A day/night split of 90%/10% was used in the analysis. A posted speed limit of 60 km/h was used for Dundas Street West.

Road traffic data for Millcroft Park Drive was obtained from the City of Burlington. The data is provided as annual average daily traffic (AADT) for 2016 and is provided in Appendix B. A commercial vehicle percentage for Millcroft Park Drive of 3.0% was provided and split into 3.0% medium trucks and 0.0% heavy trucks. A day/night split of 90%/10% was used in the analysis along

with a growth rate of 2.5%. A speed limit of 50 km/h was used for Millcroft Park Drive. Table 2 provides the projected road traffic data to the year 2030 used in the analysis.

Table 2: Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Upper Middle Road *Ultimate*	Daytime	26 928	562	562	28 052
	Nighttime	4 752	98	98	4 948
	Total	**31 680**	**660**	**660**	**33 000**
Dundas Street West *Ultimate*	Daytime	47 966	841	693	49 500
	Nighttime	5 330	93	77	5 500
	Total	**53 296**	**934**	**770**	**55 000**
Millcroft Park Drive *2030 Projected*	Daytime	6 039	187	0	6 226
	Nighttime	671	21	0	692
	Total	**6 710**	**208**	**0**	**6 918**

4.2 Rail Traffic Data

Rail traffic data for typical operations of the CN Halton Subdivision was obtained from CN personnel and is included in Appendix C. The Halton Subdivision is used for freight and way freight operations. The railway is a principal mainline and is a continuously welded line. The maximum train speed of 80 kph (50 mph) for freight and way freight trains was used in the analysis. In conformance with CN assessment requirements, these maximum speeds, number of cars and maximum locomotives per train were used in the traffic noise analysis to yield a worst case estimate of train noise. The data was projected to the year 2030 using a 2.5% per year growth rate. Table 3 summarises the rail traffic data used in the analysis.

Table 3: Rail Traffic Data Projected to the Year 2030

Type of Train	Number of Trains Day/ Night	Number of locomotives	Number of cars	Max Speed (KPH)
Freight	13.1 / 5.2	4	140	80
Way Freight	2.6 / 0.0	4	25	80

4.3 Road and Rail Traffic Noise Predictions

To assess the levels of road and rail traffic noise which will impact the site in the future, predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. Sample STAMSON output is included in Appendix D.

Predictions of the traffic sound levels were made at various locations around the development. The results of these predictions are summarized in Tables 4 and 5. The acoustic requirements are subject to modifications if the site plans are changed significantly and when further details are available for Area E.

Sound levels were predicted in the plane of the top floor windows during the daytime and nighttime hours to investigate ventilation and building façade construction requirements.

Table 4: Future Daytime Traffic Sound Levels, Without Mitigation [dBA]

Area	Prediction Location	Description	Daytime – at Façade ($L_{EQ-16hr}$)		Daytime – at Façade Total ($L_{EQ-16hr}$)	Daytime – at OLA Total ($L_{EQ-16hr}$)
			Road	Rail		
A	[1]	Lot with exposure to railway and Upper Middle Road	65	64	67	67
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	67	60	68	68
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	63	<55	64	63
B	[4]	Lot with backing exposure to railway	<55	65	65	58
B	[5]	Lot with some exposure to railway	<55	57	57	55
B	[6]	Lot with some exposure to railway	<55	55	55	<55
B	[7]	Lot with flanking exposure to Millcroft Park Drive	59	<55	59	57
C	[9]	Interior dwellings	<55	<55	<55	<55
E	[10]	6-storey condo with exposure to Dundas Street West, 6th floor	70	<55	70	--
		6-storey condo with exposure to Dundas Street West, 1st floor	70	<55	70	--
		6-storey condo, east/west façade with some exposure to Dundas Street West, 6th floor	66	<55	66	--
		6-storey condo, east/west façade with some exposure to Dundas Street West, 1st floor	66	<55	66	--
		6-storey condo, south façade, 6th floor	<55	<55	<55	--
		6-storey condo, south façade, 1st floor	<55	<55	<55	--
		Potential OLA to east, ground level	--	--	--	68
		Potential OLA to south of building, ground level	--	--	--	55
		Potential OLA on roof+	--	--	--	55
D	[8]	Lot with flanking exposure to Millcroft Park Drive	60	<55	60	57

Note: + including a minimum 1.07 m solid parapet

Table 5: Future Nighttime Traffic Sound Levels, Without Mitigation [dBA]

Area	Prediction Location	Description	Nighttime – at Façade (L_{EQ-8hr})		Nighttime – at Façade Total (L_{EQ-8hr})
			Road	Rail	
A	[1]	Lot with exposure to railway and Upper Middle Road	60	62	65
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	63	59	64
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	59	51	59
B	[4]	Lot with backing exposure to railway	<50	64	64
B	[5]	Lot with some exposure to railway	<50	56	56
B	[6]	Lot with some exposure to railway	<50	53	53
B	[7]	Lot with flanking exposure to Millcroft Park Drive	52	<50	52
C	[9]	Interior dwellings	<50	<50	<50
E	[10]	6-storey condo with exposure to Dundas Street West	63	<50	63
		6-storey condo with exposure to Dundas Street West, 1st floor	63	<50	63
		6-storey condo, east/west façade with some exposure to Dundas Street West, 6th floor	59	<50	59
		6-storey condo, east/west façade with some exposure to Dundas Street West, 1st floor	59	<50	59
		6-storey condo, south façade, 6th floor	<50	<50	<50
		6-storey condo, south façade, 1st floor	<50	<50	<50
		Potential OLA to east, ground level	--	--	--
		Potential OLA to south of building, ground level	--	--	--
		Potential OLA on roof+	--	--	--
D	[8]	Lot with flanking exposure to Millcroft Park Drive	53	<50	53

Note: + including a minimum 1.07 m solid parapet

5 Traffic Noise Recommendations

The predictions indicate that the future road and rail traffic sound levels will exceed MECP guidelines in the proposed development. Recommendations to address these excesses are discussed below.

5.1 Outdoor Living Areas

There is an existing safety berm located between the portion of the proposed site near, Upper Middle Road, and the railway right-of-way with an acoustic fence on top. The height of the berm and fence combination is approximately 5 m.

Dwellings with backing exposure to railway

The predicted sound level at prediction location [1], with backing exposure to the railway and Upper Middle Road, will be 12 dBA in excess of the MECP's limit of 55 dBA. Physical mitigation in the form of an acoustic barrier is required. An acoustic barrier 5.8 m in height would reduce sound levels to 55 dBA. Alternatively, a 3.5 m acoustic barrier will reduce the sound level to 59 dBA. The 4 dBA sound level excess is acceptable to the MECP with the use of a noise warning clause in the property and tenancy agreements.

The predicted sound level, at prediction location [2], with backing exposure to the railway and Upper Middle Road, will be 13 dBA in excess of the MECP's limit of 55 dBA. Physical mitigation in the form of an acoustic barrier is required. An acoustic barrier 4.8 m in height would reduce sound levels to 55 dBA. An acoustic barrier 3.5 m in height would reduce sound levels to 58 dBA. The 3 dBA sound level excess is acceptable to the MECP with the use of a noise warning clause in the property and tenancy agreements, if it is acceptable to the municipality.

The predicted sound level in the remaining lots with backing/flanking exposure to the railway will be 55 dBA or less. No further mitigation is required as the existing berm and acoustic fence provide sufficient mitigation.

Dwellings with backing exposure to Upper Middle Road

The predicted sound level, at prediction location [3], with exposure to Upper Middle Road, will be up to 8 dBA in excess of the MECP's limit of 55 dBA. Physical mitigation in the form of an acoustic barrier is required. An acoustic barrier 3.2 m in height would reduce sound levels to 55 dBA.

Dwellings flanking onto Millcroft Park Drive

The predicted sound level in the lots with flanking exposure (prediction locations [7] and [8]) to Millcroft Park Drive will be 57 dBA, 2 dBA in excess of the MECP's limit of 55 dBA. The 2 dBA sound level excess is acceptable to the MECP with the use of a noise warning clause in the property and tenancy agreements, if it is acceptable to the municipality. Alternatively, a 2 m high acoustic barrier would reduce sound levels in the OLA to less than 55 dBA.

A prediction location is included for "the top area on Figure 2c" [9]. The location is far from the major roadways (Dundas, Millcroft, Upper Middle Road) with significant traffic. The closest proposed residential lot is approximately 65 m from Berwick Drive with one row of existing dwellings. Berwick Drive is a low volume residential road and does not have significant traffic volumes. The sound levels at the additional prediction location is expected to be <55 dBA during the daytime hours and <50 dBA during the nighttime hours.

6-storey Condo near Dundas Street West

Balconies may be provided for each dwelling unit in the proposed 6-storey condo building. Balconies and patios that are less than 4 m in depth and are not considered to be OLAs and therefore a traffic noise assessment is not required.

The site plan does not indicate an OLA location for the 6-storey building. As requested by the City, additional noise predictions for potential OLAs have been assessed.

A potential OLA to east of the 6-storey building at ground level is predicted to have a sound level of 68 dBA, 13 dBA in excess of the MECP's noise limit of 55 dBA. Phsyical mitigation in the form of

an acoustic barrier would be required for an OLA in this location. Table 6 indicates preliminary acoustic barrier heights to shield this potential OLA.

A potential OLA to south of building at ground level is predicted to have a sound level of 55 dBA since the building itself provides shielding. Further physical mitigation is not required.

A potential OLA on roof with a minimum 1.07 m high solid parapet is predicted to have a sound level of 55 dBA. Further physical mitigation is not required.

When the OLA locations are known for the 6-storey building, an acoustical consultant shall review the sound levels and provide acoustic mitigation, as necessary.

Further Review

When siting and grading information is available, the acoustic barrier requirements should be refined. As a general note, acoustic barriers can be any combination of an earth berm with an acoustic wall on top. All noise barriers must return back to the dwelling units so that the rear yards are entirely shielded from the roadway and/or railway. The wall component of the barrier should be of a solid construction with a surface density of no less than 20 kg/m^2. The walls may be constructed from a variety of materials such as wood, brick, pre-cast concrete or other concrete/wood composite systems provided that it is free of gaps or cracks within or below its extent.

Figure 3 shows the location of the required acoustic barriers. Table 6 below includes barrier heights to achieve various sound levels.

Table 6: Summary of Barrier Heights Required to Various Sound Levels, dBA

Area	Prediction Location	Description	Barrier Height (m)				
			55	56	57	58	59
A	[1]	Lot with exposure to railway and Upper Middle Road	5.8	4.9	4.3	3.8	3.3
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	4.8	4.3	3.9	3.5	3.2
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	3.2	2.7	2.3	2.0	--
B	[4]	Lot with backing exposure to railway	--	--	--	--	--
B	[5]	Lot with some exposure to railway	--	--	--	--	--
B	[6]	Lot with some exposure to railway	--	--	--	--	--
B	[7]	Lot with flanking exposure to Millcroft Park Drive	2.0	--	--	--	--
C	[9]	Interior dwellings	--	--	--	--	--
E	[10]	Potential OLA to east, ground level	3.6	3.3	3.0	2.7	2.5
		Potential OLA to south of building, ground level	--	--	--	--	--
		Potential OLA on roof+	1.07	1.07	1.07	1.07	1.07
D	[9]	Lot with flanking exposure to Millcroft Park Drive	2.0	--	--	--	--

Note: The above barrier heights should be refined based on the dwelling siting information and lot grading information.

5.2 Indoor Living Areas

Air Conditioning

The predicted nighttime sound levels at the façade of the future dwellings with exposure to the railway and major roadway (prediction locations [1], [2], [4], and [10]) will be greater than 60 dBA and greater than 65 dBA during the daytime hours. To address these excesses, the MECP guidelines recommend that these dwellings be equipped with central air conditioning systems, so that the windows can be closed.

Provision for the Future Installation of Air Conditioning

The predicted sound levels at the façade of the future dwellings further from the CN railway or roadways (prediction locations [3], [5], [6], [7], and [8]) will be between 51 and 60 dBA during the

nighttime hours and between 56 to 65 dBA during the daytime hours. To address these excesses, the MECP guidelines recommend that these dwelling units be equipped with a forced air ventilation system with ducts sized to accommodate the future installation of air conditioning by the occupant. The guidelines also recommend warning clauses for these lots. Window or through-the-wall air conditioning units are not recommended for any residential units because of the noise they produce and because the units penetrate through the exterior wall which degrades the overall noise insulating properties of the envelope. The location, installation and sound ratings of the outdoor air conditioning devices should minimize noise impacts and comply with criteria of MECP publication NPC-300, as applicable.

These ventilation requirements are shown in Figures 3a – 3c.

5.3 Building Façade Constructions

Future rail traffic sound levels in the proposed development will exceed 55 dBA at night and 60 dBA during the daytime, due to rail noise, at the dwellings closest to the railway. MECP guidelines recommend that the windows, walls and doors be designed so that the indoor sound levels comply with MECP noise criteria.

The required building components are selected based on the AIF value for road and rail traffic. To do so, calculations were performed to determine the acoustical insulation factors to maintain indoor sound levels within MECP guidelines. The calculation methods were developed by the National Research Council (NRC). They are based on the predicted future sound levels at the building facades, and the anticipated area ratios of the facade components (walls and windows) and the floor area of the adjacent room.

a) Future Dwellings with direct exposure to railway

Exterior Wall Construction

CN guidelines recommend brick or masonry exterior walls from foundation to rafters as a minimum construction for any dwellings that are in the first row of dwellings with exposure to the CN rail line.

Glazing Construction

The minimum necessary specification for the building envelope is Acoustical Insulation Factor, AIF-32 for bedrooms and AIF-29 for living/dining/family rooms, based on the possibility of sound entering the buildings through the windows only, since the first row of dwelling units from the railway must be constructed of brick from foundation to rafters. Upgraded glazing requirements will be required. If patio doors are to be used in the dwellings, they must be included in the window area.

Detailed floor plans and building elevations were not available at the time of this report, window to floor area ratios of 50% (40% fixed, 10% operable) for living/dining rooms and 40% (30% fixed, 10% operable) for bedrooms were assumed to determine appropriate preliminary glazing requirements. The results are shown in Table 7 below assuming sound entering through windows only.

Table 7: Preliminary Minimum Glazing Requirements

Area	Prediction Location	Space	Minimum STC Requirement for Glazing
A	[1]	Living/Dining Rooms	*STC-32
		Bedrooms	*STC-33
A	[2]	Living/Dining Rooms	*STC-30
		Bedrooms	*STC-32
A	[3]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[4]	Living/Dining Rooms	*STC-31
		Bedrooms	*STC-34
B	[5]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[6]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[7]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
C	[9]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
E	[10] North	Living/Dining Rooms	+STC-33
		Bedrooms	+STC-31
E	[10] East/West/ South	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
D	[9]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC

Note: *Sound through windows only
+Sound through windows and walls
When detailed floor plans and building elevations are available, the glazing requirements should be refined.

Further Review

When the detailed floor plans and elevations of the dwellings are available for the proposed dwellings at prediction locations [1], [2], [4], and [10], an acoustical consultant should provide revised acoustical recommendations for the glazing constructions based on actual window to floor area ratios and should verify brick exterior wall construction.

5.4 Rail Vibration Impact

Measurements were performed on the site at grade, at approximately 30 m from the railway right-of-way. The measurement location is identified on Figure 2a as [M1]. The results of the measurements are presented in Figures 4 to 8. Table 8 shows the maximum vibration level measurements during each of the train pass-bys.

Table 8: Maximum RMS Vibration Velocity Measurements of Train Pass-bys at 30 m from Right-of-Way at [M1]

Train Pass-by	Type of Train	Measured Level (mm/s)	Criteria (mm/s)
1	Freight	0.01	0.14
2	Freight	0.01	0.14
3	Freight	0.01	0.14
4	Freight	0.01	0.14
5	Freight	0.02	0.14

The results indicate that the ground-borne vibration levels are below criteria. Vibration mitigation measures are not recommended for the development.

5.5 Warning Clauses

The MECP guidelines recommend that warning clauses be included in the property and tenancy agreements and offers of purchase and sale for all lots with anticipated traffic sound level excesses. Examples are provided below.

Suggested wording for dwellings with sound level excesses the MECP criteria is given below:

Type 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 and rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suggested wording for future dwelling units with daytime OLA sound levels exceeding the MECP criteria by 6 dB or more, for which physical mitigation has been provided is given below.

Type B:

> Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road and rail traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment, Conservation and Parks' noise criteria. The acoustical barrier as installed shall be maintained, repaired or replaced by the owner. Any maintenance, repair or replacement shall be with the same material, to the same standards and having the same colour and appearance of the original.

Suitable wording for future dwellings requiring central air conditioning systems is given below.

Type C:

> 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 noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks.

Suitable wording for future dwellings requiring forced air ventilation systems is given below.

Type D:

> This dwelling unit has been fitted with a forced air heating system and the ducting etc., was sized to accommodate central air conditioning. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the noise criteria of the Municipality and the Ministry of the Environment, Conservation and Parks. (Note: The location and installation of the outdoor air conditioning device should be done so as to minimize the noise impacts and comply with criteria of MECP publication NPC-300, as applicable.)

Suitable wording for dwellings for lots near commercial/institutional facilities is given below.

Type E:

> Purchasers are advised that due to the proximity of the adjacent commercial/institutional facilities, sound levels from these facilities may at times be audible.

Suggested wording by the City of Burlington for private terraces/balconies less than 4 m in depth is given below:

Type F:

> Purchasers/tenants are advised that the private terraces of each unit are less than 4.0 m deep and therefore are not required to have mitigation measures installed for noise as per the Ministry of the Environment Conservation and Parks NPC-300. Sound levels due to road/train traffic, increasing road/train traffic and not mitigation measures may interfere with some activities of the dwelling occupants use of their private terrace.

These sample clauses are provided by the MECP as examples and can be modified by the Municipality as required.

CN requires a standard warning clause as this development is located near a principal mainline. The following sample clause is typical of those included in agreements of purchase and sale or lease on the Lands for all lots in the development.

Type G:

> Warning: Purchasers or tenants are to be advised that Canadian National Railway or its successors or assigns, have an operating right-of-way within 300 metres from the land subject hereof and there may be alterations to the right-of-way including the possibility that the Railway may expand its operations, which expansion may affect the living environment of the residents notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the subdivision and individual units, and that the Railway will not be responsible for complaints or claims arising from use of its facilities and/or operations.

6 Impact of the Proposed Development on Itself

Section 5.9.1 of the Ontario Building Code (OBC) specifies the minimum required sound insulation characteristics for demising partitions, in terms of Sound Transmission Class (STC) values. In order to maintain adequate acoustical privacy between separate suites in a multi-tenant building, inter-suite walls should meet or exceed STC-50. Walls separating a suite from a noisy space such as a refuse chute, or elevator shaft, should meet or exceed STC-55. In addition, it is recommended that the floor/ceiling constructions separating suites from any amenity or commercial 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.

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 of the buildings 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.

7 Impact of the Proposed Development on the Environment

Sound levels from noise sources 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. Based on the levels observed during our site visit, the typical minimum ambient sound levels in the area are expected to be 50 dBA or more during the day and 45 dBA or more at night. Thus, any electro-mechanical equipment associated with this development (e.g. emergency generator testing, fresh-air handling equipment, etc.) should be designed such that they do not result in noise impact beyond these ranges.

At the time of this study, the design of the proposed 6-storey building was in its initial stages, and the mechanical systems had not yet been developed. As a note, the City typical requires neoprene/rubber gaskets or alternative measures for any grates located on the driveways that are in a vehicle's path.

The City in their comments dated November 6, 2020 is correct in noting that the details of the mechanical equipment and underground parking/venting are not yet available. These will be reviewed at the SPA stage when the details are available. At this point, the site plan does not indicate any vents. It is likely that the majority of rooftop mechanical equipment will be housed in a mechanical penthouse on the roof of the proposed 6-storey building. Any rooftop equipment not housed in the penthouse will be assessed and sufficiently shielded from neighbouring residences, as needed. It is noted that the residences (sensitive receptors) in the area are all 2-storeys in height. In HGC Engineering's experience, the roof edge and height of the proposed 6-storey building will sufficiently shield any rooftop equipment that is not housed inside the penthouse. These will be

verified at the detailed stage.

It is also HGC Engineering's experience with numerous developments, that typical HVAC equipment and parking garage exhaust fans can meet the applicable MECP noise criteria at neighbouring residential uses, either with low noise emission fans or relocation of the fans or through mitigation in the form of duct silencers or acoustic lining. Prior to building permit, an acoustical consultant should review the mechanical drawings and details of potential exhaust vents/fans, when available, to help ensure that the noise impact of the development on the environment, and of the development on itself, are maintained within acceptable levels. This is typically completed at the detailed noise study stage, at SPA.

8 Summary and Recommendations

The results of the study indicate that the proposed residential development is feasible. Future road and rail traffic sound levels will exceed MECP and CN guidelines, but feasible means exist to reduce the impact to within acceptable limits.

The following list, Table 9 and Figures 3a – 3c summarize the recommendations made in this report.

1. Acoustic barriers are required for dwellings closest to the railway and Upper Middle Road.

2. Central air conditioning is required for dwellings closest to the railway, Upper Middle Road, or Dundas Street West. Forced air ventilation with ducts sized for the future installation of air conditioning by the occupant is required for dwellings further from the railway or with exposure to the roadways.

3. Brick or masonry exterior wall construction is required for façades of the proposed dwellings in the first row from the railway. Upgraded building and glazing constructions are required for the dwellings with exposure to the CN railway. When the detailed floor plans and building elevations of the dwellings with exposure to the railway are available, an acoustical consultant should provide revised acoustical recommendations and verify brick exterior wall construction.

4. Noise warning clauses are required for dwellings in the proposed development with noise excesses and/or within 300 m from the railway line.

5. A detailed noise study should be performed when siting/grading information, detailed floor plans and building elevations are available for the building in Area E as part of an SPA application.

6. Tarion Builder's Bulletin B19R requires that the internal design of condominium projects integrates 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 of the buildings 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 are maintained within acceptable levels. Outdoor sound emissions should also be checked to ensure compliance with the City's by-law.

Table 9: Summary of Noise Control Requirements and Warning Clauses

Area	Prediction Location	Acoustic Barrier	Ventilation Requirements	Type of Warning Clause	Acoustical Insulation Factor+	Brick Exterior Façade
A	[1]	✓	Central A/C	B, C, E, G	LRDR: AIF-27 BR: AIF-30	✓
A	[2]	✓	Central A/C	B, C, E, G	LRDR: AIF-26 BR: AIF-29	✓
A	[3]	✓	Forced Air	A, D, E, G	LRDR: OBC BR: OBC	--
B	[4]	--	Central A/C	A, C, E, G	LRDR: AIF-28 BR: AIF-31	✓
B	[5]	--	Central A/C	A, C, E, G	LRDR: OBC BR: AIF-27	--
B	[6]	--	Forced Air	A, D, E, G	LRDR: OBC BR: OBC	--
B	[7]	✓	Forced Air	A, D	LRDR: OBC BR: OBC	--
C	[8]	✓	Forced Air	A, D	LRDR: OBC BR: OBC	--
E	[10]	--	Central A/C	A, C, F	LRDR: AIF-30 BR: AIF-28	--
D	[9]	--	--	--	--	--

Notes:
-- no specific requirement
The location, installation and sound rating of the air conditioning condensers must be compliant with MECP Guideline NPC-300, as applicable.
Windows, walls and doors to be specified to meet these minimum AIF requirements.
+When detailed floor plans and building elevations are available, the constructions should be refined based on actual window to floor area ratios
LRDR – Living Room/Dining Room
BR – Bedroom
OBC – Ontario Building Code

The reader is referred to previous sections of this report where the recommendations are discussed in more detail.

8.1 Implementation

To ensure that the noise control recommendations outlined above are fully implemented, it is recommended that:

1) A detailed noise study is required for the lots with exposure to the railway line to ensure appropriate wall and glazing constructions as per the recommendations in the noise report.

2) Prior to SPA and an application for a building permit, the Municipality's Building Department or a Professional Engineer qualified to provide acoustical engineering services in Ontario shall review the unit plans (floor plans and building elevations) for future dwellings on lots directly to ensure that the windows and building constructions are adequately designed to ensure acceptable indoor noise levels.

3) Prior to assumption for this development, the Municipality's building inspector or a Professional Engineer qualified to provide acoustical engineering services in the Province of Ontario to shall certify that the noise control measures for the dwellings units have been properly incorporated, installed, and constructed.



Figure 1a - Key Plan



Figure 1b - Key Plan Showing "Areas" of Development

Otherwise Noted.
From Various Sources And Is Approximate.
• Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
• Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT

PROJECT 1516
DATE OCT 5, 2020
SCALE NTS



Figure 2a - Proposed Development Concept Plan Showing Prediction Locations

- All Units In Metric Unless Otherwise Noted.
- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS A & B

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:2000

SK-53A&B

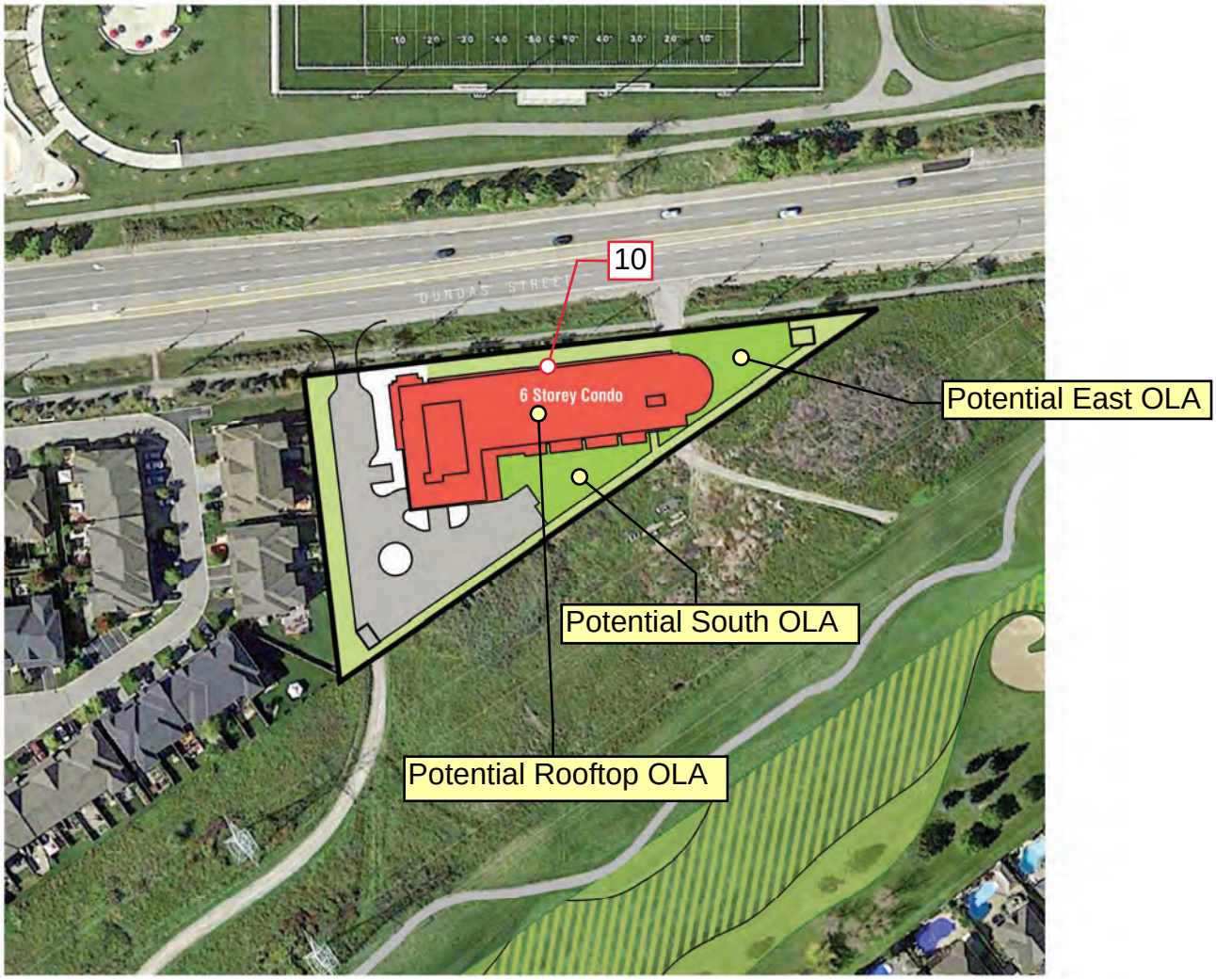


Figure 2b - Proposed Development Concept Plan Showing Prediction Locations

- All Units In Metric Unless Otherwise Noted.
- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREA 'E'

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:1250

SK-53E





Figure 2c - Proposed Development Concept Plan Showing Prediction Locations

- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS C & D

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:1250

SK-53C&D

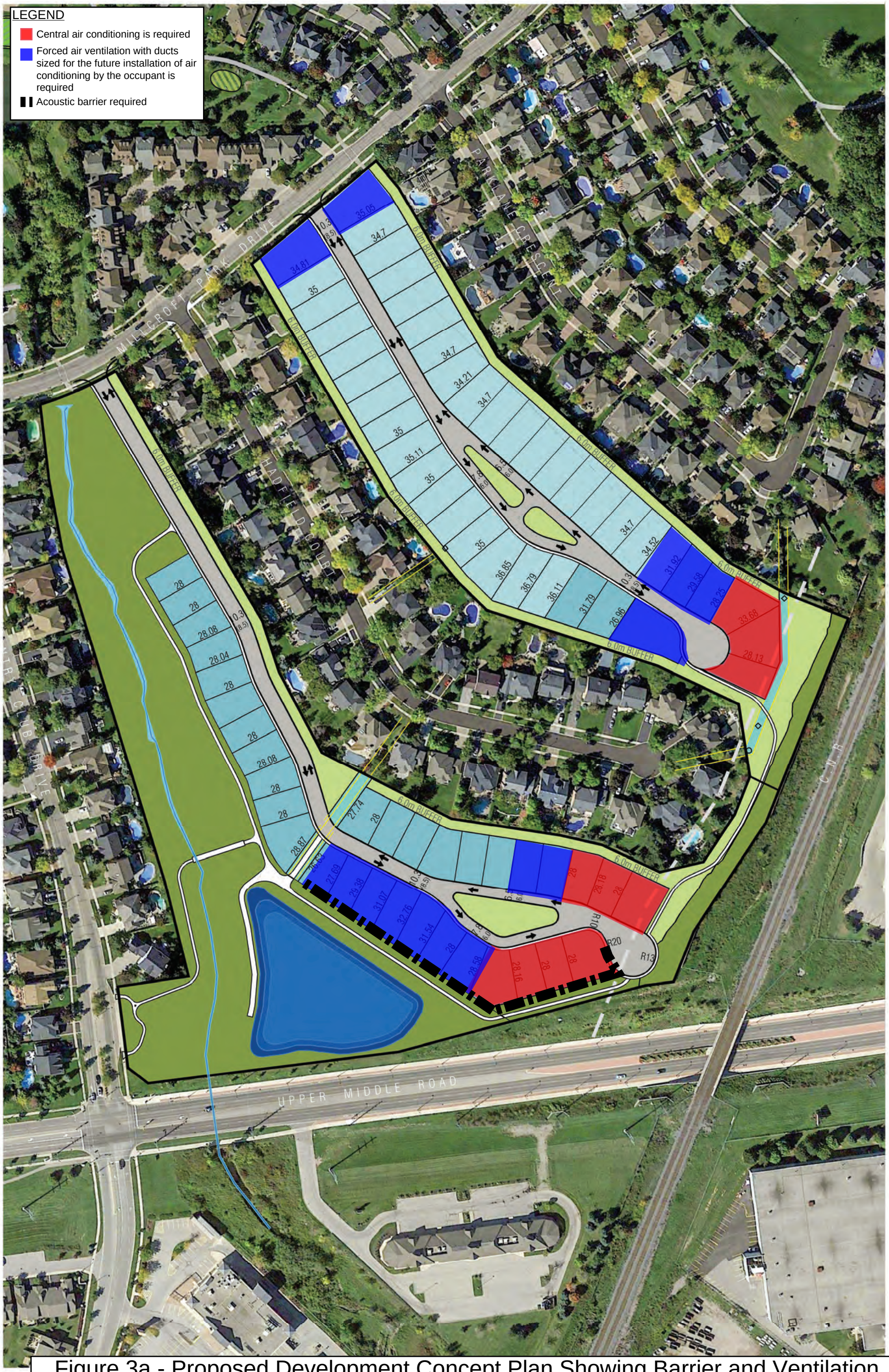


Figure 3a - Proposed Development Concept Plan Showing Barrier and Ventilation Requirements

- Schedule / Plan information is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS A & B

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:2000

SK-53A&B



Figure 3b - Proposed Development Concept Plan Showing Prediction Locations

- All Units In Metric Unless Otherwise Noted.
- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

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Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREA 'E'

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:1250

SK-53E



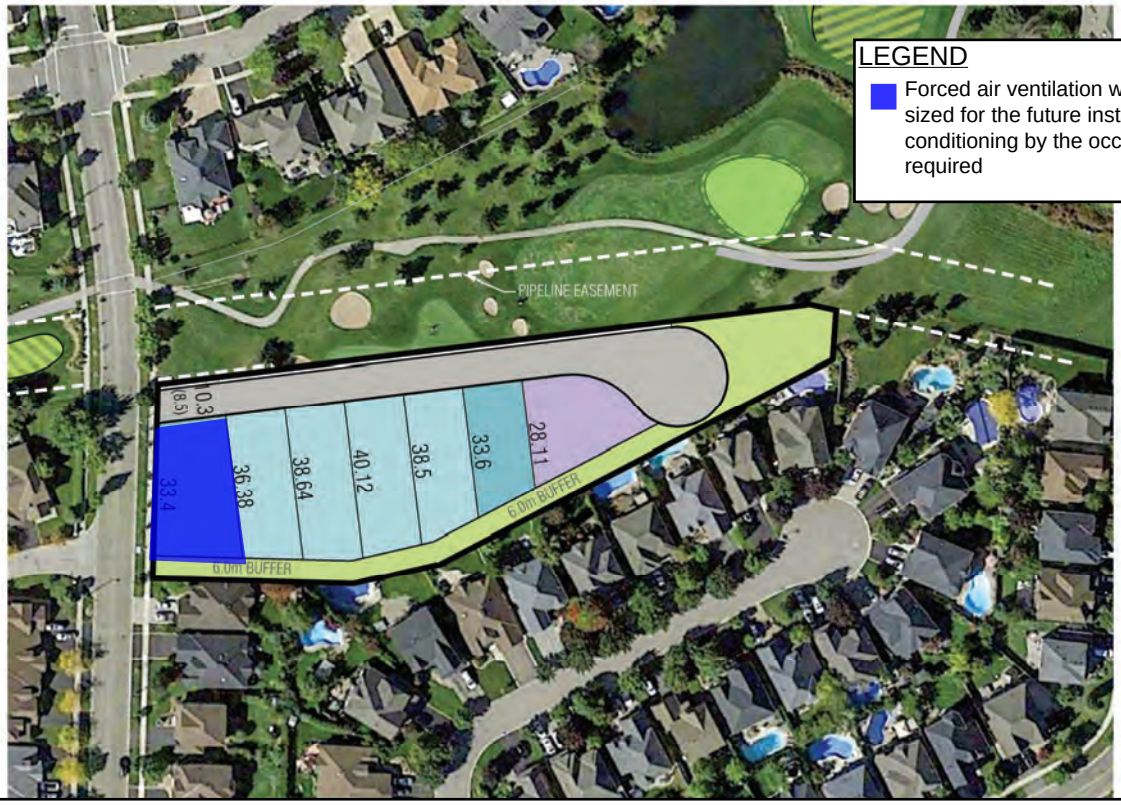


Figure 3c - Proposed Development Concept Plan Showing Prediction Locations

- Base Information Obtained From Various Sources And Is Approximate.
- Schedule / Plan Information Is Conceptual And Requires Verification by Appropriate Agency.
- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS C & D

PROJECT 1516
DATE OCT 5, 2020
SCALE 1:1250

SK-53C&D

Figure 4a: Pass-by 1
Measured Vibratory Velocity Level

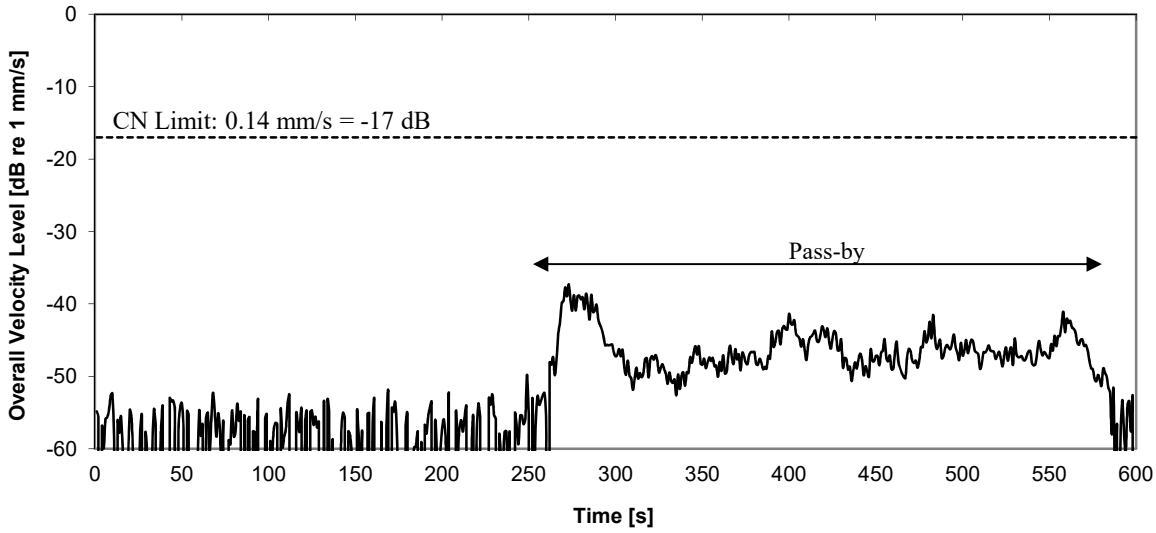


Figure 4b: Pass-by 1
Acceleration Spectrum @ Peak Level (1 sec. Duration)

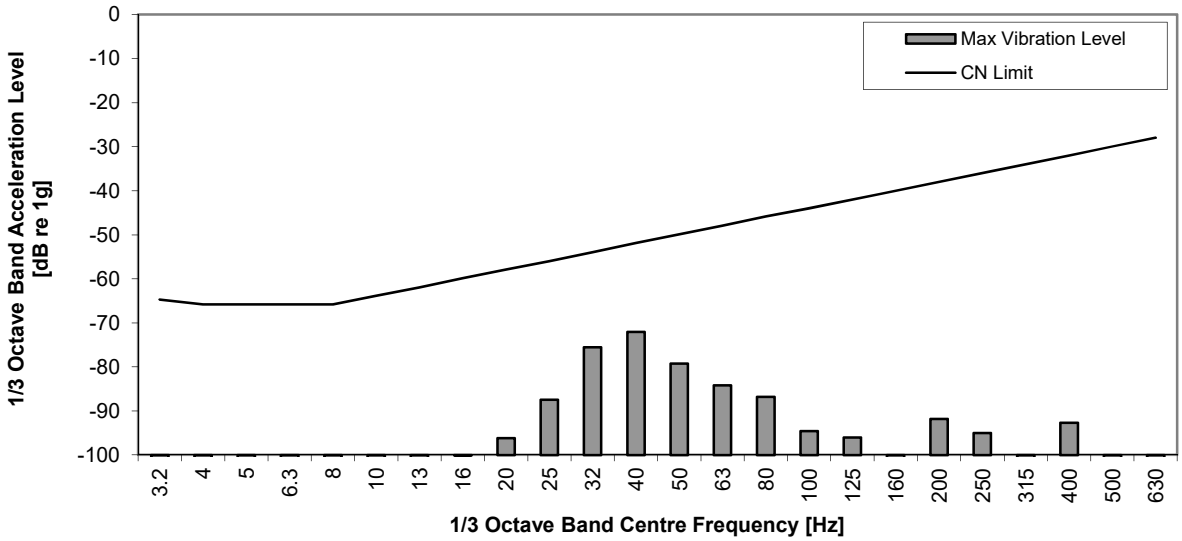


Figure 5a: Pass-by 2
Measured Vibratory Velocity Level

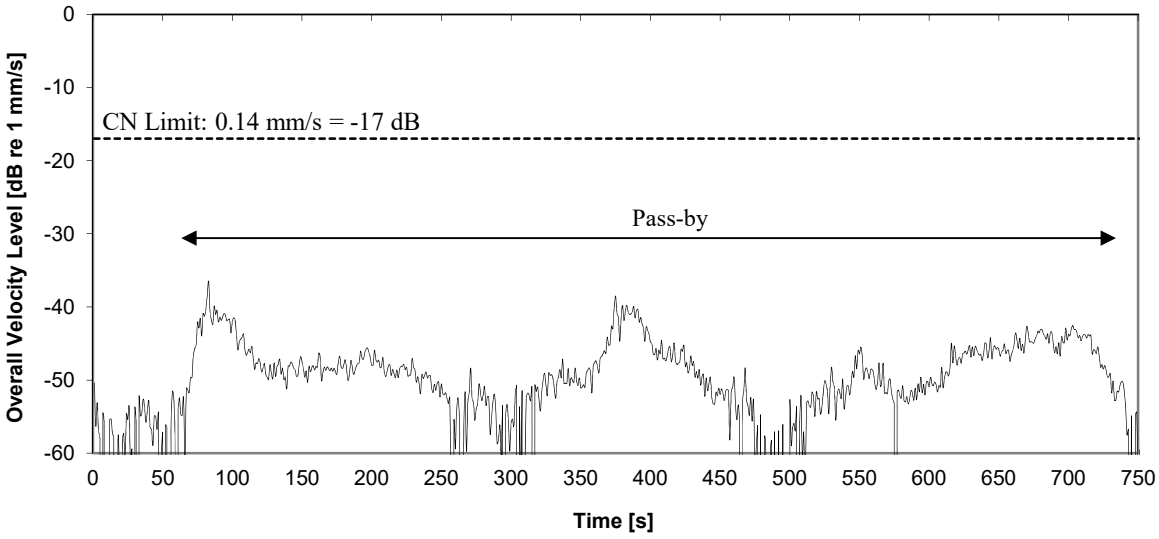


Figure 5b: Pass-by 2
Acceleration Spectrum @ Peak Level (1 sec. Duration)

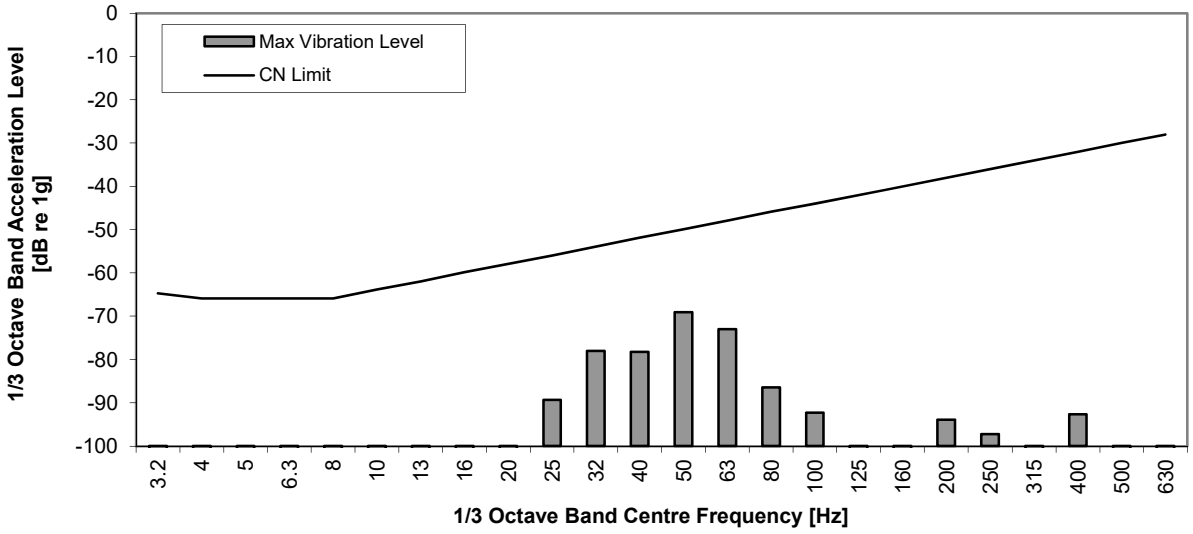


Figure 6a: Pass-by 3
Measured Vibratory Velocity Level

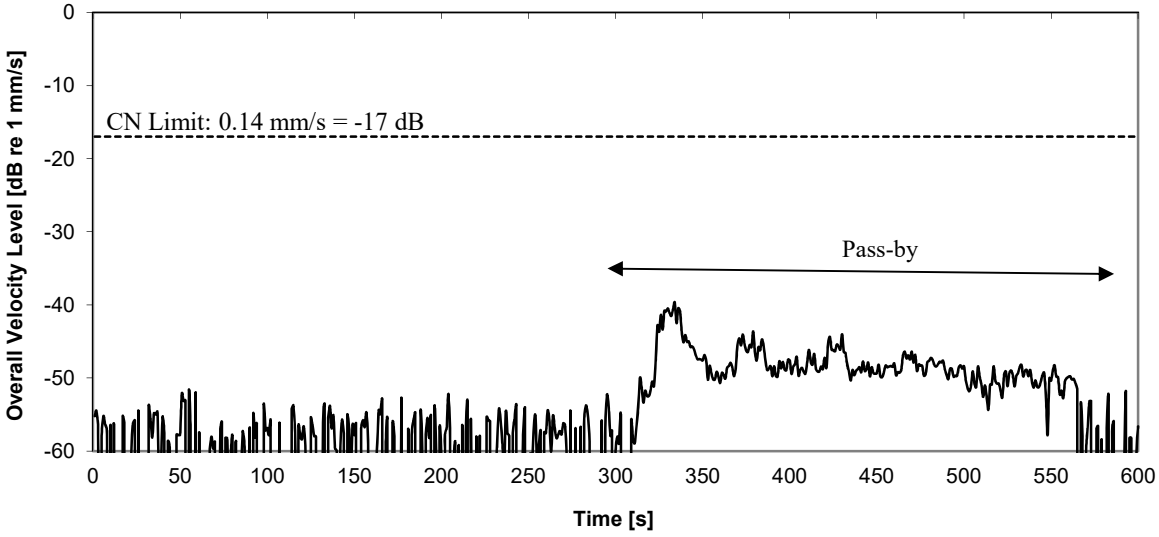


Figure 6b: Pass-by 3
Acceleration Spectrum @ Peak Level (1 sec. Duration)

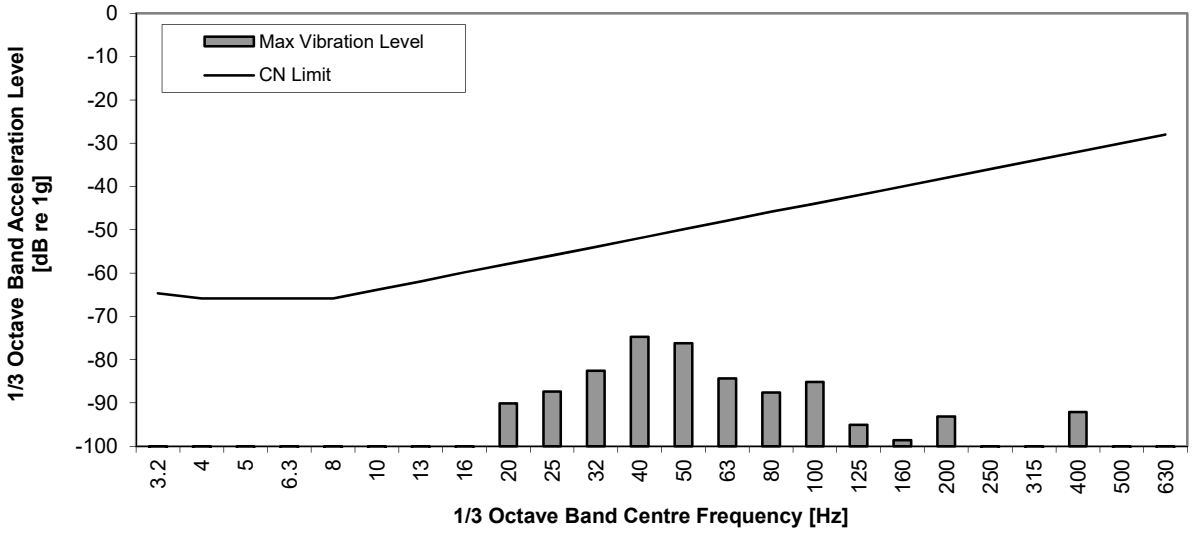


Figure 7a: Pass-by 4
Measured Vibratory Velocity Level

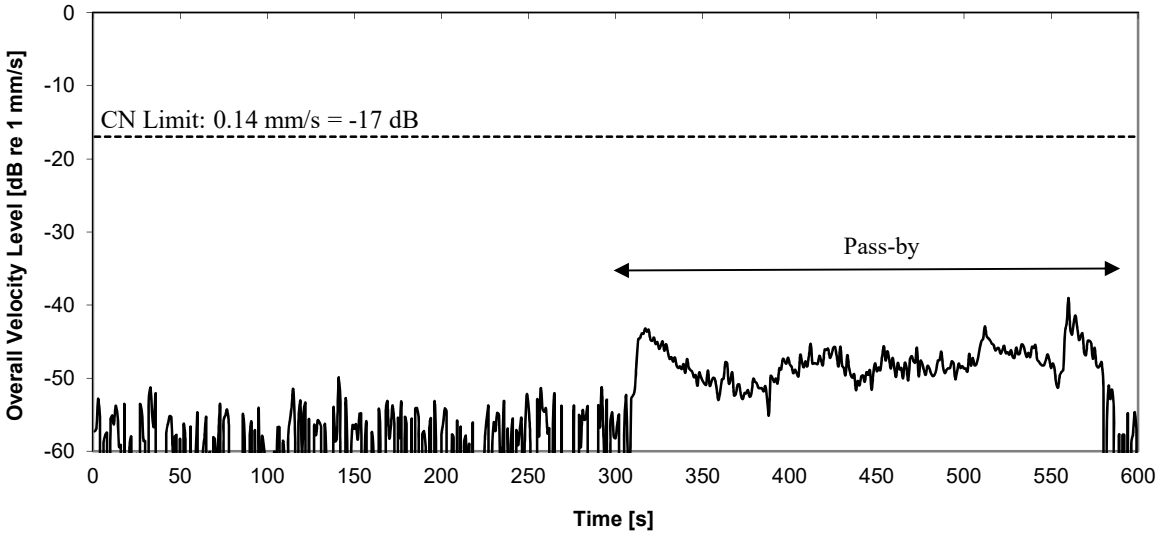


Figure 7b: Pass-by 4
Acceleration Spectrum @ Peak Level (1 sec. Duration)

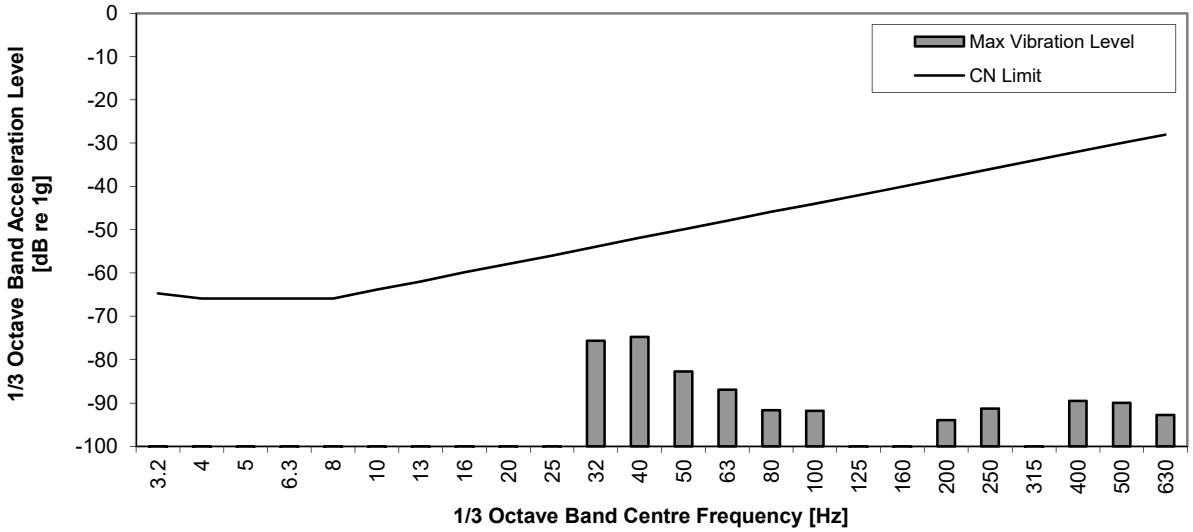


Figure 8a: Pass-by 5
Measured Vibratory Velocity Level

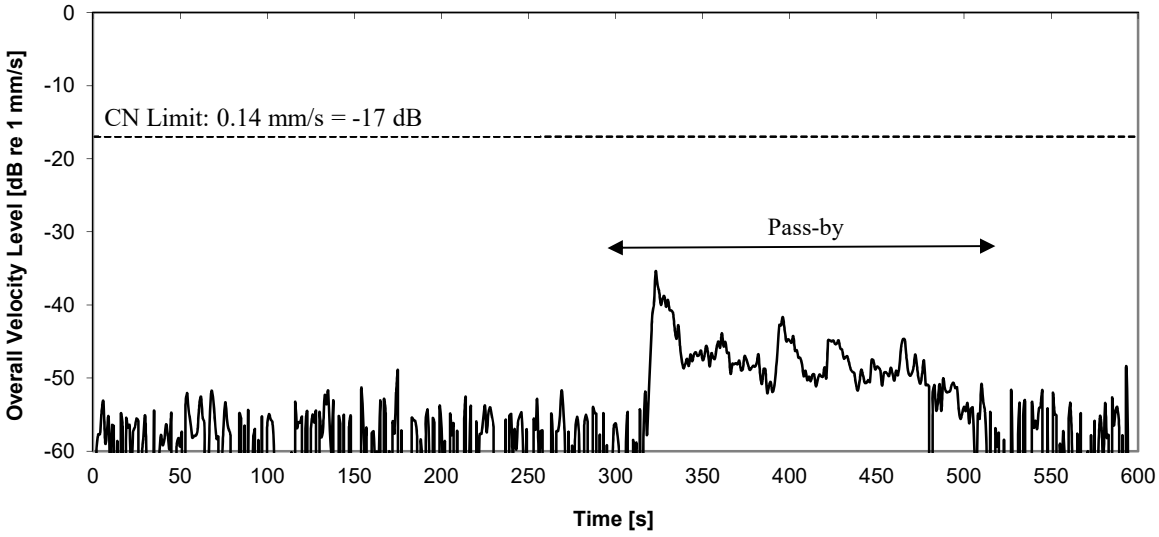
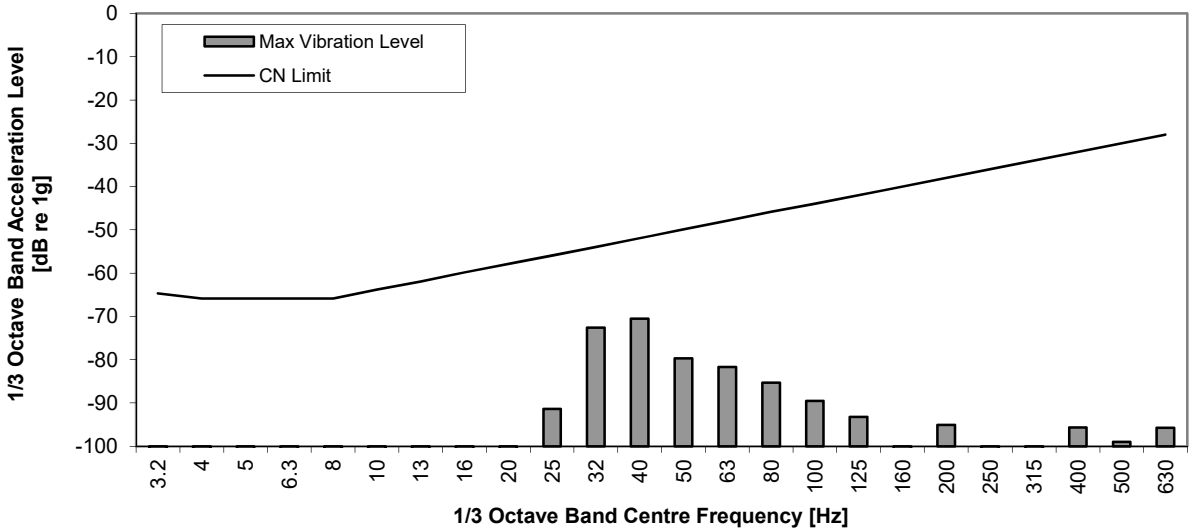


Figure 8b: Pass-by 5
Acceleration Spectrum @ Peak Level (1 sec. Duration)



APPENDIX A

CN Principal Mainline Requirements

Canadian National Railway Properties Inc.
Propriétés ferroviaires du Canadien National Inc.

277 Front Street West
Floor 8
Toronto, Ontario
M5V 2X7

Telephone: (416) 217-6961
Facsimile: (416) 217-6743

277, rue Front ouest
8e étage
Toronto (Ontario)
M5V 2X7

Téléphone: (416) 217-6961
Télécopieur: (416) 217-6743

PRINCIPAL MAIN LINE REQUIREMENTS

A. Safety setback of dwellings from the railway rights-of-way to be a minimum of 30 metres in conjunction with a safety berm. The safety berm shall be adjoining and parallel to the railway rights-of-way with returns at the ends, 2.5 metres above grade at the property line, with side slopes not steeper than 2.5 to 1.

B. The Owner shall engage a consultant to undertake an analysis of noise. At a minimum, a noise attenuation barrier shall be adjoining and parallel to the railway rights-of-way, having returns at the ends, and a minimum total height of 5.5 metres above top-of-rail. Acoustic fence to be constructed without openings and of a durable material weighing not less than 20 kg. per square metre of surface area. Subject to the review of the noise report, the Railway may consider other measures recommended by an approved Noise Consultant.

C. Ground-borne vibration transmission to be evaluated in a report through site testing to determine if dwellings within 75 metres of the railway rights-of-way will be impacted by vibration conditions in excess of 0.14 mm/sec RMS between 4 Hz and 200 Hz. The monitoring system should be capable of measuring frequencies between 4 Hz and 200 Hz, ±3 dB with an RMS averaging time constant of 1 second. If in excess, isolation measures will be required to ensure living areas do not exceed 0.14 mm/sec RMS on and above the first floor of the dwelling.

D. The Owner shall install and maintain a chain link fence of minimum 1.83 metre height along the mutual property line.

E. The following clause should be inserted in all development agreements, offers to purchase, and agreements of Purchase and Sale or Lease of each dwelling unit within 300m of the railway right-of-way: "Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

F. Any proposed alterations to the existing drainage pattern affecting railway property must receive prior concurrence from the Railway and be substantiated by a drainage report to the satisfaction of the Railway.

G. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and vibration isolation measures implemented are not to be tampered with or altered and further that the Owner shall have sole responsibility for and shall maintain these measures to the satisfaction of CN.

H. The Owner enter into an Agreement stipulating how CN's concerns will be resolved and will pay CN's reasonable costs in preparing and negotiating the agreement.

I. The Owner may be required to grant CN an environmental easement for operational noise and vibration emissions, registered against the subject property in favour of CN.

A wholly owned subsidiary of Canadian National Railway Company / Une filiale en propriété exclusive de la Compagnie des chemins de fer nationaux du Canada

APPENDIX B

Road Traffic Data

Victor Garcia

From: Krusto, Matt <Matt.Krusto@halton.ca>
Sent: January 3, 2019 2:28 PM
To: Victor Garcia
Subject: RE: Road Traffic Data Request - Upper Middle Road near Country Club Drive

Hi Victor,

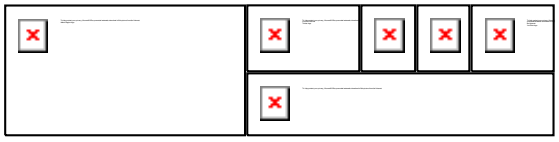
In a recent noise study for another area development along Upper Middle Road, the following 2031 AADT for Upper Middle Road was found to be acceptable:
-year 2031 AADT 33,000
-85/15 split
-2% medium and 2% heavy truck percentages

If you require the existing AADT for your report, I have looked up the latest count and it is 21,000 for 2017.

Hopefully this is what you need.

Matt

Matt Krusto
Transportation Planning Coordinator
Infrastructure Planning & Policy
Public Works
Halton Region
905-825-6000, ext. 7225 | 1-866-442-5866



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From: Victor Garcia [mailto:vgarcia@hgcengineering.com]
Sent: Thursday, January 03, 2019 1:50 PM
To: Krusto, Matt; Monaghan, Patrick
Subject: Road Traffic Data Request - Upper Middle Road near Country Club Drive

Good morning,

We are conducting a noise feasibility study for a proposed residential development located near Upper Middle Road and Country Club Drive. A google link is included for your reference:

aster	Statio	Description	Station	Count date	total vol	ampk end	ampk vol	off pk end	offpk vol	pm pk end	pkhr vol	8hr vol	13hr vol	ited speed (H	%speed (kr	avg (km)	85percent.	Variance	xceeding (%	#cars	# sml trk	med trk/bu	# hvy trk	%cars	%smal trk	med trk/bu	% hvy trk	dway max (s	dway min (s	emp min (C	emp max (C	surface
103814		Upper Middle Road - between Appleby Line and Imperial W		31-May-18	18,393	8:45	1,454	13:30	1,088	17:30	1,684	10,002	14,589	60	50	55	68.22	8.22	31.10%	15,886	492	752	673	89.2%	2.8%	4.2%	3.8%	1.99	300.00	25	45	Dry
103815		Upper Middle Road - between Heron Way and Appleby Line		31-May-18	20,039	8:45	1,319	13:15	1,325	17:30	1,936	11,131	16,158	60	50	49	59.49	-0.51	13.10%	19,008	242	227	155	96.8%	1.2%	1.2%	0.8%	1.76	225.00	26	43	Dry
103816		Upper Middle Road - between Walker's Line and Itabashi Wa		31-May-18	25,020	9:00	1,582	13:15	1,712	17:30	2,221	13,862	20,589	60	60	62	69.80	9.80	56.20%	24,220	196	212	126	97.8%	0.8%	0.9%	0.5%	1.51	225.00	25	43	Dry

Victor Garcia

From: Krusto, Matt <Matt.Krusto@halton.ca>
Sent: September 18, 2019 1:58 PM
To: Victor Garcia
Cc: Scattolon, Walter
Subject: RE: Road Traffic Data Request

Hi Victor,

For Noise Studies along/near Dundas Street please use the following for Dundas Street assumptions:

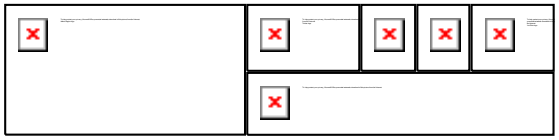
-Future volumes/assumptions for Dundas Street must be 55,000 AADT and 6 lanes.
-The use of existing medium and heavy truck percentages is required in the analysis of the future noise levels.

For existing count data to determine existing truck percentages, please send your request to Road Operations at accesshalton@halton.ca

Thank you,

Matt

Matt Krusto
Transportation Planning Coordinator
Infrastructure Planning & Policy
Public Works
Halton Region
905-825-6000, ext. 7225 | 1-866-442-5866



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From: Victor Garcia <vgarcia@hgcengineering.com>
Sent: Wednesday, September 18, 2019 1:43 PM
To: Krusto, Matt <Matt.Krusto@halton.ca>
Subject: Road Traffic Data Request

Hi Matt,

HGC Engineering is conducting a noise feasibility study for a proposed development near Dundas St and Tim Dobbie Dr in Burlington, Ontario. Do you have road traffic data available for Dundas St west of Appleby Line?

Conversation Record

Between	+ HGC	CC:
Brittany	VG	

Company	Project	
Region of Halton	Argo Millcroft Golf Course	☐ call from ☐ call to ☐ meeting

Address

Phone	E-mail	Date	Time
905-825-6000 ext 7174		Sept. 20/19	1:55 pm

Dundas St between E of Walker's

MT = 1.7%

HT = 1.4%

HGC ENGINEERING

2000 Argentia Road, Plaza One, Suite 203,
Mississauga, Ontario, L5N 1P7
T: 905-826-4044 E: answers@hgcengineering.com

Conversation Record

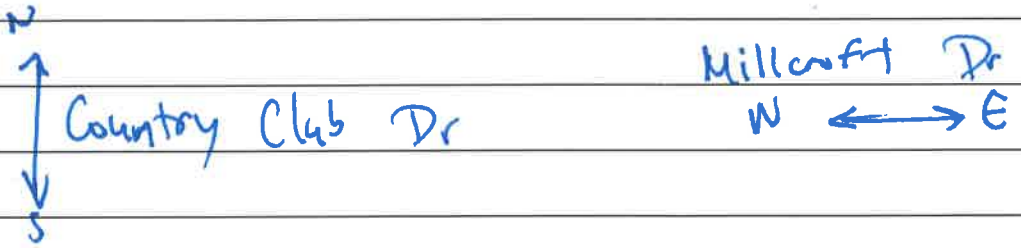
Between	+ HGC	CC:
Florin Patcau	VG	

Company	Project	
Burlington	Ayo Millcroft Golf Course	☐ call from ☐ call to ☐ meeting

Address			
Phone	**E-mail**	**Date**	**Time**
905-335-7671 ext. 7838	Florin.Patcau@Burlington.ca	Jan. 3/19	1:50 pm

2016 ~~AADT~~ MT

N →	3017	9%
S →	5989	5%
E →	4896	3%
W →	2336	3%



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2000 Argentia Road, Plaza One, Suite 203,
Mississauga, Ontario, L5N 1P7
T: 905-826-4044 E: answers@hgcengineering.com

APPENDIX C

Rail Traffic Data

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 One, Suite 203, Mississauga, ON L5N 1P7	*Project :*	HAL-45.17- Upper Middle Rd, Burlington, ON
Att'n:	Victor Garcia	*Routing:*	vgarcia@hgcengineering.com
From: *Expéditeur :*	Michael Vallins	*Date:*	02/05/2019
Cc:	Adjacent Development CN via e-mail		

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

Re: Train Traffic Data – CN Halton Subdivision near Upper Middle Road in Burlington, 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 905-669-3264.

Sincerely,
CN Design & Construction

Michael Vallins P.Eng
Manager of Public Works
public_works_gld@cn.ca

Date: 2019/02/05 Project Number: HAL-45.17- Upper Middle Rd, Burlington, ON

Dear Victor:

Re: Train Traffic Data – CN Halton Subdivision near Upper Middle Road in Burlington, ON

The following is provided in response to Victor's 2018/12/18 request for information regarding rail traffic in the vicinity of Plains Road in Burlington, ON at approximately Mile 32.23 on CN's Halton 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	10	140	50	4
Way Freight	2	25	50	4
Passenger	0	10	50	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	4	140	50	4
Way Freight	0	25	50	4
Passenger	0	10	50	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Halton 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 46.16 (Mainway Drive). Anti-whistling bylaws are not 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,

Michael Vallins P.Eng
Manager of Public Works
public_works_gld@cn.ca

APPENDIX D

Sample STAMSON 5.04 Output

Location 1, Area A

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:27:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with exposure to railway and Upper Middle Road


Rail data, segment # 1: CN (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 1: CN (day/night)
------------------------------------
Angle1   Angle2           : -45.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  70.00 / 70.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : 0.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  34.00 / 34.00  m
Source elevation          : 142.50 m
Receiver elevation        : 141.00 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 2: CN (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
```


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```
* 1. Freight     !  16.8/6.7   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   3.4/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  12.8/5.1   !    2.50  !   11.00  !
  2. Way Freight    !   2.6/0.0   !    2.50  !   11.00  !

Data for Segment # 2: CN (day/night)
------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  70.00 / 70.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  10.00 / 10.00  m
Source elevation          : 142.50 m
Receiver elevation        : 141.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        1.99 !       145.99
       0.50 !        4.50 !        0.29 !       144.29

LOCOMOTIVE (0.00 + 58.15 + 0.00) = 58.15 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45      0   0.50  74.40 -10.00  -6.25   0.00   0.00   0.00  58.15*
   -45      0   0.50  74.40 -10.00  -6.25   0.00   0.00   0.00  58.15
-------------------------------------------------------------------------
```


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```
 * Bright Zone !

WHEEL (0.00 + 50.66 + 0.00) = 50.66 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45      0   0.60  67.67 -10.70  -6.30   0.00   0.00  -4.89  45.77*
   -45      0   0.60  67.67 -10.70  -6.30   0.00   0.00   0.00  50.66
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.86 dBA

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

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !      145.64 !       145.64
       0.50 !        4.50 !      145.14 !       145.14

LOCOMOTIVE (0.00 + 61.31 + 0.00) = 61.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.50  75.49 -10.00  -4.18   0.00   0.00  -0.00  61.31*
     0     90   0.50  75.49 -10.00  -4.18   0.00   0.00   0.00  61.31
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 53.68 + 0.00) = 53.68 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.60  68.75 -10.70  -4.37   0.00   0.00  -0.00  53.68*
     0     90   0.60  68.75 -10.70  -4.37   0.00   0.00   0.00  53.68
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 62.00 dBA

Total Leq All Segments: 63.72 dBA

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


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```
Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        1.99 !       145.99
       0.50 !        4.50 !        0.29 !       144.29

LOCOMOTIVE (0.00 + 56.84 + 0.00) = 56.84 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45      0   0.50  73.09 -10.00  -6.25   0.00   0.00   0.00  56.84*
   -45      0   0.50  73.09 -10.00  -6.25   0.00   0.00   0.00  56.84
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 49.49 + 0.00) = 49.49 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45      0   0.60  66.49 -10.70  -6.30   0.00   0.00  -4.89  44.60*
   -45      0   0.60  66.49 -10.70  -6.30   0.00   0.00   0.00  49.49
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 57.57 dBA

Results segment # 2: CN (night)
-------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !      145.64 !       145.64
       0.50 !        4.50 !      145.14 !       145.14

LOCOMOTIVE (0.00 + 60.02 + 0.00) = 60.02 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.50  74.19 -10.00  -4.18   0.00   0.00  -0.00  60.02*
     0     90   0.50  74.19 -10.00  -4.18   0.00   0.00   0.00  60.02
-------------------------------------------------------------------------

 * Bright Zone !
```


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```
WHEEL (0.00 + 52.52 + 0.00) = 52.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.60  67.59 -10.70  -4.37   0.00   0.00  -0.00  52.52*
     0     90   0.60  67.59 -10.70  -4.37   0.00   0.00   0.00  52.52
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 60.73 dBA

Total Leq All Segments: 62.44 dBA

Road data, segment # 1: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   2.00
    Heavy Truck  % of Total Volume      :   2.00
    Day (16 hrs) % of Total Volume      :  85.00

Data for Segment # 1: Upper Middle (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  45.00 / 45.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
```

```
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: Upper Middle (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  58.00 / 58.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Upper Middle (day)
---------------------------------------

Source height = 1.19 m

ROAD (0.00 + 62.43 + 0.00) = 62.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  67.20   0.00  -4.77   0.00   0.00   0.00   0.00  62.43
-------------------------------------------------------------------------------

Segment Leq : 62.43 dBA

Results segment # 2: Upper Middle (day)
---------------------------------------

Source height = 1.19 m

ROAD (0.00 + 61.33 + 0.00) = 61.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  67.20   0.00  -5.87   0.00   0.00   0.00   0.00  61.33
-------------------------------------------------------------------------------
```


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Segment Leq : 61.33 dBA

Total Leq All Segments: 64.93 dBA

Results segment # 1: Upper Middle (night)

Source height = 1.19 m

ROAD (0.00 + 57.88 + 0.00) = 57.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.65	0.00	-4.77	0.00	0.00	0.00	0.00	57.88

Segment Leq : 57.88 dBA

Results segment # 2: Upper Middle (night)

Source height = 1.19 m

ROAD (0.00 + 56.78 + 0.00) = 56.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.65	0.00	-5.87	0.00	0.00	0.00	0.00	56.78

Segment Leq : 56.78 dBA

Total Leq All Segments: 60.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.37 dBA
(NIGHT): 64.54 dBA

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```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:30:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aola.te              Time Period: 16 hours

Description: OLA of lot with exposure to railway and Upper Middle Road with 3.5 m
acoustic barrier

Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/22.4  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   11.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   11.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           : -90.00 deg   -45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  76.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : -45.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   3.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.00 m
Barrier elevation         : 142.00 m
Reference angle           :   0.00

Rail data, segment # 2: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
```


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```
* 1. Freight     !  13.1/22.4  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   11.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   11.00  !

Data for Segment # 2: CN
------------------------
Angle1   Angle2           : -45.00 deg   -10.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  76.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : -10.00 deg
Barrier height            :   2.00 m
Barrier receiver distance :  34.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.00 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 3: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/22.4  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   11.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   11.00  !

Data for Segment # 3: CN
```


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```
-----------------------
Angle1   Angle2           : -10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  76.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -10.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :  10.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.00 m
Barrier elevation         : 140.50 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        0.66 !       142.66
       0.50 !        1.50 !        0.52 !       142.52

LOCOMOTIVE (0.00 + 43.37 + 0.00) = 43.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -45   0.17  74.40  -8.21  -6.88   0.00   0.00 -15.94  43.37
-------------------------------------------------------------------

WHEEL (0.00 + 35.20 + 0.00) = 35.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -45   0.27  67.67  -8.95  -7.39   0.00   0.00 -16.13  35.20
-------------------------------------------------------------------

Segment Leq : 43.99 dBA

Results segment # 2: CN
-----------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
```


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```
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        0.29 !       144.29
       0.50 !        1.50 !       -1.28 !       142.72

LOCOMOTIVE (0.00 + 48.89 + 0.00) = 48.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -45    -10   0.47  74.40 -10.32  -7.39   0.00   0.00  -7.80  48.89
-------------------------------------------------------------------

WHEEL (0.00 + 37.35 + 0.00) = 37.35 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -45    -10   0.57  67.67 -11.06  -7.45   0.00   0.00 -11.80  37.35
-------------------------------------------------------------------

Segment Leq : 49.18 dBA

Results segment # 3: CN
-----------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.53 !       143.03
       0.50 !        1.50 !        2.07 !       142.57

LOCOMOTIVE (0.00 + 54.76 + 0.00) = 54.76 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -10     90   0.38  74.40  -9.69  -3.38   0.00   0.00  -6.57  54.76
-------------------------------------------------------------------

WHEEL (0.00 + 45.81 + 0.00) = 45.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -10     90   0.48  67.67 -10.43  -3.56   0.00   0.00  -7.86  45.81
-------------------------------------------------------------------

Segment Leq : 55.28 dBA

Total Leq All Segments: 56.48 dBA

Road data, segment # 1: Upper Middle
------------------------------------
```

```
Car traffic volume  : 13464 veh/TimePeriod  *
Medium truck volume :   281 veh/TimePeriod  *
Heavy truck volume  :   281 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Upper Middle
-----------------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  42.00 m
Receiver height           :   1.50 m
Topography                :      0       (Define your own alpha.)
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Alpha                     :   0.50
Reference angle           :   0.00

Road data, segment # 2: Upper Middle
-----------------------------------
Car traffic volume  : 13464 veh/TimePeriod  *
Medium truck volume :   281 veh/TimePeriod  *
Heavy truck volume  :   281 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Upper Middle
-----------------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  55.00 m
Receiver height           :   1.50 m
Topography                :      0       (Define your own alpha.)
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
```

```
Barrier elevation         :   0.00 m
Alpha                     :   0.50
Reference angle           :   0.00

Results segment # 1: Upper Middle
---------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.43 !         1.43

ROAD (0.00 + 49.67 + 0.00) = 49.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.50  68.80   0.00  -6.71  -2.09   0.00   0.00 -10.34  49.67
-------------------------------------------------------------------------------

Segment Leq : 49.67 dBA

Results segment # 2: Upper Middle
---------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.44 !         1.44

ROAD (0.00 + 48.17 + 0.00) = 48.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.50  68.80   0.00  -8.46  -2.09   0.00   0.00 -10.08  48.17
-------------------------------------------------------------------------------

Segment Leq : 48.17 dBA

Total Leq All Segments: 51.99 dBA

TOTAL Leq FROM ALL SOURCES: 57.81 dBA
```

Location 2, Area A

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:17:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with exposure to Upper Middle Road, some exposure to CN


Rail data, segment # 1: CN (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 1: CN (day/night)
------------------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 108.00 / 108.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  34.00 / 34.00  m
Source elevation          : 143.50 m
Receiver elevation        : 139.63 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Barrier height for grazing incidence
------------------------------------
```


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Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	145.19	145.19
0.50	4.50	144.09	144.09

LOCOMOTIVE (0.00 + 59.29 + 0.00) = 59.29 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.50	74.19	-12.82	-2.08	0.00	0.00	-0.00	59.29*
-45	90	0.50	74.19	-12.82	-2.08	0.00	0.00	0.00	59.29

* Bright Zone !

WHEEL (0.00 + 51.63 + 0.00) = 51.63 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.60	67.56	-13.72	-2.22	0.00	0.00	-0.00	51.63*
-45	90	0.60	67.56	-13.72	-2.22	0.00	0.00	0.00	51.63

* Bright Zone !

Segment Leq : 59.98 dBA

Total Leq All Segments: 59.98 dBA

Results segment # 1: CN (night)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	145.19	145.19
0.50	4.50	144.09	144.09

LOCOMOTIVE (0.00 + 58.20 + 0.00) = 58.20 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.50	73.09	-12.82	-2.08	0.00	0.00	-0.00	58.20*
-45	90	0.50	73.09	-12.82	-2.08	0.00	0.00	0.00	58.20

* Bright Zone !

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```
WHEEL (0.00 + 50.56 + 0.00) = 50.56 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45     90   0.60  66.49 -13.72  -2.22   0.00   0.00  -0.00  50.56*
   -45     90   0.60  66.49 -13.72  -2.22   0.00   0.00   0.00  50.56
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.89 dBA

Total Leq All Segments: 58.89 dBA

Road data, segment # 1: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   2.00
    Heavy Truck  % of Total Volume      :   2.00
    Day (16 hrs) % of Total Volume      :  85.00

Data for Segment # 1: Upper Middle (day/night)
------------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  37.00 / 37.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
Posted speed limit  :    60 km/h
```

```
Road gradient         :     8 %
Road pavement         :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: Upper Middle (day/night)
------------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  51.00 / 51.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Upper Middle (day)
---------------------------------------

Source height = 1.19 m

ROAD (0.00 + 64.88 + 0.00) = 64.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.80   0.00  -3.92   0.00   0.00   0.00   0.00  64.88
-------------------------------------------------------------------------------

Segment Leq : 64.88 dBA

Results segment # 2: Upper Middle (day)
---------------------------------------

Source height = 1.19 m

ROAD (0.00 + 63.48 + 0.00) = 63.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.80   0.00  -5.31   0.00   0.00   0.00   0.00  63.48
-------------------------------------------------------------------------------

Segment Leq : 63.48 dBA
```

```
Total Leq All Segments: 67.25 dBA

Results segment # 1: Upper Middle (night)
----------------------------------------

Source height = 1.19 m

ROAD (0.00 + 60.32 + 0.00) = 60.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  64.24   0.00  -3.92   0.00   0.00   0.00   0.00  60.32
-------------------------------------------------------------------------------

Segment Leq : 60.32 dBA

Results segment # 2: Upper Middle (night)
----------------------------------------

Source height = 1.19 m

ROAD (0.00 + 58.92 + 0.00) = 58.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  64.24   0.00  -5.31   0.00   0.00   0.00   0.00  58.92
-------------------------------------------------------------------------------

Segment Leq : 58.92 dBA

Total Leq All Segments: 62.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.99 dBA
                           (NIGHT): 64.20 dBA
```

Location 2 OLA, Area A

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:19:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: bola.te              Time Period: 16 hours

Description: OLA of lots with exposure to Upper Middle Road, some exposure to CN,
with 3.5 m acoustic barrier

Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/22.4  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   11.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   11.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 105.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :   7.00 m
Source elevation          : 143.50 m
Receiver elevation        : 139.63 m
Barrier elevation         : 139.60 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
------------------------------------
```


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```
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        1.95 !       141.55
       0.50 !        1.50 !        1.72 !       141.32

LOCOMOTIVE (0.00 + 51.58 + 0.00) = 51.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45     90   0.38  74.19 -11.62  -1.91   0.00   0.00  -9.08  51.58
-------------------------------------------------------------------------

WHEEL (0.00 + 43.14 + 0.00) = 43.14 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -45     90   0.48  67.56 -12.51  -2.06   0.00   0.00  -9.85  43.14
-------------------------------------------------------------------------

Segment Leq : 52.16 dBA

Total Leq All Segments: 52.16 dBA

Road data, segment # 1: Upper Middle
------------------------------------
Car traffic volume  : 13464 veh/TimePeriod  *
Medium truck volume :   281 veh/TimePeriod  *
Heavy truck volume  :   281 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Upper Middle
----------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :   7.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```


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```
Road data, segment # 2: Upper Middle
-----------------------------------
Car traffic volume  : 13464 veh/TimePeriod  *
Medium truck volume :   281 veh/TimePeriod  *
Heavy truck volume  :   281 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Upper Middle
-----------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  48.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :   7.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Upper Middle
-----------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.44 !         1.44

ROAD (0.00 + 54.68 + 0.00) = 54.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.80   0.00  -3.55   0.00   0.00   0.00 -10.56  54.68
-------------------------------------------------------------------------------

Segment Leq : 54.68 dBA

Results segment # 2: Upper Middle
-----------------------------------
```

Location 2 OLA, Area A

Source height = 1.19 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.19	1.50	1.45	1.45

ROAD (0.00 + 53.44 + 0.00) = 53.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.80	0.00	-5.05	0.00	0.00	0.00	-10.30	53.44

Segment Leq : 53.44 dBA

Total Leq All Segments: 57.11 dBA

TOTAL Leq FROM ALL SOURCES: 58.32 dBA

Location 3, Area A

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:32:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot backing onto SWM pond, exposure to Upper Middle Road


Rail data, segment # 1: CN (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.0/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  12.8/5.1   !    2.50  !    1.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !    1.00  !

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: CN (day/night)
------------------------------------
Angle1   Angle2           :  30.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 173.00 / 173.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :  30.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          : 138.80 m
```


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```
Receiver elevation        : 143.50 m
Barrier elevation         : 138.80 m
Reference angle           :   0.00

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        8.99 !       147.79
       0.50 !        4.50 !        8.85 !       147.65

LOCOMOTIVE (0.00 + 51.87 + 0.00) = 51.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.50  74.33 -15.88  -6.59   0.00   0.00  -0.03  51.84*
    30     90   0.50  74.33 -15.88  -6.59   0.00   0.00   0.00  51.87
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 43.73 + 0.00) = 43.73 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.60  67.63 -16.99  -6.91   0.00   0.00  -0.03  43.70*
    30     90   0.60  67.63 -16.99  -6.91   0.00   0.00   0.00  43.73
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 52.49 dBA

Total Leq All Segments: 52.49 dBA

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        8.99 !       147.79
       0.50 !        4.50 !        8.85 !       147.65
```


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```
LOCOMOTIVE (0.00 + 50.63 + 0.00) = 50.63 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.50  73.09 -15.88  -6.59   0.00   0.00  -0.03  50.60*
    30     90   0.50  73.09 -15.88  -6.59   0.00   0.00   0.00  50.63
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 42.60 + 0.00) = 42.60 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.60  66.49 -16.99  -6.91   0.00   0.00  -0.03  42.57*
    30     90   0.60  66.49 -16.99  -6.91   0.00   0.00   0.00  42.60
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 51.26 dBA

Total Leq All Segments: 51.26 dBA

Road data, segment # 1: Upper Middle (day/night)
-----------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     4 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   2.00
    Heavy Truck  % of Total Volume      :   2.00
    Day (16 hrs) % of Total Volume      :  85.00

Data for Segment # 1: Upper Middle (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  76.00 / 76.00  m
Receiver height           :   4.50 / 4.50   m
```


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```
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13464/2376  veh/TimePeriod  *
Medium truck volume :   281/49    veh/TimePeriod  *
Heavy truck volume  :   281/49    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     4 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  16500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.00
    Heavy Truck  % of Total Volume     :   2.00
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: Upper Middle (day/night)
------------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  90.00 / 90.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Upper Middle (day)
---------------------------------------

Source height = 1.19 m

ROAD (0.00 + 60.61 + 0.00) = 60.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  67.66   0.00  -7.05   0.00   0.00   0.00   0.00  60.61
-------------------------------------------------------------------------------

Segment Leq : 60.61 dBA

Results segment # 2: Upper Middle (day)
---------------------------------------
```

Source height = 1.19 m

ROAD (0.00 + 59.88 + 0.00) = 59.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.66	0.00	-7.78	0.00	0.00	0.00	0.00	59.88

Segment Leq : 59.88 dBA

Total Leq All Segments: 63.27 dBA

Results segment # 1: Upper Middle (night)

Source height = 1.19 m

ROAD (0.00 + 56.06 + 0.00) = 56.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.11	0.00	-7.05	0.00	0.00	0.00	0.00	56.06

Segment Leq : 56.06 dBA

Results segment # 2: Upper Middle (night)

Source height = 1.19 m

ROAD (0.00 + 55.32 + 0.00) = 55.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.11	0.00	-7.78	0.00	0.00	0.00	0.00	55.32

Segment Leq : 55.32 dBA

Total Leq All Segments: 58.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.62 dBA
(NIGHT): 59.43 dBA

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```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:37:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: cola.te              Time Period: 16 hours

Description: OLA of lots backing onto SWM pond, exposure to Upper Middle Road with
3.2 m acoustic barrier

Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  12.8/21.9  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   10.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   10.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           :  30.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 176.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :  30.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.20 m
Barrier receiver distance :   7.00 m
Source elevation          : 138.80 m
Receiver elevation        : 143.50 m
Barrier elevation         : 138.80 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
------------------------------------
```


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Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	6.11	144.91
0.50	1.50	5.97	144.77

LOCOMOTIVE (0.00 + 50.50 + 0.00) = 50.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.39	74.31	-14.90	-6.26	0.00	0.00	-0.21	52.95*
30	90	0.58	74.31	-16.95	-6.86	0.00	0.00	0.00	50.50

* Bright Zone !

WHEEL (0.00 + 42.74 + 0.00) = 42.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.50	67.57	-16.02	-6.60	0.00	0.00	-0.23	44.72*
30	90	0.66	67.57	-17.75	-7.08	0.00	0.00	0.00	42.74

* Bright Zone !

Segment Leq : 51.17 dBA

Total Leq All Segments: 51.17 dBA

Road data, segment # 1: Upper Middle

Car traffic volume	: 13464 veh/TimePeriod	*
Medium truck volume	: 281 veh/TimePeriod	*
Heavy truck volume	: 281 veh/TimePeriod	*
Posted speed limit	: 60 km/h	
Road gradient	: 4 %	
Road pavement	: 1 (Typical asphalt or concrete)	

Data for Segment # 1: Upper Middle

Angle1 Angle2	: -70.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 74.50 m	
Receiver height	: 1.50 m	
Topography	: 0	(Define your own alpha.)
Barrier angle1	: -70.00 deg	Angle2 : 90.00 deg
Barrier height	: 3.20 m	

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```
Barrier receiver distance :   7.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Alpha                     :   0.50
Reference angle           :   0.00

Road data, segment # 2: Upper Middle
-----------------------------------
Car traffic volume  : 13464 veh/TimePeriod  *
Medium truck volume :   281 veh/TimePeriod  *
Heavy truck volume  :   281 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     4 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Upper Middle
-----------------------------------
Angle1   Angle2           : -70.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  88.50 m
Receiver height           :   1.50 m
Topography                :      0       (Define your own alpha.)
Barrier angle1            : -70.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.20 m
Barrier receiver distance :   7.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Alpha                     :   0.50
Reference angle           :   0.00

Results segment # 1: Upper Middle
---------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.47 !         1.47

ROAD (0.00 + 50.46 + 0.00) = 50.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```


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```
-------------------------------------------------------------------------------
   -70     90   0.00  67.66   0.00  -6.96  -0.51   0.00   0.00  -9.73  50.46
-------------------------------------------------------------------------------

Segment Leq : 50.46 dBA

Results segment # 2: Upper Middle
---------------------------------

Source height = 1.19 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.19 !        1.50 !        1.48 !         1.48

ROAD (0.00 + 49.77 + 0.00) = 49.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70     90   0.00  67.66   0.00  -7.71  -0.51   0.00   0.00  -9.67  49.77
-------------------------------------------------------------------------------

Segment Leq : 49.77 dBA

Total Leq All Segments: 53.14 dBA

TOTAL Leq FROM ALL SOURCES: 55.28 dBA
```

Location 4, Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:39:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with backing exposure to railway


Rail data, segment # 1: CN (day/night)
-------------------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

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

    24 hr Traffic Volume (AADT or SADT):  50000
    Percentage of Annual Growth        :   5.00
    Number of Years of Growth          :  10.00
    Medium Truck % of Total Volume     :  20.00
    Heavy Truck  % of Total Volume     :  10.00
    Day (16 hrs) % of Total Volume     :  66.67

Data for Segment # 1: CN (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  :  61.00 / 61.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  34.00 / 34.00  m
Source elevation          : 142.00 m
```


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```
Receiver elevation        : 142.50 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.44 !       146.44
       0.50 !        4.50 !        0.49 !       144.49

LOCOMOTIVE (0.00 + 64.13 + 0.00) = 64.13 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.50  74.40  -9.11  -1.17   0.00   0.00  -0.44  63.69*
   -90     90   0.50  74.40  -9.11  -1.17   0.00   0.00   0.00  64.13
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 56.56 + 0.00) = 56.56 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  67.67  -9.75  -1.35   0.00   0.00  -4.72  51.84*
   -90     90   0.60  67.67  -9.75  -1.35   0.00   0.00   0.00  56.56
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 64.83 dBA

Total Leq All Segments: 64.83 dBA

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.44 !       146.44
       0.50 !        4.50 !        0.49 !       144.49
```


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Location 4, Area B

LOCOMOTIVE (0.00 + 62.82 + 0.00) = 62.82 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	73.09	-9.11	-1.17	0.00	0.00	-0.44	62.38*
-90	90	0.50	73.09	-9.11	-1.17	0.00	0.00	0.00	62.82

* Bright Zone !

WHEEL (0.00 + 55.39 + 0.00) = 55.39 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	66.49	-9.75	-1.35	0.00	0.00	-4.72	50.67*
-90	90	0.60	66.49	-9.75	-1.35	0.00	0.00	0.00	55.39

* Bright Zone !

Segment Leq : 63.54 dBA

Total Leq All Segments: 63.54 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.83 dBA
(NIGHT): 63.54 dBA

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Location 4, ola Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:42:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: dola.te              Time Period: 16 hours

Description: OLA of lots with backing exposure to railway


Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/22.4  !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/1.3   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/17.1  !    2.50  !   11.00  !
  2. Way Freight    !   2.0/1.0   !    2.50  !   11.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  58.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.50 m
Barrier receiver distance :  34.00 m
Source elevation          : 142.00 m
Receiver elevation        : 142.50 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
------------------------------------
```


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Location 4, ola Area B

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.17	145.17
0.50	1.50	-0.88	143.12

LOCOMOTIVE (0.00 + 58.02 + 0.00) = 58.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.44	74.19	-8.43	-1.05	0.00	0.00	-6.69	58.02

WHEEL (0.00 + 46.52 + 0.00) = 46.52 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.54	67.56	-9.04	-1.25	0.00	0.00	-10.75	46.52

Segment Leq : 58.32 dBA

Total Leq All Segments: 58.32 dBA

TOTAL Leq FROM ALL SOURCES: 58.32 dBA

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Location 5 Area B

STAMSON 5.0 NORMAL REPORT Date: 04-05-2020 10:44:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with some exposure to railway

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	13.1/5.2	80.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	2.6/0.0	80.0	4.0	25.0	Diesel	Yes

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

Train type: No	Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	Freight	10.0/4.0	2.50	11.00
2.	Way Freight	2.0/0.0	2.50	11.00

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

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 40 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 86.00 / 86.00	m
Receiver height	: 4.50 / 4.50	m
Topography	: 2	(Flat/gentle slope; with barrier)
No Whistle		
Barrier angle1	: -90.00 deg	Angle2 : 0.00 deg
Barrier height	: 0.00 m	
Barrier receiver distance	: 64.00 / 64.00	m
Source elevation	: 142.50 m	
Receiver elevation	: 141.11 m	
Barrier elevation	: 144.00 m	
Reference angle	: 0.00	

Results segment # 1: CN (day)

Barrier height for grazing incidence

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```
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.27 !       146.27
       0.50 !        4.50 !       -0.33 !       143.67

LOCOMOTIVE (0.00 + 56.89 + 0.00) = 56.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.50  74.40 -11.34  -4.18   0.00  -2.00   0.00  56.89
   -90      0   0.50  74.40 -11.34  -4.18   0.00   0.00  -0.56  58.33*
   -90      0   0.50  74.40 -11.34  -4.18   0.00   0.00   0.00  58.89
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 46.05 + 0.00) = 46.05 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.60  67.67 -12.13  -4.37   0.00  -2.00   0.00  49.17
   -90      0   0.60  67.67 -12.13  -4.37   0.00   0.00  -5.11  46.05
-------------------------------------------------------------------------

Segment Leq : 57.23 dBA

Total Leq All Segments: 57.23 dBA

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.27 !       146.27
       0.50 !        4.50 !       -0.33 !       143.67

LOCOMOTIVE (0.00 + 55.58 + 0.00) = 55.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.50  73.09 -11.34  -4.18   0.00  -2.00   0.00  55.58
   -90      0   0.50  73.09 -11.34  -4.18   0.00   0.00  -0.56  57.02*
   -90      0   0.50  73.09 -11.34  -4.18   0.00   0.00   0.00  57.58
-------------------------------------------------------------------------

 * Bright Zone !
```

Location 5 Area B

```
WHEEL (0.00 + 44.88 + 0.00) = 44.88 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.60  66.49 -12.13  -4.37   0.00  -2.00   0.00  47.99
   -90      0   0.60  66.49 -12.13  -4.37   0.00   0.00  -5.11  44.88
-------------------------------------------------------------------------

Segment Leq : 55.93 dBA

Total Leq All Segments: 55.93 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.23 dBA
                           (NIGHT): 55.93 dBA
```

Location 5 ola Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:50:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: eola.te              Time Period: 16 hours

Description: OLA of lots with some exposure to railway


Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  91.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   3.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 2: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
```


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```
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 2: CN
------------------------
Angle1   Angle2           :   0.00 deg   30.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  91.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :   0.00 deg   Angle2 : 30.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  69.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 3: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  4.0 ! 25.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 3: CN
```

```
-----------------------
Angle1   Angle2           :  30.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     40 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  91.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :  30.00 deg   Angle2 : 90.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  20.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !       -1.26 !       142.74
       0.50 !        1.50 !       -1.38 !       142.62

LOCOMOTIVE (0.00 + 43.67 + 0.00) = 43.67 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90      0   0.17  74.40  -9.12  -3.46   0.00   0.00 -18.15  43.67
-------------------------------------------------------------------

WHEEL (0.00 + 35.78 + 0.00) = 35.78 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90      0   0.27  67.67  -9.94  -3.71   0.00   0.00 -18.23  35.78
-------------------------------------------------------------------

Segment Leq : 44.32 dBA

Results segment # 2: CN
-----------------------

Barrier height for grazing incidence
-----------------------------------
```


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Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.56	145.56
0.50	1.50	-1.09	142.91

LOCOMOTIVE (0.00 + 54.09 + 0.00) = 54.09 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	30	0.58	74.40	-12.41	-7.90	0.00	0.00	-0.03	54.07*
0	30	0.58	74.40	-12.41	-7.90	0.00	0.00	0.00	54.09

* Bright Zone !

WHEEL (0.00 + 40.17 + 0.00) = 40.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	30	0.66	67.67	-13.00	-7.91	0.00	0.00	-6.59	40.17

Segment Leq : 54.26 dBA

Results segment # 3: CN

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	-0.54	143.46
0.50	1.50	-1.30	142.70

LOCOMOTIVE (0.00 + 45.62 + 0.00) = 45.62 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.58	74.40	-12.41	-6.86	0.00	-2.00	0.00	53.13
30	90	0.17	74.40	-9.12	-5.45	0.00	0.00	-14.21	45.62

WHEEL (0.00 + 37.02 + 0.00) = 37.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.66	67.67	-13.00	-7.08	0.00	-2.00	0.00	45.59
30	90	0.27	67.67	-9.94	-5.84	0.00	0.00	-14.87	37.02

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Location 5 ola Area B

Segment Leq : 46.18 dBA

Total Leq All Segments: 55.25 dBA

TOTAL Leq FROM ALL SOURCES: 55.25 dBA

Location 6 Area B

STAMSON 5.0 NORMAL REPORT Date: 04-05-2020 10:52:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with some exposure to the railway

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	13.1/5.2	80.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	2.6/0.0	80.0	1.0	10.0	Diesel	Yes

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

Train type: No	Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	Freight	10.0/4.0	2.50	11.00
2.	Way Freight	2.0/0.0	2.50	11.00

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

Angle1 Angle2	: -90.00 deg	0.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 60 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 102.00 / 102.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 2	(Flat/gentle slope; with barrier)
No Whistle		
Barrier angle1	: -90.00 deg	Angle2 : 0.00 deg
Barrier height	: 0.00 m	
Barrier receiver distance	: 81.00 / 81.00 m	
Source elevation	: 142.50 m	
Receiver elevation	: 141.11 m	
Barrier elevation	: 144.00 m	
Reference angle	: 0.00	

Results segment # 1: CN (day)

Barrier height for grazing incidence

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```
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.32 !       146.32
       0.50 !        4.50 !       -0.46 !       143.54

LOCOMOTIVE (0.00 + 54.10 + 0.00) = 54.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.50  74.19 -12.45  -4.18   0.00  -3.46   0.00  54.10
   -90      0   0.50  74.19 -12.45  -4.18   0.00   0.00  -0.55  57.01*
   -90      0   0.50  74.19 -12.45  -4.18   0.00   0.00   0.00  57.56
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 44.66 + 0.00) = 44.66 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.60  67.56 -13.32  -4.37   0.00  -3.46   0.00  46.42
   -90      0   0.60  67.56 -13.32  -4.37   0.00   0.00  -5.21  44.66
-------------------------------------------------------------------------

Segment Leq : 54.57 dBA

Total Leq All Segments: 54.57 dBA

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

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        4.50 !        2.32 !       146.32
       0.50 !        4.50 !       -0.46 !       143.54

LOCOMOTIVE (0.00 + 53.01 + 0.00) = 53.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.50  73.09 -12.45  -4.18   0.00  -3.46   0.00  53.01
   -90      0   0.50  73.09 -12.45  -4.18   0.00   0.00  -0.55  55.92*
   -90      0   0.50  73.09 -12.45  -4.18   0.00   0.00   0.00  56.47
-------------------------------------------------------------------------

 * Bright Zone !
```

Location 6 Area B

```
WHEEL (0.00 + 43.60 + 0.00) = 43.60 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.60  66.49 -13.32  -4.37   0.00  -3.46   0.00  45.35
   -90      0   0.60  66.49 -13.32  -4.37   0.00   0.00  -5.21  43.60
-------------------------------------------------------------------------

Segment Leq : 53.48 dBA

Total Leq All Segments: 53.48 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.57 dBA
                           (NIGHT): 53.48 dBA
```


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Location 6 ola Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 10:58:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: fola.te              Time Period: 16 hours

Description: OLA of lots with some exposure to the railway


Rail data, segment # 1: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 1: CN
------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     60 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 107.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   3.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 2: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
```


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```
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !

Data for Segment # 2: CN
------------------------
Angle1   Angle2           :   0.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     60 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 107.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :   0.00 deg   Angle2 : 20.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  86.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Rail data, segment # 3: CN
--------------------------
Train            ! Trains      ! Speed !# loc !# Cars! Eng  !Cont
Type             !             !(km/h) !/Train!/Train! type !weld
-----------------+-------------+-------+------+------+------+----
* 1. Freight     !  13.1/5.2   !  80.0 !  4.0 !140.0 !Diesel! Yes
* 2. Way Freight !   2.6/0.0   !  80.0 !  1.0 ! 10.0 !Diesel! Yes

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

Train type:         ! Unadj. ! Annual % ! Years of !
 No  Name           ! Trains ! Increase !  Growth  !
--------------------+--------+----------+----------+
  1. Freight        !  10.0/4.0   !    2.50  !   11.00  !
  2. Way Freight    !   2.0/0.0   !    2.50  !   11.00  !
```


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```
Data for Segment # 3: CN
------------------------
Angle1   Angle2           :  20.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1
House density             :     60 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 107.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1            :  20.00 deg   Angle2 : 90.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  20.00 m
Source elevation          : 142.50 m
Receiver elevation        : 141.11 m
Barrier elevation         : 144.00 m
Reference angle           :   0.00

Results segment # 1: CN
-----------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !       -1.28 !       142.72
       0.50 !        1.50 !       -1.38 !       142.62

LOCOMOTIVE (0.00 + 42.64 + 0.00) = 42.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90      0   0.58  74.19 -13.52  -4.34   0.00  -3.44   0.00  52.88
   -90      0   0.17  74.19  -9.94  -3.46   0.00   0.00 -18.15  42.64
-------------------------------------------------------------------

WHEEL (0.00 + 34.80 + 0.00) = 34.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90      0   0.66  67.56 -14.16  -4.47   0.00  -3.44   0.00  45.49
   -90      0   0.27  67.56 -10.84  -3.71   0.00   0.00 -18.22  34.80
-------------------------------------------------------------------

Segment Leq : 43.30 dBA

Results segment # 2: CN
```


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```
----------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        1.74 !       145.74
       0.50 !        1.50 !       -1.08 !       142.92

LOCOMOTIVE (0.00 + 47.62 + 0.00) = 47.62 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     20   0.58  74.19 -13.52  -9.59   0.00  -3.44   0.00  47.62
     0     20   0.58  74.19 -13.52  -9.59   0.00   0.00   0.00  51.07*
     0     20   0.58  74.19 -13.52  -9.59   0.00   0.00   0.00  51.07
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 37.23 + 0.00) = 37.23 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     20   0.66  67.56 -14.16  -9.60   0.00  -3.44   0.00  40.35
     0     20   0.66  67.56 -14.16  -9.60   0.00   0.00  -6.56  37.23
-------------------------------------------------------------------------

Segment Leq : 48.00 dBA

Results segment # 3: CN
----------------------

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !       -0.66 !       143.34
       0.50 !        1.50 !       -1.32 !       142.68

LOCOMOTIVE (0.00 + 44.90 + 0.00) = 44.90 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    20     90   0.58  74.19 -13.52  -5.88   0.00  -3.44   0.00  51.34
    20     90   0.17  74.19  -9.94  -4.69   0.00   0.00 -14.65  44.90
-------------------------------------------------------------------------

WHEEL (0.00 + 36.50 + 0.00) = 36.50 dBA
```

Location 6 ola Area B

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
20	90	0.66	67.56	-14.16	-6.06	0.00	-3.44	0.00	43.90
20	90	0.27	67.56	-10.84	-5.02	0.00	0.00	-15.20	36.50

Segment Leq : 45.49 dBA

Total Leq All Segments: 50.79 dBA

TOTAL Leq FROM ALL SOURCES: 50.79 dBA

Location 7 Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 11:00:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with flanking exposure to Millcroft Road


Road data, segment # 1: Millcroft (day/night)
----------------------------------------------
Car traffic volume  :  6039/671   veh/TimePeriod  *
Medium truck volume :   187/21    veh/TimePeriod  *
Heavy truck volume  :     0/0     veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   4896
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :  14.00
    Medium Truck % of Total Volume     :   3.00
    Heavy Truck  % of Total Volume     :   0.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Millcroft (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  16.80 / 16.80  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

ROAD (0.00 + 59.00 + 0.00) = 59.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  59.50   0.00  -0.49   0.00   0.00   0.00   0.00  59.00
-------------------------------------------------------------------------------
```


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Location 7 Area B

Segment Leq : 59.00 dBA

Total Leq All Segments: 59.00 dBA

Results segment # 1: Millcroft (night)

Source height = 0.50 m

ROAD (0.00 + 52.49 + 0.00) = 52.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.98	0.00	-0.49	0.00	0.00	0.00	0.00	52.49

Segment Leq : 52.49 dBA

Total Leq All Segments: 52.49 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.00 dBA
(NIGHT): 52.49 dBA

Location 7 ola Area B

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 11:05:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: gola.te              Time Period: 16 hours

Description: Lot with some exposure to Millcroft Road


Road data, segment # 1: Millcroft
---------------------------------
Car traffic volume  :  6039 veh/TimePeriod  *
Medium truck volume :   187 veh/TimePeriod  *
Heavy truck volume  :     0 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Millcroft
-------------------------------
Angle1   Angle2           : -90.00 deg   -45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.70 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -45.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :   3.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Millcroft
---------------------------------
Car traffic volume  :  6039 veh/TimePeriod  *
Medium truck volume :   187 veh/TimePeriod  *
Heavy truck volume  :     0 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Millcroft
-------------------------------
Angle1   Angle2           : -45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
```


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```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  21.70 m
Receiver height            :   1.50 m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             : -45.00 deg   Angle2 : 90.00 deg
Barrier height             :   2.00 m
Barrier receiver distance  :  10.00 m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00

Results segment # 1: Millcroft
------------------------------

Source height = 0.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.36 !         1.36

ROAD (0.00 + 35.78 + 0.00) = 35.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -45   0.00  59.50   0.00  -1.60  -6.02   0.00   0.00 -16.09  35.78
-------------------------------------------------------------------------------

Segment Leq : 35.78 dBA

Results segment # 2: Millcroft
------------------------------

Source height = 0.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.04 !         1.04

ROAD (0.00 + 49.20 + 0.00) = 49.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.00  59.50   0.00  -1.60  -1.25   0.00   0.00  -7.44  49.20
```

Location 7 ola Area B

Segment Leq : 49.20 dBA

Total Leq All Segments: 49.39 dBA

TOTAL Leq FROM ALL SOURCES: 49.39 dBA

Location 10, Area E

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 11:07:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: 6-storey condo with exposure to Dundas Street West


Road data, segment # 1: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Dundas (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.80 / 19.80  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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


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```
    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Dundas (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  32.70 / 32.70  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.09 m

ROAD (0.00 + 67.77 + 0.00) = 67.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.98   0.00  -1.21   0.00   0.00   0.00   0.00  67.77
-------------------------------------------------------------------------------

Segment Leq : 67.77 dBA

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

Source height = 1.09 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.98   0.00  -3.38   0.00   0.00   0.00   0.00  65.59
-------------------------------------------------------------------------------

Segment Leq : 65.59 dBA

Total Leq All Segments: 69.83 dBA


Results segment # 1: Dundas (night)
```

```
----------------------------------

Source height = 1.09 m

ROAD (0.00 + 61.26 + 0.00) = 61.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  62.47   0.00  -1.21   0.00   0.00   0.00   0.00  61.26
-------------------------------------------------------------------------------

Segment Leq : 61.26 dBA

Results segment # 2: Dundas (night)
----------------------------------

Source height = 1.09 m

ROAD (0.00 + 59.08 + 0.00) = 59.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  62.47   0.00  -3.38   0.00   0.00   0.00   0.00  59.08
-------------------------------------------------------------------------------

Segment Leq : 59.08 dBA

Total Leq All Segments: 63.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.83 dBA
                           (NIGHT): 63.32 dBA
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-11-2020 13:49:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: h1.te                Time Period: Day/Night 16/8 hours
Description:  Sound levels at 6-storey condo, south façade, 1st floor

Road data, segment # 1: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Dundas (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.80 / 19.80  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Dundas (day/night)
```

```
----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  32.70 / 32.70  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.09 m

ROAD (0.00 + 67.77 + 0.00) = 67.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  68.98   0.00  -1.21   0.00   0.00   0.00   0.00
67.77
-------------------------------------------------------------------------
---

Segment Leq : 67.77 dBA

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

Source height = 1.09 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  68.98   0.00  -3.38   0.00   0.00   0.00   0.00
65.59
-------------------------------------------------------------------------
---

Segment Leq : 65.59 dBA

Total Leq All Segments: 69.83 dBA

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

Source height = 1.09 m

ROAD (0.00 + 61.26 + 0.00) = 61.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
```

```
------------------------------------------------------------------------
---
   -90     90   0.00  62.47   0.00  -1.21   0.00   0.00   0.00   0.00
61.26
------------------------------------------------------------------------
---

Segment Leq : 61.26 dBA

Results segment # 2: Dundas (night)
-----------------------------------

Source height = 1.09 m

ROAD (0.00 + 59.08 + 0.00) = 59.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
------------------------------------------------------------------------
---
   -90     90   0.00  62.47   0.00  -3.38   0.00   0.00   0.00   0.00
59.08
------------------------------------------------------------------------
---

Segment Leq : 59.08 dBA

Total Leq All Segments: 63.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.83
                           (NIGHT): 63.32
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-11-2020 13:49:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: heast.te             Time Period: Day/Night 16/8 hours
Description: ***Sound levels at east/west facade***

Road data, segment # 1: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Dundas (day/night)
----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Dundas (day/night)
----------------------------------------
Car traffic volume  : 23983/2665  veh/TimePeriod  *
Medium truck volume :   421/47    veh/TimePeriod  *
Heavy truck volume  :   347/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  27500
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.70
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: Dundas (day/night)
```

```
----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.70 / 38.70  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.09 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  68.98   0.00  -2.22  -3.01   0.00   0.00   0.00
63.75
-------------------------------------------------------------------------
---

Segment Leq : 63.75 dBA

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

Source height = 1.09 m

ROAD (0.00 + 61.85 + 0.00) = 61.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  68.98   0.00  -4.12  -3.01   0.00   0.00   0.00
61.85
-------------------------------------------------------------------------
---

Segment Leq : 61.85 dBA

Total Leq All Segments: 65.91 dBA

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

Source height = 1.09 m

ROAD (0.00 + 57.24 + 0.00) = 57.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
```

```
-------------------------------------------------------------------------
---
     0     90   0.00  62.47   0.00  -2.22  -3.01   0.00   0.00   0.00
57.24
-------------------------------------------------------------------------
---

Segment Leq : 57.24 dBA

Results segment # 2: Dundas (night)
-----------------------------------

Source height = 1.09 m

ROAD (0.00 + 55.34 + 0.00) = 55.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
     0     90   0.00  62.47   0.00  -4.12  -3.01   0.00   0.00   0.00
55.34
-------------------------------------------------------------------------
---

Segment Leq : 55.34 dBA

Total Leq All Segments: 59.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.91
                           (NIGHT): 59.40
Location 10 potential OLA at east,  Area E
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-11-2020 13:50:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: heola.te             Time Period: 16 hours
Description: ***Potential east OLA, ground level***, with mitigation

Road data, segment # 1: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Dundas
----------------------------
Angle1   Angle2           : -35.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.80 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            : -35.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Dundas
----------------------------
Angle1   Angle2           : -35.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  32.70 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            : -35.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.50 m
```

```
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Dundas
---------------------------

Source height = 1.09 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.50 !        1.42 !         1.42

ROAD (0.00 + 53.30 + 0.00) = 53.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -35     90   0.00  68.98   0.00  -1.21  -1.58   0.00   0.00 -12.89
53.30
-------------------------------------------------------------------------
---

Segment Leq : 53.30 dBA

Results segment # 2: Dundas
---------------------------

Source height = 1.09 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.50 !        1.45 !         1.45

ROAD (0.00 + 51.55 + 0.00) = 51.55 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -35     90   0.00  68.98   0.00  -3.38  -1.58   0.00   0.00 -12.46
51.55
-------------------------------------------------------------------------
---

Segment Leq : 51.55 dBA
```

Location 10, potential east OLA, Area E

```
Total Leq All Segments: 55.52 dBA

TOTAL Leq FROM ALL SOURCES:       55.52
```

```
STAMSON 5.0        NORMAL REPORT        Date: 19-11-2020 13:50:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: hrola.te             Time Period: 16 hours
Description:  Potential OLA on roof with minimum 1.07 m high solid
parapet

Road data, segment # 1: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Dundas
----------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 m
Receiver height           :   1.60 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
Elevation                 :   0.00 m
Barrier receiver distance :   8.00 m
Source elevation          :   0.00 m
Receiver elevation        :  18.00 m
Barrier elevation         :  18.00 m
Reference angle           :   0.00

Road data, segment # 2: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Dundas
----------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 m
Receiver height           :   1.50 m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
```

```
Elevation                 :  18.00 m
Barrier receiver distance :   8.00 m
Source elevation          :   0.00 m
Receiver elevation        :  18.00 m
Barrier elevation         :  18.00 m
Reference angle           :   0.00

Results segment # 1: Dundas
--------------------------

Source height = 1.09 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.60 !       -4.32 !        13.68

ROAD (0.00 + 51.41 + 0.00) = 51.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  68.98   0.00  -2.22   0.00   0.00   0.00 -15.35
51.41
-------------------------------------------------------------------------
---

Segment Leq : 51.41 dBA

Results segment # 2: Dundas
--------------------------

Source height = 1.09 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.50 !       -4.39 !        13.61

ROAD (0.00 + 51.30 + 0.00) = 51.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90     90   0.00  68.98   0.00  -2.22   0.00   0.00   0.00 -15.46
51.30
-------------------------------------------------------------------------
---

Segment Leq : 51.30 dBA
```

Total Leq All Segments: 54.37 dBA

TOTAL Leq FROM ALL SOURCES: 54.37
Location 10 potential OLA on roof, Area E

```
STAMSON 5.0        NORMAL REPORT        Date: 19-11-2020 13:51:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: hsola.te             Time Period: 16 hours
Description:  Potential OLA to south of building, ground level

Road data, segment # 1: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Dundas
----------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            : -85.00 deg   Angle2 : 80.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :   0.50 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Dundas
------------------------------
Car traffic volume  : 23983 veh/TimePeriod  *
Medium truck volume :   421 veh/TimePeriod  *
Heavy truck volume  :   347 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Dundas
----------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with
barrier)
Barrier angle1            : -85.00 deg   Angle2 : 85.00 deg
Barrier height            :  16.00 m
```

```
Barrier receiver distance :   0.50 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Dundas
---------------------------

Source height = 1.09 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.50 !        1.49 !         1.49

ROAD (39.22 + 45.59 + 44.22) = 48.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
---
   -90    -85   0.66  68.98   0.00  -5.00 -24.76   0.00   0.00   0.00
39.22
-------------------------------------------------------------------------
---
   -85     80   0.00  68.98   0.00  -3.01  -0.38   0.00   0.00 -20.00
45.59
-------------------------------------------------------------------------
---
    80     90   0.66  68.98   0.00  -5.00 -19.76   0.00   0.00   0.00
44.22
-------------------------------------------------------------------------
---

Segment Leq : 48.51 dBA

Results segment # 2: Dundas
---------------------------

Source height = 1.09 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.09 !        1.50 !        1.49 !         1.49

ROAD (39.22 + 45.72 + 39.22) = 47.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
```

```
-------------------------------------------------------------------------
---
   -90    -85   0.66  68.98   0.00  -5.00 -24.76   0.00   0.00   0.00
39.22
-------------------------------------------------------------------------
---
   -85     85   0.00  68.98   0.00  -3.01  -0.25   0.00   0.00 -20.00
45.72
-------------------------------------------------------------------------
---
    85     90   0.66  68.98   0.00  -5.00 -24.76   0.00   0.00   0.00
39.22
-------------------------------------------------------------------------
---

Segment Leq : 47.33 dBA

Total Leq All Segments: 50.97 dBA

TOTAL Leq FROM ALL SOURCES:       50.97
```

Location 8, Area D

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 11:08:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Dwellings flanking onto Millcroft Road


Road data, segment # 1: Millcroft (day/night)
----------------------------------------------
Car traffic volume  :  6039/671   veh/TimePeriod  *
Medium truck volume :   187/21    veh/TimePeriod  *
Heavy truck volume  :     0/0     veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   6749
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :   1.00
    Medium Truck % of Total Volume     :   3.00
    Heavy Truck  % of Total Volume     :   0.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: Millcroft (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

ROAD (0.00 + 59.50 + 0.00) = 59.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  59.50   0.00   0.00   0.00   0.00   0.00   0.00  59.50
-------------------------------------------------------------------------------
```


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Location 8, Area D

```
Segment Leq : 59.50 dBA

Total Leq All Segments: 59.50 dBA

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

Source height = 0.50 m

ROAD (0.00 + 52.98 + 0.00) = 52.98 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  52.98   0.00   0.00   0.00   0.00   0.00   0.00  52.98
-------------------------------------------------------------------------------

Segment Leq : 52.98 dBA

Total Leq All Segments: 52.98 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.50 dBA
                           (NIGHT): 52.98 dBA
```

Location 8, ola Area D

```
STAMSON 5.0        NORMAL REPORT        Date: 04-05-2020 11:12:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: iola.te              Time Period: 16 hours

Description: OLA of dwellings flanking onto Millcroft Road


Road data, segment # 1: Millcroft
---------------------------------
Car traffic volume  :  6039 veh/TimePeriod  *
Medium truck volume :   187 veh/TimePeriod  *
Heavy truck volume  :     0 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Millcroft
-------------------------------
Angle1   Angle2           : -90.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  18.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 45.00 deg
Barrier height            :   2.00 m
Barrier receiver distance :  10.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Road data, segment # 2: Millcroft
---------------------------------
Car traffic volume  :  6039 veh/TimePeriod  *
Medium truck volume :   187 veh/TimePeriod  *
Heavy truck volume  :     0 veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: Millcroft
-------------------------------
Angle1   Angle2           :  45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0
```


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```
Surface                    :      2       (Reflective ground surface)
Receiver source distance   :  18.00 m
Receiver height            :   1.50 m
Topography                 :      2       (Flat/gentle slope; with barrier)
Barrier angle1             :  45.00 deg   Angle2 : 90.00 deg
Barrier height             :   7.00 m
Barrier receiver distance  :   3.00 m
Source elevation           :   0.00 m
Receiver elevation         :   0.00 m
Barrier elevation          :   0.00 m
Reference angle            :   0.00

Results segment # 1: Millcroft
------------------------------

Source height = 0.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        0.94 !         0.94

ROAD (0.00 + 49.24 + 0.00) = 49.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     45   0.00  59.50   0.00  -0.79  -1.25   0.00   0.00  -8.21  49.24
-------------------------------------------------------------------------------

Segment Leq : 49.24 dBA

Results segment # 2: Millcroft
------------------------------

Source height = 0.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.33 !         1.33

ROAD (0.00 + 36.45 + 0.00) = 36.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    45     90   0.00  59.50   0.00  -0.79  -6.02   0.00   0.00 -16.23  36.45
```

Location 8, ola Area D

Segment Leq : 36.45 dBA

Total Leq All Segments: 49.46 dBA

TOTAL Leq FROM ALL SOURCES: 49.46 dBA

APPENDIX E

City of Burlington Comments and HGC Engineering Responses

HGC ENGINEERING

Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203
Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044

November 13, 2020

Frank Bon
E: Frank Bon frank@fbdevconsulting.com

Re: Responses to City of Burlington Comments dated November 6, 2020, Noise and Vibration Feasibility Study, Proposed Residential Development, Millcroft Greens Corporation, Burlington, Ontario dated October 6, 2020

Dear Frank,

We are in receipt of the City of Burlington's comments dated November 6, 2020 in reference to our noise study entitled, "Noise and Vibration Feasibility Study, Proposed Residential Development, Millcroft Greens Corporation, Burlington, Ontario" dated October 6, 2020. The City's comments related to noise and vibration are *italicized* below followed by HGC Engineering's responses.

10. Please revise the Noise and Vibration Feasibility Study prepared by HGC Engineering, dated October 6, 2020 as follows:

d. Please clearly state in the noise report that the development blocks are considered Class 1 properties.

Noted. This will be included in the updated noise study.

e. Please use the same identification for the blocks as the other reports. i.e. Area A, B, etc., please also avoid confusion with prediction locations having the same lettering.

Noted. This will be included in the updated noise study.

f. Please assess the proposed 6 story condo as a possible stationary source on existing adjacent residential. Please provide comments/recommendations on locations of rooftop/at grade mechanical and underground parking/venting, mitigation strategies, etc. We acknowledge and appreciate that detailed design for the proposed 6 storey building is likely not available, however, we trust that HGC in consultation with the architect has experience on similar projects and could provide expert opinion on estimated mechanical requirements for the building that would produce noise. We need to clearly see in the report that the proposed 6 story building will not be a source of noise to the existing adjacent residential.

The City is correct in noting that the details of the mechanical equipment and underground parking/venting are not yet available. These will be reviewed at the SPA stage when the details are available. It is likely that the majority of rooftop mechanical equipment will be housed in a mechanical penthouse on the roof of the proposed 6-storey building. Any rooftop equipment not housed in the penthouse will be assessed and sufficiently shielded from neighbouring residences, as needed. It is noted that the residences (sensitive receptors) in the area are all 2-storeys in height. In HGC Engineering's experience, the roof edge and height of the proposed 6-storey building will

sufficiently shield any rooftop equipment that is not housed inside the penthouse. These will be verified at the detailed stage.

It is also HGC Engineering's experience with numerous developments, that typical HVAC equipment and parking garage exhaust fans can meet the applicable MECP noise criteria at neighbouring residential uses, either with low noise emission fans or relocation of the fans or through mitigation. Prior to building permit, an acoustical consultant should review the mechanical drawings and details of potential exhaust vents/fans, when available, to help ensure that the noise impact of the development on the environment, and of the development on itself, are maintained within acceptable levels.

g. Please clarify in the report who is responsible for installation of noise control measures (i.e. builder) and who is responsible for maintenance (i.e. homeowner, condo corp., other). The Pre-Consultation Checklist indicated "Includes technical details and clarifies the responsibility for the implementation and maintenance of the required noise measures".

Typically, noise control measures will be installed prior to occupancy. Maintenance is typically the responsibility of the condo corporation for common element features.

h. Please address construction related vibration on neighboring dwellings. Is construction related vibration a concern? If so, for all areas? If so, what are the recommended precondition survey limits and vibration monitoring during construction?

Please see response to 12. e. below.

i. Figure 2b should be updated to provide general (recommended) location of the underground parking vents/fans, rooftop mechanical, emergency generator, etc.

This will be completed at the detailed noise study stage, at SPA. Please see response to f.

j. Please provide an additional prediction location for the (top) area on Figure 2c at the worst-case scenario for the 16 lot pod, we acknowledge that it is probably similar to "I" but need to see the values in the table.



Figure 1 - Key Plan



Figure 2c - Proposed Development Concept Plan Showing Prediction Locations

A prediction location was not included for "the top area on Figure 2c" since that area is far from the major roadways (Dundas, Millcroft, Upper Middle Road) with traffic. The closest proposed residential lot is approximately 65 m from Berwick Drive with one row of existing dwellings. Berwick Drive is a low volume residential road and does not have significant traffic volumes. The sound levels at the additional prediction location is expected to be <55 dBA during the daytime hours and <50 dBA during the nighttime hours.

k. Tables 4 and 5, please either add columns for mitigated estimated noise levels or provide additional table(s) for mitigated noise levels for all prediction locations.

Outdoor predicted sound levels at the facade will remain the same even with mitigation. The City should clarify this request.

The Outdoor Living Area (OLA) sound levels with the proposed mitigation has been provided in Table 6.

l. As per the pre-consultation notes please provide the actual noise measurements taken from the site visit, including supporting information, date, weather, calibration, equipment, etc.

Actual noise measurements are not required by the Ministry of Environment, Conservation and Parks (MECP). Noise studies are based on sound level predictions from traffic data. Appropriate mitigation measures are recommended based on the predicted sound levels.

m. There is correspondence from Halton and CNR regarding traffic/train counts but not the City of Burlington, only handwritten notes, please include the correspondence from the City regarding traffic counts.

The traffic data from the City of Burlington was obtained through a phone conversation, hence, the hand written notes on the *Conversation Record*. In the revised noise study, we can attempt to obtain email correspondence including the traffic data from the City of Burlington.

n. For prediction location H, please also provide prediction values for the OLA, at grade and/or rooftop

The site plan does not indicate an OLA location. The following table provides the additional noise predictions for location H, as requested.

Balconies less than 4 m in depth are not considered as outdoor living areas and are exempt from road traffic noise assessments.

Table 1: Future Daytime and Nighttime Traffic Sound Levels, Without Mitigation [dBA]

Prediction Location	Description	Daytime – at Façade Total ($L_{EQ-16hr}$)	Nighttime – at Façade Total (L_{EQ-8hr})
[H]	6-storey condo with exposure to Dundas Street West, 6th floor	70	63
	6-storey condo with exposure to Dundas Street West, 1st floor	70	63
	6-storey condo, east/west façade with some exposure to Dundas Street West, 6th floor	66	59
	6-storey condo, east/west façade with some exposure to Dundas Street West, 1st floor	66	59
	6-storey condo, south façade, 6th floor	<55	<50
	6-storey condo, south façade, 1st floor	<55	<50
	Potential OLA to east, ground level	68	--
	Potential OLA to south of building, ground level	55	--
	Potential OLA on roof+	55	--

Note: + including minimum 1.07 m high solid parapet

o. For prediction location H, the receptor height in the Stamson calculation is noted as 16.5m, the top floor? Please also provide a receptor for the ground floor (if residential units on the ground floor) or the 2nd floor (if that's where the residential units start)

Please see Table 1 in Item n. above.

p. For prediction location H, please provide receptors for each side of the building (ground/first and top floor)

Please see Table 1 in Item n. above.

q. As per the Pre-Consultation Notes, please provide an area context plan showing & labelling sources of noise (roads, rail, buildings, commercial, etc.), including distance from receptor to source of noise

Noted. Figure 1b shows the main noise sources.

12. e. Include a section that addresses vibration from construction activities, whether or not it is a concern and if so, recommendations for pre-condition survey/vibration monitoring during construction. This could also be addressed by the acoustical consultant.

In our experience, vibration studies during construction are not generally required for single family homes in the area.

13. c. Include a section that addresses vibration from construction activities, whether or not it is a concern, and if so, and recommendations for pre-condition survey/vibration monitoring during construction. This could also be addressed by the acoustical consultant.

Upon submission of a site plan application, details of the apartment building will be determined, such as underground parking levels and the method of construction and excavation of the site.

Although some municipalities, such as the City of Toronto, routinely require an assessment and subsequent vibration monitoring to address potential concerns related to construction vibration, most do not. In our experience, such assessments are routinely conducted only in municipalities that require them.

In Burlington, a City of Burlington Report, Report CW-27-19, dated September 9, 2019 discusses the need for studies assessing construction vibration, but it is not clear when this requirement could be expected to apply. For example, in this case, does it apply to all four areas, or only for the six-storey building? Burlington will need to clarify this.

If an assessment of construction vibration is required, HGC Engineering has the capability to provide this service. Typically, this is needed at SPA of at the construction permit stage and when details of the construction process are known.

Summary

It is our understanding that a comprehensive noise and vibration study will need to be updated with all of the various comments from the agencies incorporated.

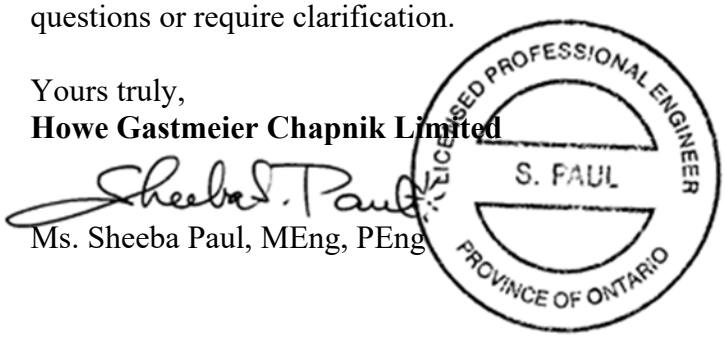
Many of the comments relate to details that are not available at this stage. When details are available at SPA, HGC Engineering will update the information, provide calculations and mitigation, as necessary and as required.

Minor comments have been addressed above and do not change the overall recommendations of the noise and vibration report.

In summary, the recommendations and conclusions of the noise report do not change from previous versions. Detailed noise studies will be needed for the properties closest to Dundas Street and Upper Middle Road, to refine the acoustic requirements.

Trusting this information is sufficient for your present purposes. Please call if you have any further questions or require clarification.

Yours truly,
Howe Gastmeier Chapnik Limited



Ms. Sheeba Paul, MEng, PEng