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Noise and Vibration Feasibility Study
Proposed Residential Development
2155 Country Club Drive and 4272 Dundas Street
Millcroft Greens Corporation
Burlington, Ontario

Prepared for:

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Table of Contents

1 Introduction and Summary 1

2 Site Description and Sources of Sound 2

3 Criteria for Acceptable Sound Levels 3

3.1 Ground-borne Vibration from Rail Traffic 5

4 Traffic Sound Level Assessment 5

4.1 Road Traffic Data 5

4.2 Rail Traffic Data 6

4.3 Road and Rail Traffic Noise Predictions 7

5 Traffic Noise Recommendations 10

5.1 Outdoor Living Areas 10

5.2 Indoor Living Areas 13

5.3 Building Façade Constructions 14

5.4 Rail Vibration Impact 17

5.5 Warning Clauses 17

6 Impact of the Proposed Development on Itself 20

7 Impact of the Proposed Development on the Environment 20

8 Summary and Recommendations 21

8.1 Implementation 24

Figure 1a: Key Plan
Figure 1b: Key Plan Showing "Areas" of Development
Figure 2a – 2c: Proposed Development Concept Plans Showing Prediction Locations
Figure 3a – 3c: Proposed Development Concept Plans Showing Barrier and Ventilation Requirements
Figure 3d: Proposed Grading Plan For Areas A and B
Figure 4-8a: Pass-bys: Measured Vibratory Velocity Level
Figure 4-8b: Pass-bys: Acceleration Spectrum @ Peak Level (1 sec. Duration)

Appendix A: CN Principal Main Line Requirements
Appendix B: Road Traffic Data
Appendix C: Rail Traffic Data
Appendix D: Sample STAMSON 5.04 Output
Appendix E: HGC Engineering Responses to Comments from the City, Region, and CN Railway

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 Region of Halton's comments dated April 23, 2021, City of Burlington's Comments dated September 22, 2021, and Peer Review comments dated September 8, 2021 prepared by Jade Acoustics, included in Appendix E. Updated traffic data has also been included in this study

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 and protects the proposed rear yards of lots adjacent to the railway line. Central air conditioning is required for dwellings closest to the railway, Dundas Street West, and Upper Middle Road. 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 veneer or a masonry equivalent exterior wall 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) prepared by Gerrard Design dated February 23, 2022; and proposed site plan (Area E) prepared by Kirkor Architects and Planners last revised December 20, 2021, 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.

There are no airports located in the vicinity of the subject sites and aircraft noise is not expected to be a concern. There are also no sources of impulsive sounds in the vicinity of the subject sites.

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.

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

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

Site along Dundas Street West (Refer to Figure 2c) – 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.

3 Criteria for Acceptable Sound Levels

Guidelines for acceptable levels of road and rail traffic noise impacting residential developments are outlined 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 Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) “Guidelines for New Development in Proximity to Railway Operations”, dated May 2013 (RAC/FCM guidelines were also reviewed dated November 2006). 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 veneer or a masonry equivalent construction for 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.

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 1.2% was provided and split into 0.8% medium trucks and 0.4% 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 3.4% was provided and split into 2.3%

medium trucks and 1.1% 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 2032 used in the analysis.

Table 2: Road Traffic Data

Road Name		Cars	Medium Trucks	Heavy Trucks	Total
Upper Middle Road *Ultimate*	Daytime	27 714	224	112	28 050
	Nighttime	4 890	40	20	4 950
	Total	**32 604**	**264**	**132**	**33 000**
Dundas Street West *Ultimate*	Daytime	47 818	1 138	544	49 500
	Nighttime	5 314	126	60	5 500
	Total	**53 132**	**1 264**	**604**	**55 000**
Millcroft Park Drive *2032 Projected*	Daytime	6 345	196	0	6 541
	Nighttime	705	22	0	727
	Total	**7 050**	**218**	**0**	**7 268**

4.2 Rail Traffic Data

Rail traffic data for typical operations of the CN Halton Subdivision was obtained from CN personnel, 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 2032 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 2032

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	63	63	66	65
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	66	60	67	66
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	62	<55	62	61
B	[4]	Lot with backing exposure to railway	<55	65	65	58
B	[5]	Lot with some exposure to railway	<55	58	58	<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
D	[8]	Lot with flanking exposure to Millcroft Park Drive	60	<55	60	58
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 5th floor roof	--	--	--	<57*

Note: * including a minimum 1.07 m solid parapet
+ Sound level prediction at most exposed façade

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	59	62	64
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	62	59	63
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	57	51	58
B	[4]	Lot with backing exposure to railway	<50	63	64
B	[5]	Lot with some exposure to railway	<50	56	56
B	[6]	Lot with some exposure to railway	<50	54	54
B	[7]	Lot with flanking exposure to Millcroft Park Drive	53	<50	53
D	[8]	Lot with flanking exposure to Millcroft Park Drive	53	<50	53
C	[9]	Interior dwellings	<50	<50	<50
E	[10]	6-storey condo with exposure to Dundas Street West, 6th floor	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 5th floor roof	--	--	--

Note: * including a minimum 1.07 m solid parapet
+ Sound level prediction at most exposed façade

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 exposure to railway

For dwellings with exposure to the railway and Upper Middle Road, a numerical computer modeling package (*Cadna-A version 2021 MR2 build: 187.5163*), was employed to create a 3-D model to assist in the determination of acoustic barrier heights for the flanking rear yards to supplement STAMSON calculations. This is due to the complex geometry at this portion of the site which includes a CN overpass, Upper Middle Road underpass, and an existing berm and acoustic fence combination along the railway. The grading plan for this area is included as Figure 3d. The road and railway noise sources were included in the model as line sources producing equivalent sound pressure levels at a reference distance to those predicted by STAMSON 5.04, a computer algorithm developed by the MECP, based on the daytime and nighttime traffic volumes presented in Section 4.1 and 4.2.

As per comments received from the Region of Halton, the location of an acoustic fence was requested to be investigated along the Upper Middle Road right-of-way and has been included in the calculations below.

The predicted sound level at prediction location [1], with backing exposure to the railway and Upper Middle Road, will be 10 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 6.4 m in height would reduce sound levels to 55 dBA. Alternatively, a 3.5 m acoustic barrier will reduce the sound level to 58 dBA. The

43 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 11 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 4.4 m in height would reduce sound levels to 55 dBA. An acoustic barrier 3.5 m in height would reduce sound levels to 57 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.

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.

The predicted sound level, at prediction location [3], with exposure to Upper Middle Road, will be up to 6 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 3.3 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 up to 58 dBA, 3 dBA in excess of the MECP's limit of 55 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. 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 2b" [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 less than 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. Physical 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 less than 55 dBA since the building itself provides shielding. Further physical mitigation is not required.

A potential OLA on 5th floor roof with a minimum 1.07 m high solid parapet is predicted to have a sound level of 57 dBA. The 2 dBA sound level excess is acceptable to the MECP with the use of a noise warning clause if it is acceptable to the municipality. Alternatively, if the parapet is extended to 2.0 m in height, the sound level in the OLA can be reduced to 55 dBA.

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 final 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	6.4	5.2	4.2	3.5	2.4
A	[2]	Lot with exposure to Upper Middle Road, some exposure to CN	4.4	3.7	2.9	2.0	--
A	[3]	Lot backing onto SWM pond, exposure to Upper Middle Road	3.3	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	--	--	--	--
D	[8]	Lot with flanking exposure to Millcroft Park Drive	2.0	--	--	--	--
C	[9]	Interior dwellings	--	--	--	--	--
E	[10]	Potential OLA to east, ground level	3.5	3.2	2.9	2.7	2.5
		Potential OLA to south of building, ground level	--	--	--	--	--
		Potential OLA on roof+	2.0	—1.4	1.07--	--	--

Note: The above barrier heights should be refined based on the dwelling siting information and final 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 veneer or a masonry equivalent 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

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.

Table 7: Preliminary Minimum Glazing Requirements

Area	Prediction Location	Space	**Minimum STC Requirement for Glazing
A	[1]	Living/Dining Rooms	*STC-30
		Bedrooms	*STC-33
A	[2]	Living/Dining Rooms	*STC-30
		Bedrooms	*STC-31
A	[3]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[4]	Living/Dining Rooms	*STC-31
		Bedrooms	*STC-35
B	[5]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[6]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
B	[7]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
D	[8]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
C	[9]	Living/Dining Rooms	+OBC
		Bedrooms	+OBC
E	[10] North	Living/Dining Rooms	+STC-34
		Bedrooms	+STC-32
E	[10] East/West/ South	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 veneer or masonry equivalent exterior wall construction.

5.4 Rail Vibration Impact

Measurements were performed on the site at grade on January 9 and January 18, 2019, 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.

Suggested wording by the Region of Halton for dwellings along Upper Middle Road is given below:

Type G:

> Purchasers are advised that the construction of elevated decks within their yards may compromise the effectiveness of the noise mitigation measures and controls which have been established within the subdivision for their lots.

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 H:

> Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 meters 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

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. When final siting/grading information is available, the acoustic barrier requirements should be refined.

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 vener or a masonry equivalent 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 veneer or a masonry equivalent 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 final 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, H	[1] LRDR: STC-30 [1] BR: STC-33	✓
A	[2]	✓	Central A/C	B, C, E, G, H	[1] LRDR: STC-30 [1] BR: STC-31	✓
A	[3]	✓	Forced Air	A, D, E, G, H	[2] LRDR: OBC [2] BR: OBC	--
B	[4]	--	Central A/C	A, C, E, H	[1] LRDR: STC-30 [1] BR: STC-34	✓
B	[5]	--	Central A/C	A, C, E, H	[2] LRDR: OBC [2] BR: OBC	--
B	[6]	--	Forced Air	A, D, E, H	[2] LRDR: OBC [2] BR: OBC	--
B	[7]	✓	Forced Air	A, D	[2] LRDR: OBC [2] BR: OBC	--
C	[8]	✓	Forced Air	A, D	[2] LRDR: OBC [2] BR: OBC	--
E	[10]	--	Central A/C	A, C, F	[1] LRDR: STC-34 [1] BR: STC-32	--
D	[9]	--	--	--	[2] LRDR: OBC [2] BR: OBC	--

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
[1] Sound through windows only
[2] Sound through windows and walls

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.

Limitations

This document was prepared solely for the addressed party and titled project or named part thereof, and should not be relied upon or used for any other project without obtaining prior written authorization from HGC Engineering. HGC Engineering accepts no responsibility or liability for any consequence of this document being used for a purpose other than for which it was commissioned. Any person or party using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm their agreement to indemnify HGC Engineering for all loss or damage resulting therefrom. HGC Engineering accepts no responsibility or liability for this document to any person or party other than the party by whom it was commissioned.

Any conclusions and/or recommendations herein reflect the judgment of HGC Engineering based on information available at the time of preparation, and were developed in good faith on information provided by others, as noted in the report, which has been assumed to be factual and accurate. Changed conditions or information occurring or becoming known after the date of this report could affect the results and conclusions presented.



Figure 1a - Key Plan



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

- 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

PROJECT 1516
DATE FEB 23, 2022
SCALE NTS

SK-74

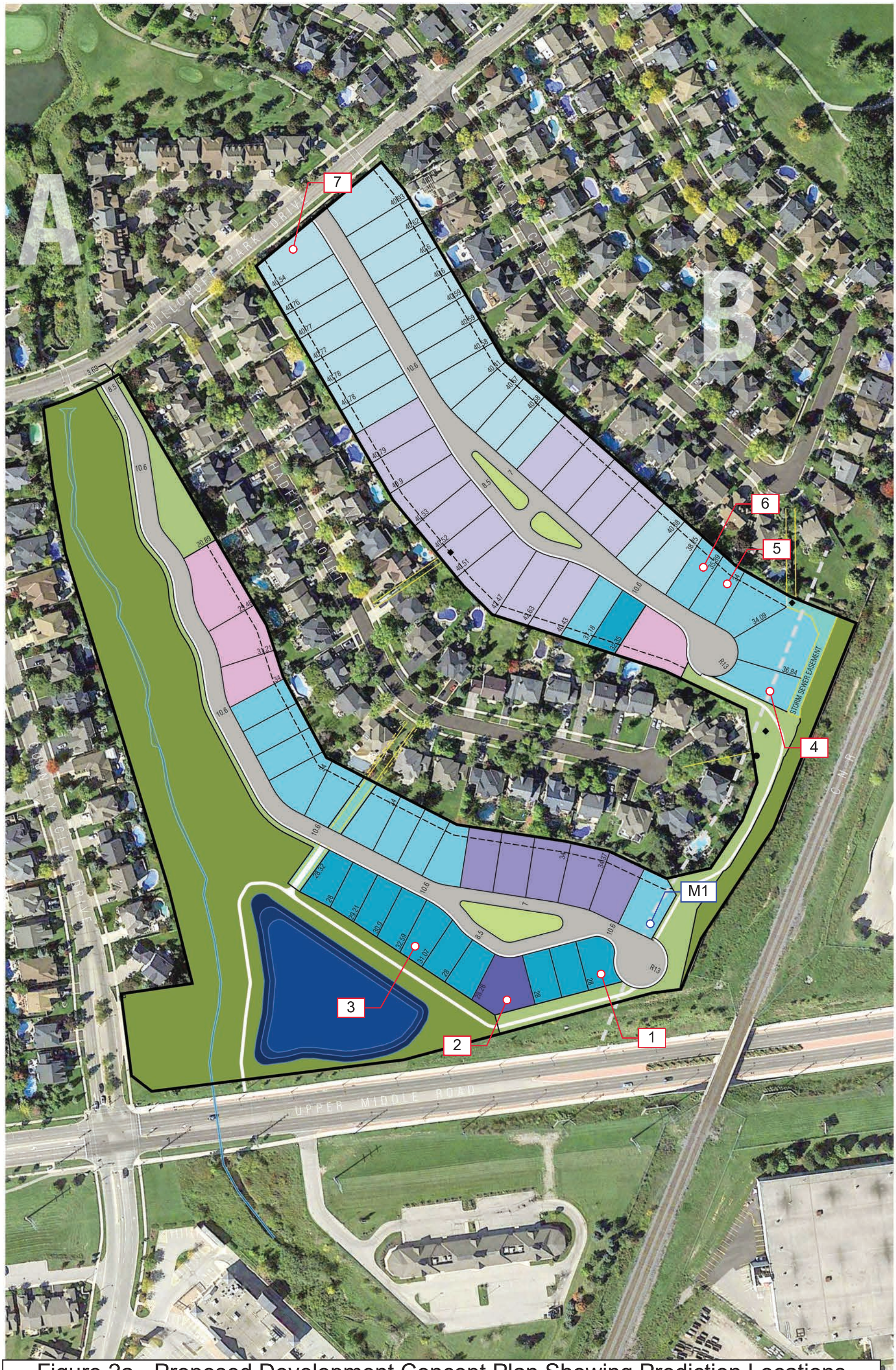


Figure 2a - Proposed Development Concept Plan Showing Prediction Locations

- All Units In Metric Unless Otherwise Noted.
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- Aerial Photo: Google Earth, Approx. Spring 2015

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Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS A & B

PROJECT 1516
DATE FEB 23, 2022
SCALE 1:2000

SK-74A&B

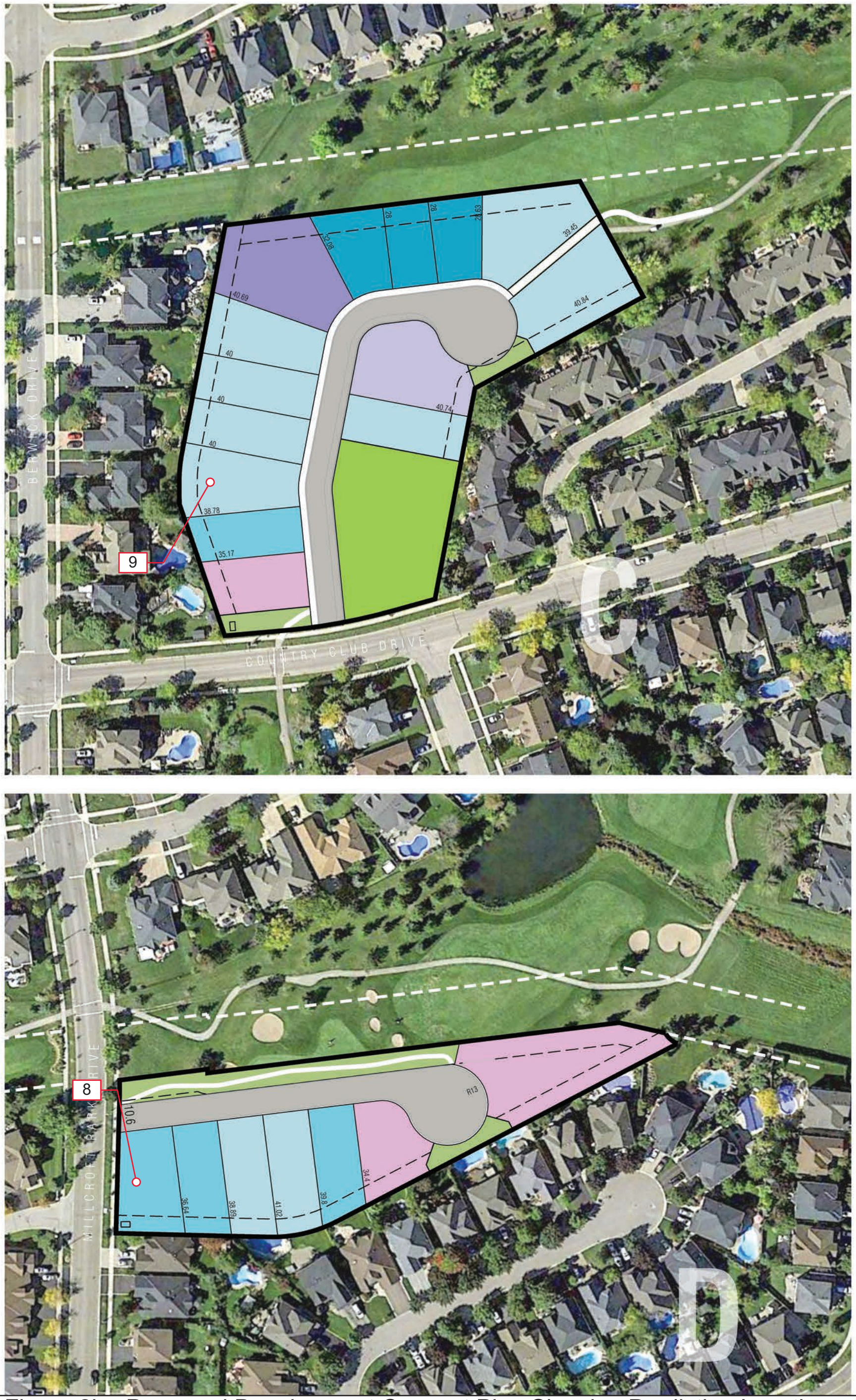


Figure 2b - Proposed Development Concept Plan Showing Prediction Locations

15.24m x 28.0m
15.24m x 34.0m
15.24m x 40.0m
18.3m x 28.0m
18.3m x 34.0m
18.3m x 40.0m
Custom Lot

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- Aerial Photo: Google Earth, Approx. Spring 2015

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Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS C & D

PROJECT 1516
DATE FEB 23, 2022
SCALE 1:1250

SK-74C&D

GENERAL INFORMATION:

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-FOR LANDSCAPE INFORMATION, PLEASE REFER TO NAK DESIGN

-FOR TRAFFIC AND TRUCK TURNING INFORMATION, PLEASE REFER TO CROZIER CONSULTING ENGINEERS

-SNOW WILL BE REMOVED FROM SITE

LOT INFORMATION:

LOT INFORMATION

FFE:

FFE AT GROUND FLOOR = 155.10

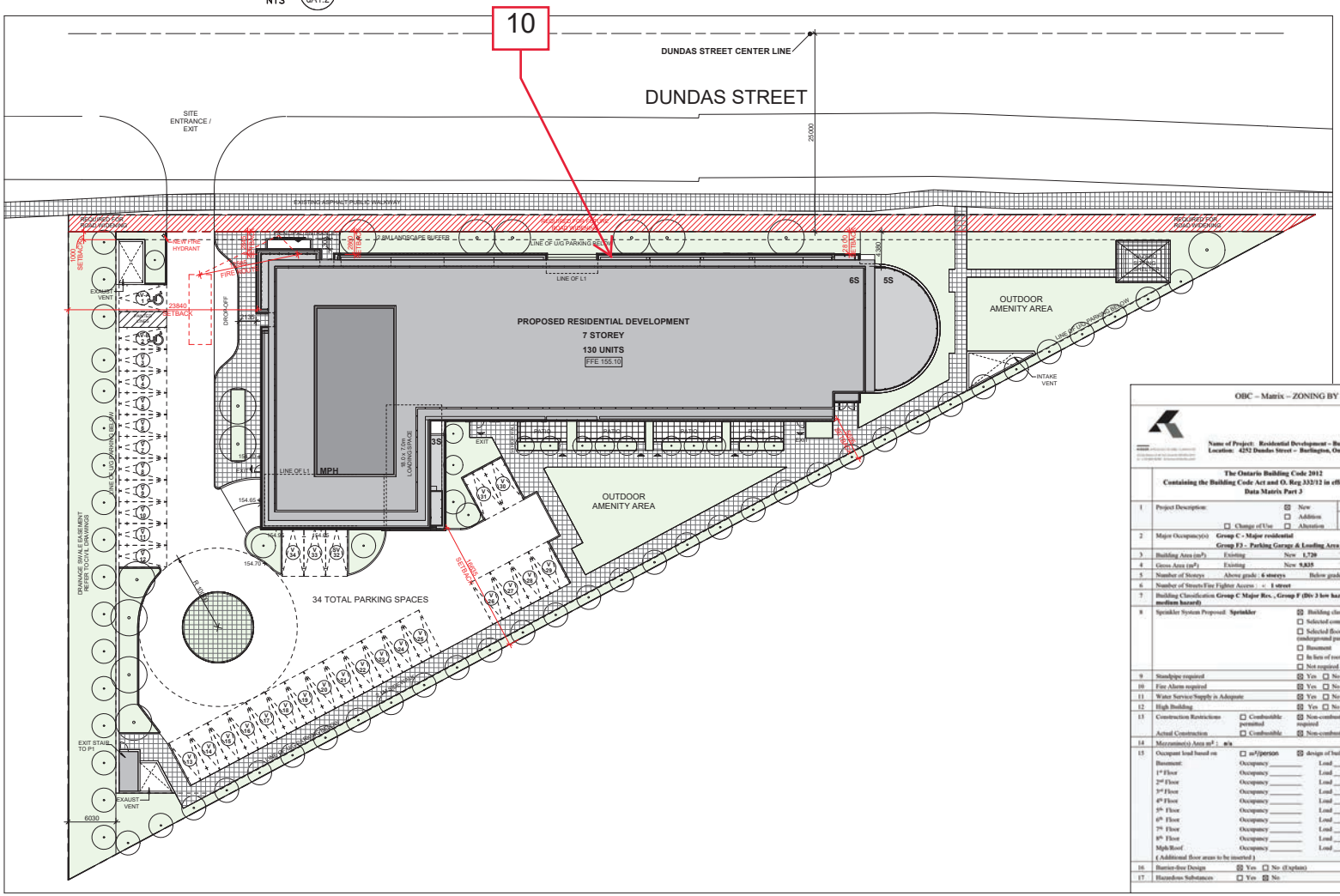
General Notes 4 dA1.2
NTS

O OCCUPANT PARKING SPACE
V VISITOR PARKING SPACE
AO - A ACCESSIBLE OCCUPANT SPACE TYPE A
AV - A ACCESSIBLE VISITOR SPACE TYPE A
AO - B ACCESSIBLE OCCUPANT SPACE TYPE B
AV - B ACCESSIBLE VISITOR SPACE TYPE B
SV SERVICE VEHICLE SPACE

1200 VERTICAL BIKE SPACE
1800 HORIZONTAL STACKED BIKE SPACE
6000 / 2750 PARKING SPACE
6000 / 3400 ACCESSIBLE PARKING SPACE A
2.0M AISLE MIN.
2750 ACCESSIBLE PARKING SPACE B

NOTE: 6M TYPICAL DRIVEWAY WIDTH IS MAINTAINED THROUGHOUT THE DEVELOPMENT

Typical Parking Space Legend 3 dA1.2
NTS



Site Plan 2 dA1.2
1 : 250

OBC Classification 1 dA1.2
NTS

OBC – Matrix – ZONING BY LAW AMENDMENT

Name of Project: Residential Development – Building with U/G parking
Location: 4252 Dundas Street – Burlington, Ontario

Seal must be signed to be valid

	The Ontario Building Code 2012 Containing the Building Code Act and O. Reg 332/12 in effect Jan 1, 2014 Data Matrix Part 3			OBC Reference (References are to Division B unless noted [A] for Division A or [C] for Division C)	
1	Project Description:	☒ New ☐ Addition ☐ Change of Use ☐ Alteration	☐ Part 11 11.1 to 11.4	☒ Part 3 1.1.2. [A]	☐ Part 9 1.1.2. [A] & 9.10.1.3.
2	Major Occupancy(s):	Group C - Major residential Group F3 - Parking Garage & Loading Area		3.1.2.1.(1)	9.10.2.
3	Building Area (m²)	Existing — New 1,720 Total 1,720		1.4.1.2. [A]	1.4.1.2. [A]
4	Gross Area (m²)	Existing — New 9,835 Total 9,835		1.4.1.2. [A]	1.4.1.2. [A]
5	Number of Storeys	Above grade: 6 storeys Below grade: 1		1.4.1.2. [A]3.2.1.1.	1.4.1.2[A] & 9.10.4
6	Number of Streets/Fire Fighter Access	- 1 street		3.2.2.10. & 3.2.5.	9.10.20.
7	Building Classification	Group C Major Res. , Group F (Div 3 low hazard, Div.2 medium hazard)		3.2.2.20.-83	9.10.2.
8	Sprinkler System Proposed:	Sprinkler	☒ Building classification ☐ Selected compartments ☐ Selected floor areas (underground parking garage only) ☐ Basement ☐ In lieu of roof rating ☐ Not required	3.2.1.5. 3.2.2.17.	9.10.8.
9	Standpipe required		☒ Yes ☐ No	3.2.9.	N/A
10	Fire Alarm required		☒ Yes ☐ No	3.2.4.	9.10.18.
11	Water Service/Supply is Adequate		☒ Yes ☐ No	3.2.5.7.	N/A
12	High Building		☒ Yes ☐ No	3.2.6.	N/A
13	Construction Restrictions	☐ Combustible permitted	☒ Non-combustible required ☐ Both	3.2.2.20.-83	9.10.6.
	Actual Construction	☐ Combustible	☒ Non-combustible ☐ Both	3.2.1.1.(3)-(8)	9.10.4.1.
14	Mezzanine(s) Area m² :	n/a		3.1.17.	9.9.1.3.
15	Occupant load based on	☐ m²/person	☒ design of building		
	Basement:	Occupancy _____	Load _____ persons		
	1st Floor	Occupancy _____	Load _____ persons		
	2nd Floor	Occupancy _____	Load _____ persons		
	3rd Floor	Occupancy _____	Load _____ persons		
	4th Floor	Occupancy _____	Load _____ persons		
	5th Floor	Occupancy _____	Load _____ persons		
	6th Floor	Occupancy _____	Load _____ persons		
	7th Floor	Occupancy _____	Load _____ persons		
	8th Floor	Occupancy _____	Load _____ persons		
	Mph/Roof	Occupancy _____	Load _____ persons		
	(Additional floor areas to be inserted)				
16	Barrier-free Design	☒ Yes ☐ No (Explain)		3.8.	9.5.2.
17	Hazardous Substances	☐ Yes ☒ No		3.3.1.2. & 3.3.1.19.	9.10.1.3.(4)

Figure 2c - Proposed Site Plan Showing Prediction Locations

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Date:

KIRKOR ARCHITECTS AND PLANNERS
20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

Revisions:

No.:	Revision:	Date:
2	ZBA Submission #2	Dec. 20, 2021
1	ZBA Submission #1	Nov. 16, 2020

Drawing Title:

Site Plan

Client:

MILLCROFT - AREA E

Project:

PROPOSED RESIDENTIAL DEVELOPMENT

4274 Dundas Street, Burlington Ontario L7R 3X4

Scale: As indicated

Drawn by: Author

Checked by: Checker

Project No.: 19-111

Date: 18/08/21

Drawing No.: dA1.2



Figure 3a - Proposed Development Concept Plan Showing Barrier, Ventilation, and Brick Exterior Wall Construction Requirements

15.24m x 28.0m
15.24m x 34.0m
15.24m x 40.0m
18.3m x 28.0m
18.3m x 34.0m
18.3m x 40.0m
Custom Lot

- All Units In Metric Unless Otherwise Noted.
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- Aerial Photo: Google Earth, Approx. Spring 2015

GERRARD DESIGN

Millcroft Greens Corporation | Burlington, Ontario

PRELIMINARY DEVELOPMENT CONCEPT - AREAS A & B

PROJECT 1516
DATE FEB 23, 2022
SCALE 1:2000

SK-74A&B

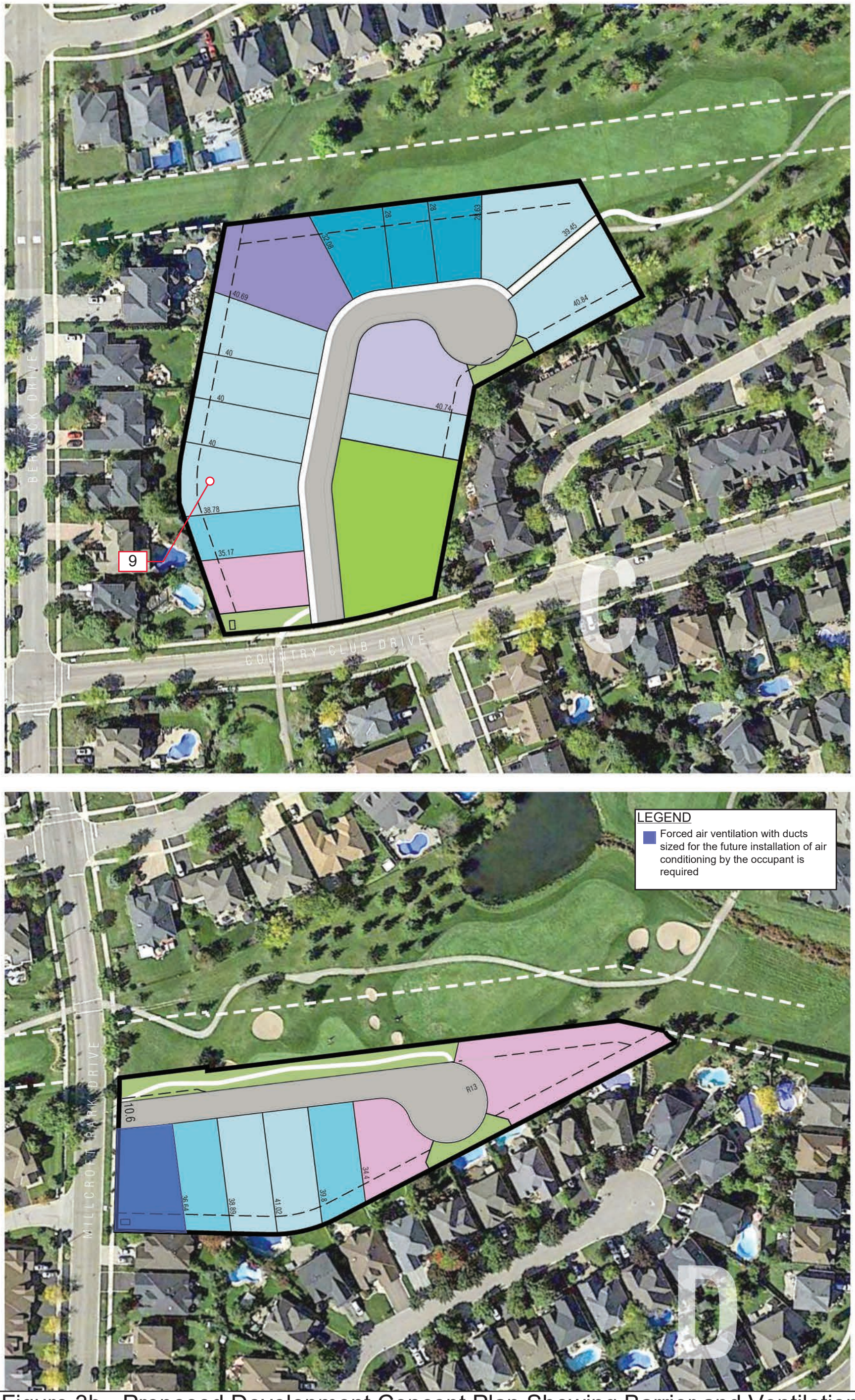


Figure 3b - Proposed Development Concept Plan Showing Barrier and Ventilation Requirements

15.24m x 28.0m
15.24m x 34.0m
15.24m x 40.0m
18.3m x 28.0m
18.3m x 34.0m
18.3m x 40.0m
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PRELIMINARY DEVELOPMENT CONCEPT - AREAS C & D

PROJECT 1516
DATE FEB 23, 2022
SCALE 1:1250

SK-74C&D

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-SNOW WILL BE REMOVED FROM SITE

LOT INFORMATION:

LOT INFORMATION

FFE:

FFE AT GROUND FLOOR = 155.10

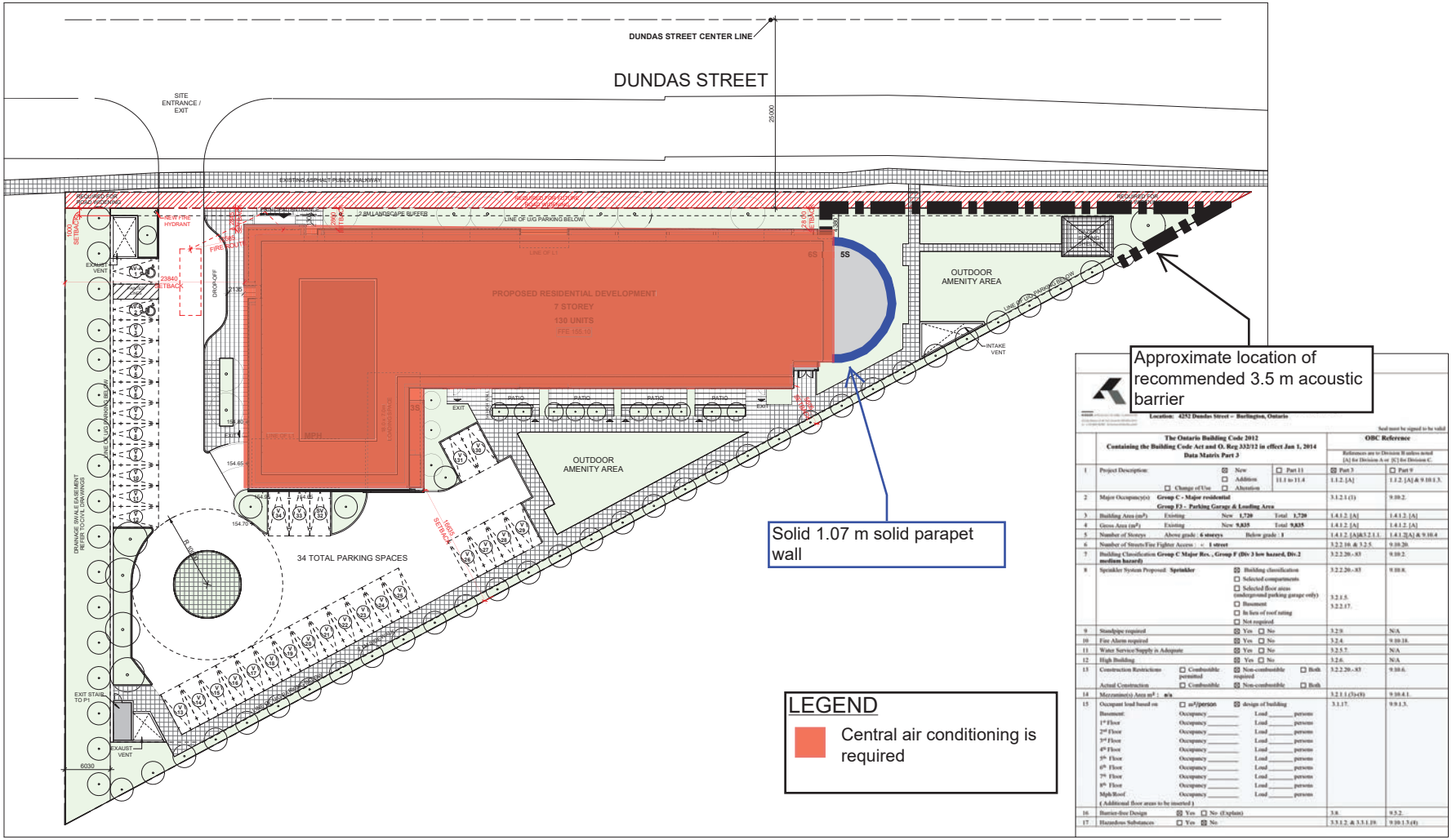
General Notes 4 dA1.2
NTS

O OCCUPANT PARKING SPACE
V VISITOR PARKING SPACE
AO - A ACCESSIBLE OCCUPANT SPACE TYPE A
AV - A ACCESSIBLE VISITOR SPACE TYPE A
AO - B ACCESSIBLE OCCUPANT SPACE TYPE B
AV - B ACCESSIBLE VISITOR SPACE TYPE B
SV SERVICE VEHICLE SPACE

1200 VERTICAL BIKE SPACE
1800 HORIZONTAL STACKED BIKE SPACE
6000 / 2750 PARKING SPACE
6000 / 3400 / 2.0M AISLE MIN. / 2750 ACCESSIBLE PARKING SPACE A / ACCESSIBLE PARKING SPACE B

NOTE: 6M TYPICAL DRIVEWAY WIDTH IS MAINTAINED THROUGHOUT THE DEVELOPMENT

Typical Parking Space Legend 3 dA1.2
NTS



LEGEND

Central air conditioning is required

Site Plan 2 dA1.2
1 : 250

OBC Classification 1 dA1.2
NTS

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TEL 416 665 6060 kirkorarchitects.com

Revisions:

No.:	Revision:	Date:
2	ZBA Submission #2	Dec. 20, 2021
1	ZBA Submission #1	Nov. 16, 2020

Drawing Title:

Site Plan

Client:

MILLCROFT - AREA E

Project:

PROPOSED RESIDENTIAL DEVELOPMENT

4274 Dundas Street, Burlington Ontario L7R 3X4

Scale:

As indicated

Drawn by:

Author

Checked by:

Checker

Project No.:

19-111

Date:

18/08/21

Drawing No.:

dA1.2

Figure 3c - Proposed Site Plan Showing Barrier and Ventilation Requirements

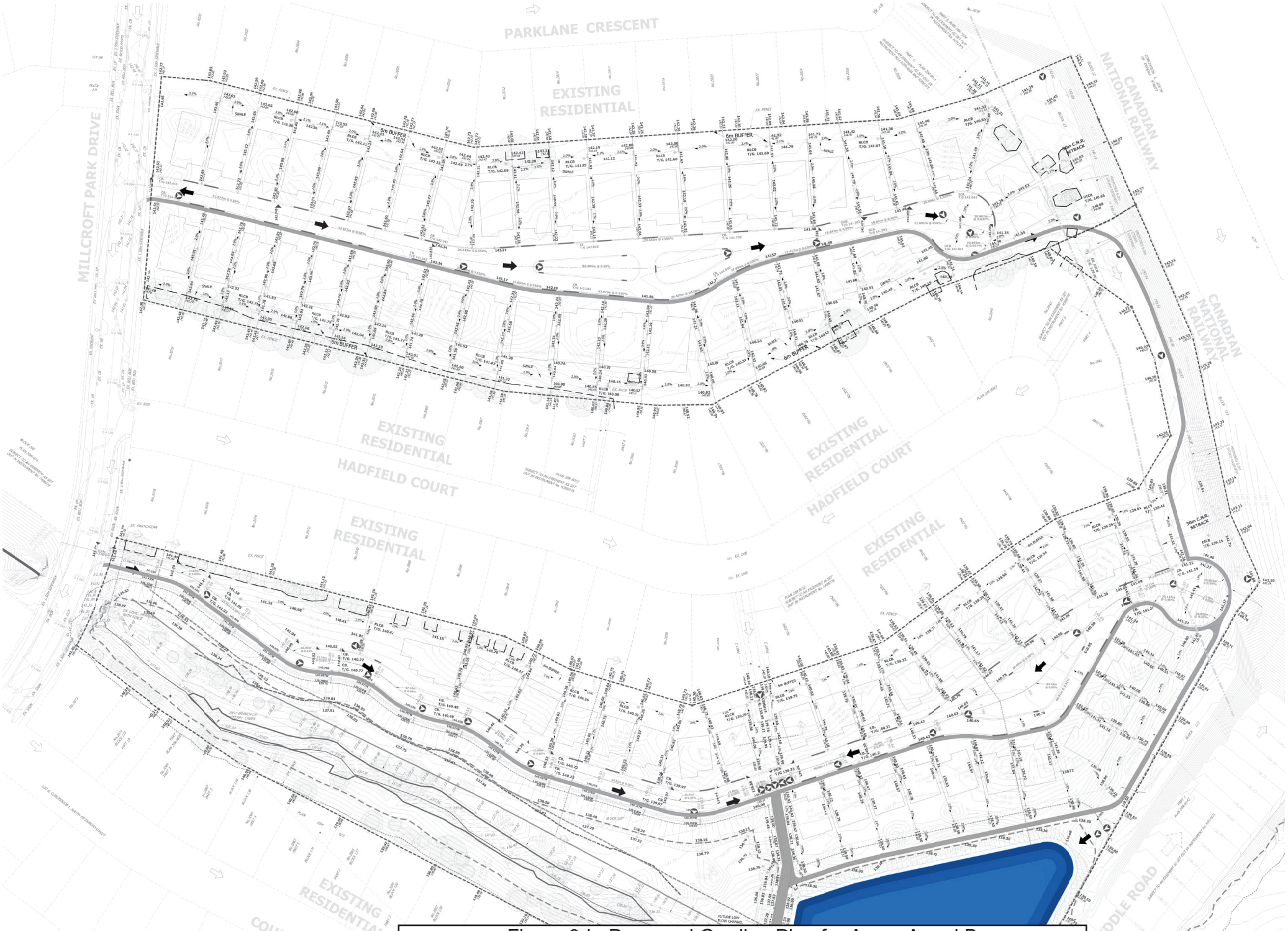


Figure 3d - Proposed Grading Plan for Areas A and B

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

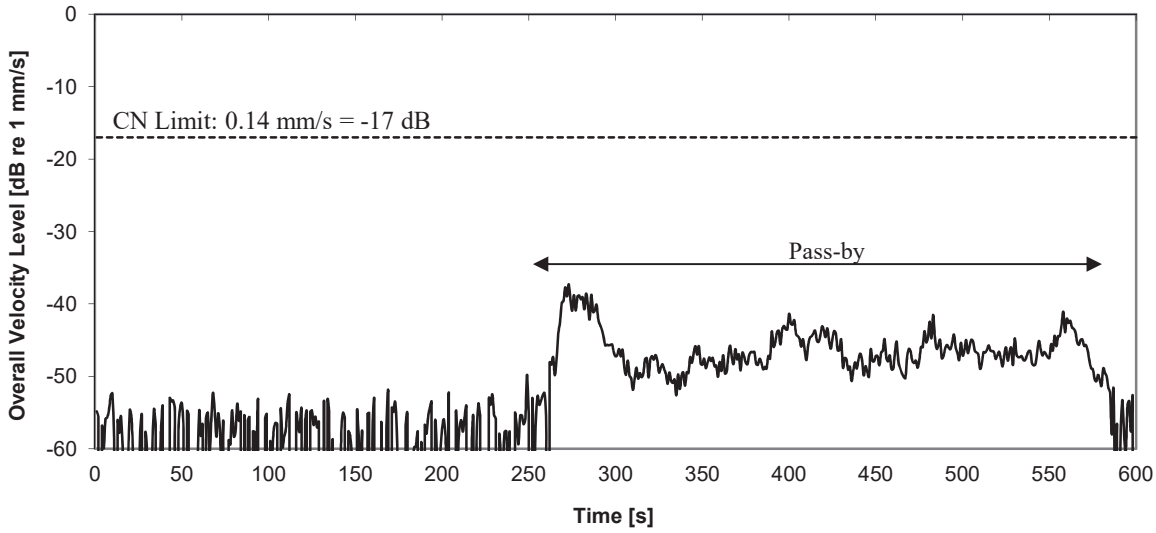


Figure 4b: Pass-by 1
Acceleration Spectrum @ Peak Level (1 sec. Duration)

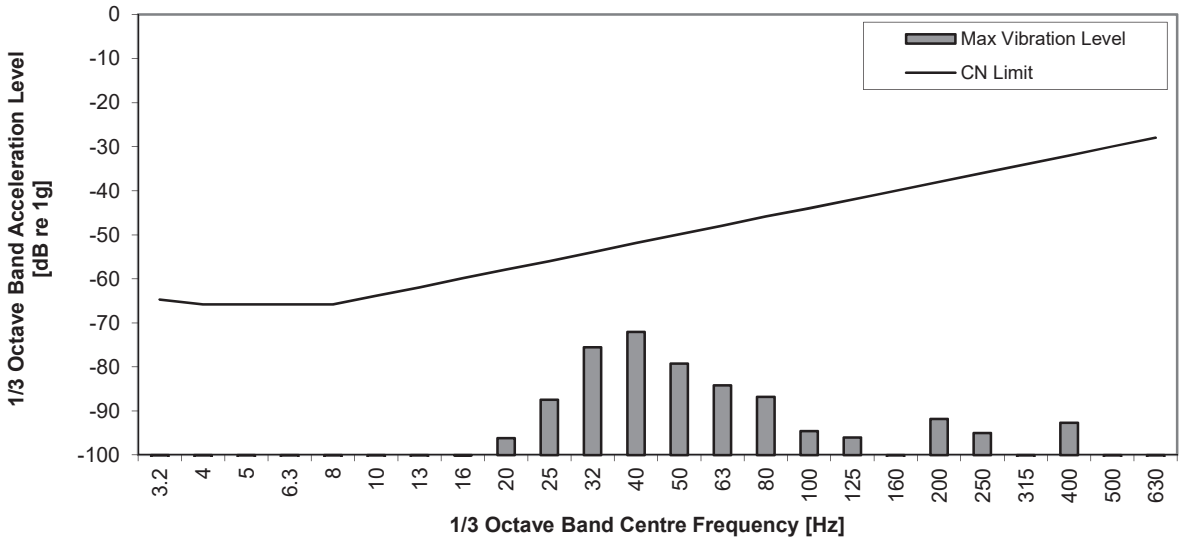


Figure 5a: Pass-by 2
Measured Vibratory Velocity Level

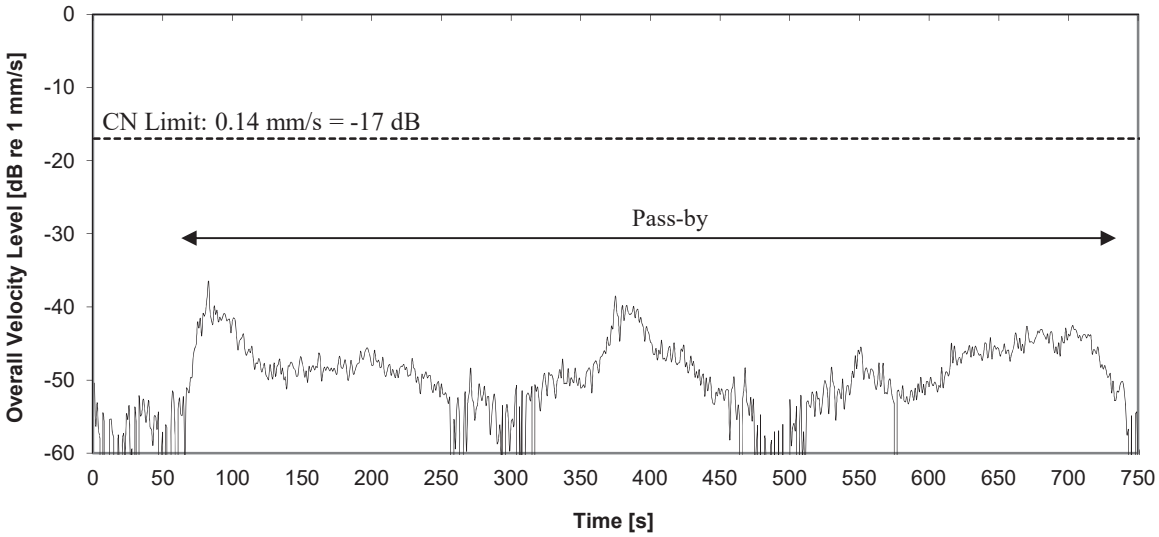


Figure 5b: Pass-by 2
Acceleration Spectrum @ Peak Level (1 sec. Duration)

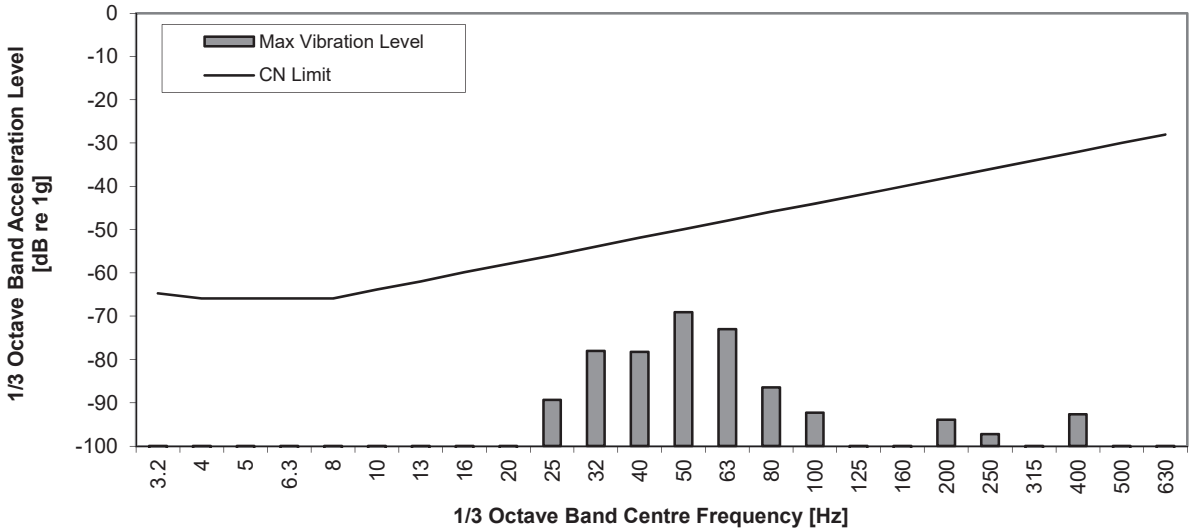


Figure 6a: Pass-by 3
Measured Vibratory Velocity Level

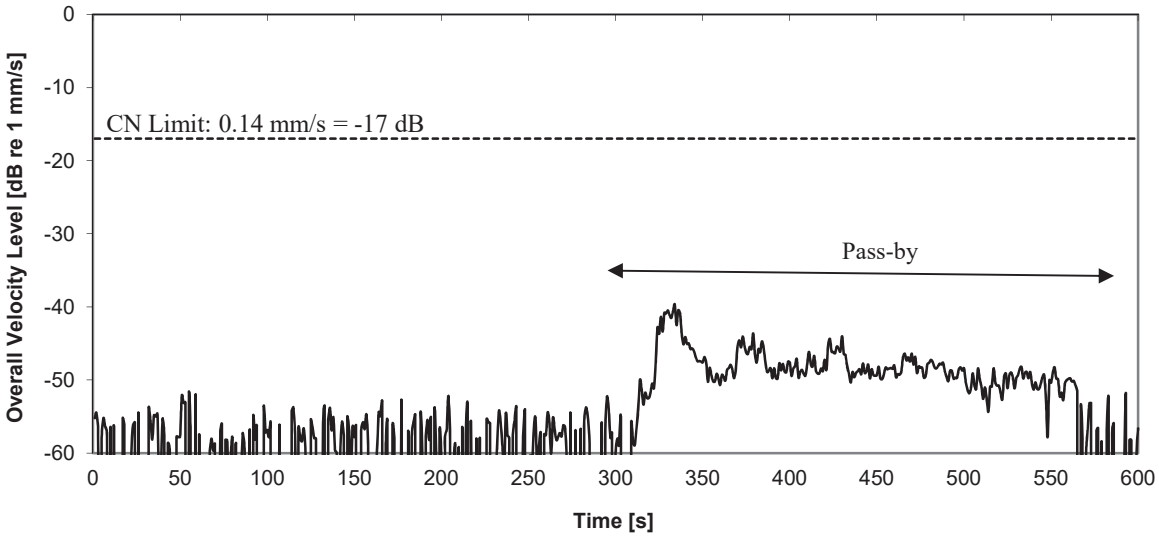


Figure 6b: Pass-by 3
Acceleration Spectrum @ Peak Level (1 sec. Duration)

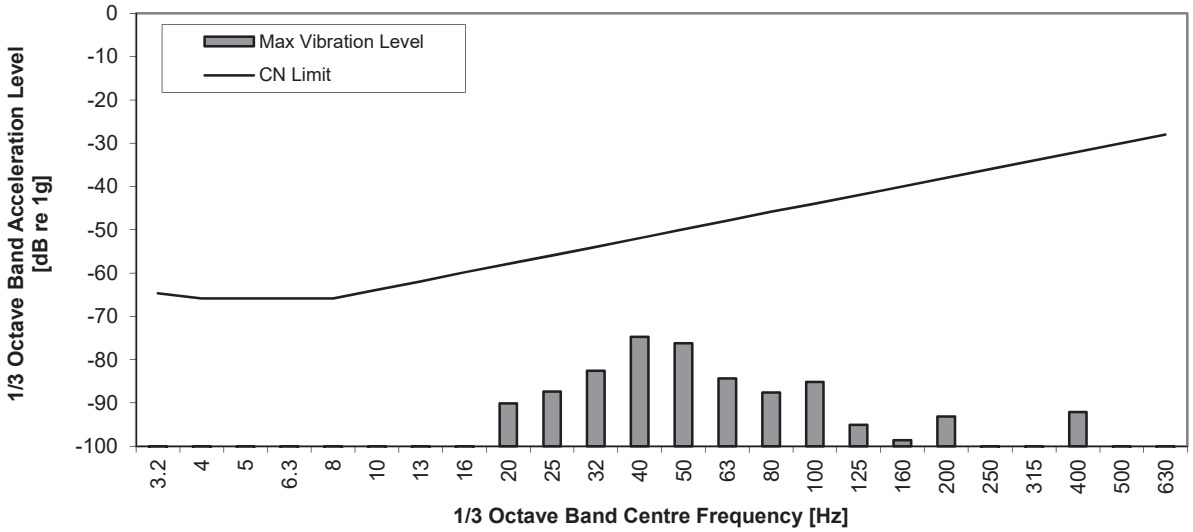


Figure 7a: Pass-by 4
Measured Vibratory Velocity Level

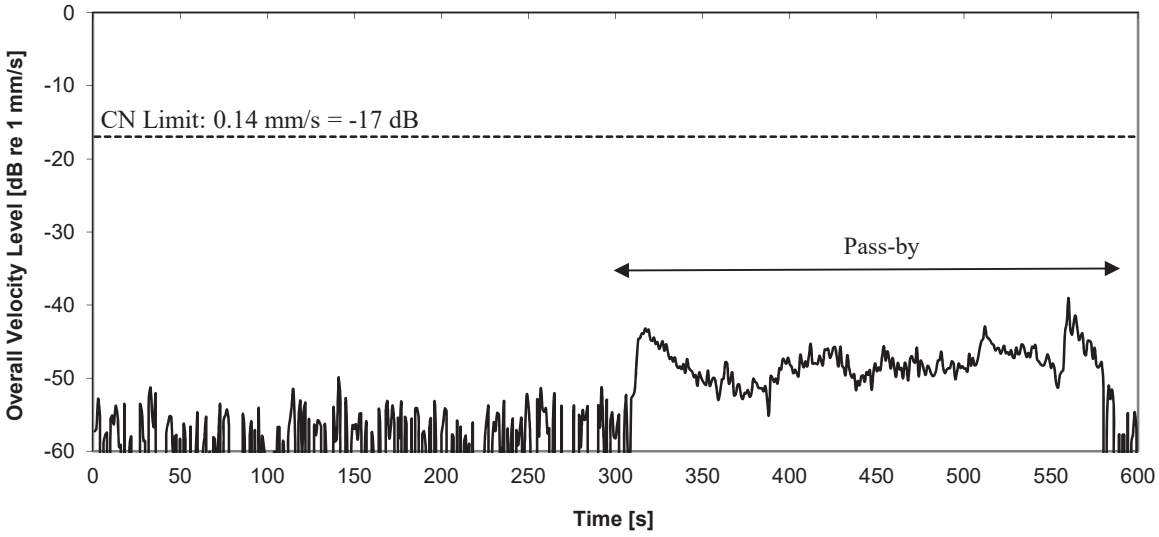


Figure 7b: Pass-by 4
Acceleration Spectrum @ Peak Level (1 sec. Duration)

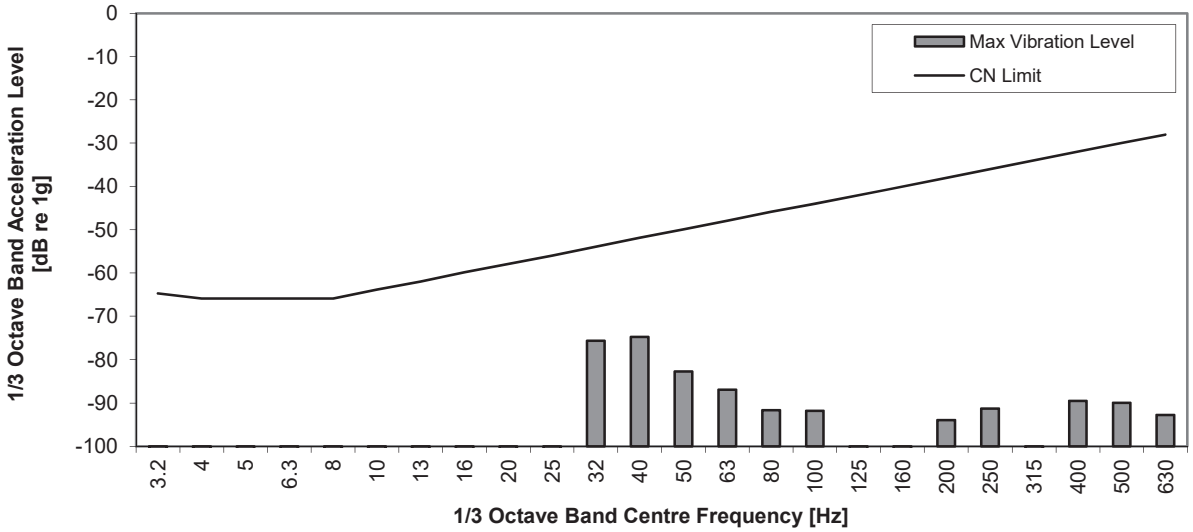


Figure 8a: Pass-by 5
Measured Vibratory Velocity Level

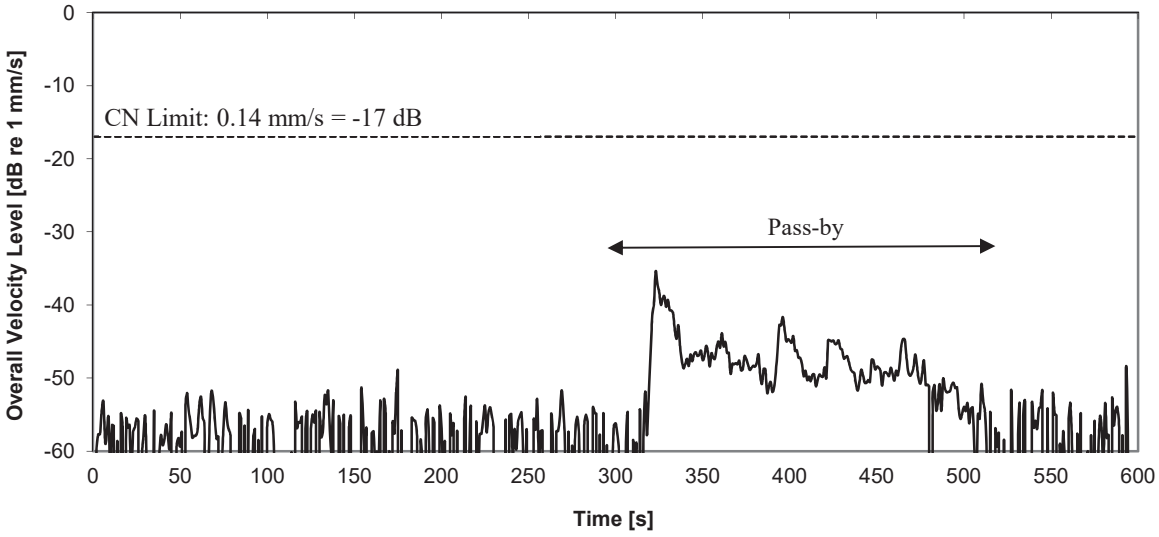
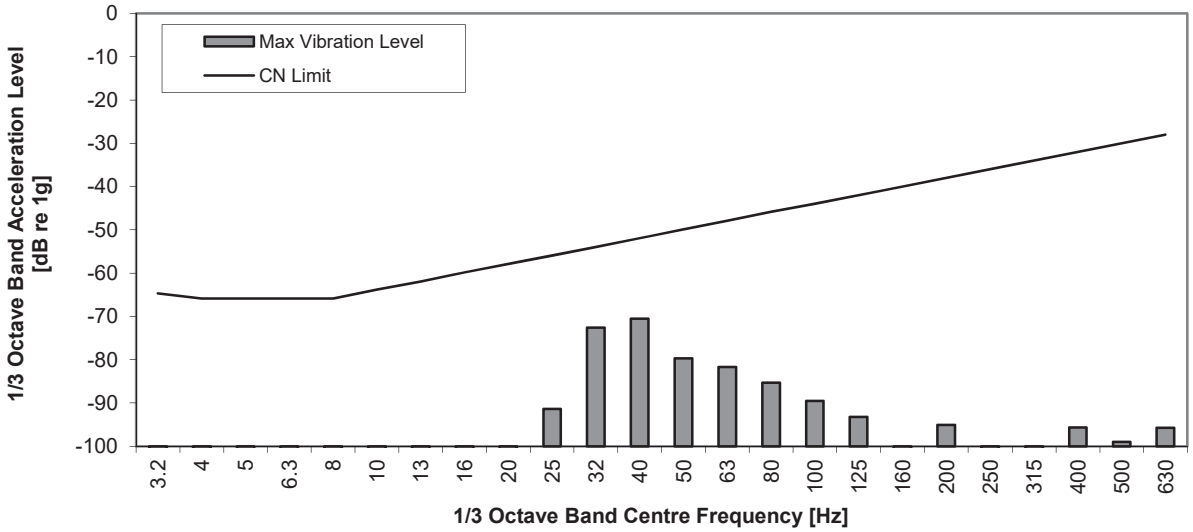


Figure 8b: Pass-by 5
Acceleration Spectrum @ Peak Level (1 sec. Duration)



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.

March 2002

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,

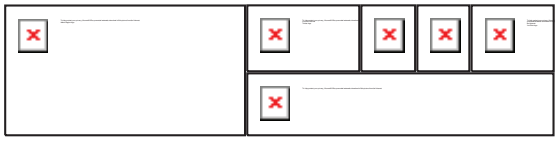
In a recent noise study for another area development along Upper Middle Road, the following 2031 AADT for Upper Middle Road was found to be acceptable:
-year 2031 AADT 33,000
-85/15 split
-2% medium and 2% heavy truck percentages

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:

Master Stations	Description	Count date	total vol	ampk end	ampk vol	off pk end	offpk vol	pm pk end	pkhr vol	8hr vol	13hr vol	posted speed (km)	50%speed (km)	avg (km)	85percent.	Variance	exceeding (%)	#cars	# sml trk	# med trk/bus	# hvy trk	%cars	%smal trk	% med trk/bus	% hvy trk
100504	Dundas Street - 1000m east of Walkers Line	05-Sep-19	32,278	8:45	2,595	12:30	1,688	17:30	2,997	18,117	26,966	60	60	61	71.11	11.11	55.20%	30,929	327	429	359	96.5%	1.0%	1.3%	1.1%
103814	Upper Middle Road - between Appleby Line and Imperial Way	06-Jun-19	18,882	8:45	1,480	14:00	1,129	18:00	1,598	9,971	14,824	60	50	49	59.66	-0.34	13.70%	18,367	112	155	83	98.1%	0.6%	0.8%	0.4%

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:

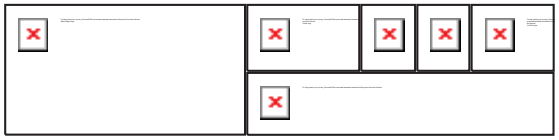
-Future volumes/assumptions for Dundas Street must be 55,000 AADT and 6 lanes.
-The use of existing medium and heavy truck percentages is required in the analysis of the future noise levels.

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

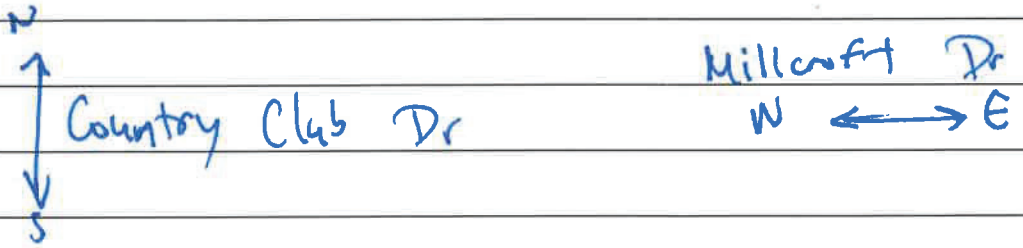
2016 ~~AADT~~ MT

N → 3017 9%

S → 5989 5%

E → 4896 3%

W → 2336 3%



HGC ENGINEERING

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

APPENDIX C

Rail Traffic Data

Victor Garcia

From: Umair Naveed <Umair.Naveed@cn.ca> on behalf of GLD-Permits <permits.gld@cn.ca>
Sent: September 23, 2021 3:33 PM
To: Victor Garcia
Cc: Frank Bon
Subject: RE: Rail Traffic Data Verification -

Hi Victor,

The attached data is still valid.

Thanks,

GLD Team

From: Victor Garcia <vgarcia@hgcengineering.com>
Sent: Thursday, September 23, 2021 1:26 PM
To: GLD-Permits <permits.gld@cn.ca>
Cc: Frank Bon <frank@fbdevconsulting.com>
Subject: Rail Traffic Data Verification -

CAUTION: This email originated from outside CN: DO NOT click links or open attachments unless you recognize the sender AND KNOW the content is safe.

AVERTISSEMENT : ce courriel provient d'une source externe au CN : NE CLIQUEZ SUR AUCUN lien ou pièce jointe à moins de reconnaitre l'expéditeur et c

Good afternoon,

HGC Engineering is preparing an update to a noise study for a proposed development located near Upper Middle Road in Burlington, Ontario at approximately Mile 32.23 on CN's Halton Subdivision. A google link is included below for your reference:

https://secure-web.cisco.com/1sJsLNxdu-DkOgF6klB4KeWCdFAFtaptVkLzMoUIf2jgHvcDv9BYnLVME7fL9WTzYcEmtTfPHh4_rIRS3yZrCucbHbdf6qZjfQG_aMd_Vfe2mdqW0j4An8c9JrEDg_OhU3OjQU4UioXAEnKUsmwD0fxbdjU0VYD7Qz5oAdyhIxjLWV6DAWDfx_ZriUnKfeE9EYYSwE27RrgYfxoRdcwt2E4hI_dezPZgKaLipae-uhRr3kPF0SJhVvGJUFUjOB4dpN6juZUakmn6rqZFwS_QXr7JaOF_OaKaaPQYErNZn8CRHgk0VI4BNQkqjvlDQQ9if/https%3A%2F%2Fgoo.gl%2Fmaps%2FJB9yjyNnCASRnqLa6

We were previously provided with the attached data. Is the attached data valid? If the data is no longer valid can you please provide updated traffic data?

Thanks,

Victor Garcia, P.Eng
Associate

HGC Engineering NOISE | VIBRATION | ACOUSTICS
Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203, Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044 e: vgarcia@hgcengineering.com

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

Victor Garcia

From: Rail Data Requests <RailDataRequests@metrolinx.com>
Sent: October 12, 2021 3:42 PM
To: Victor Garcia
Subject: RE: Rail Traffic Data Request - Upper Middle Road and Country Club Dr, Burlington, Ontario

Good afternoon Victor,

Metrolinx does not operate trains on this railway. It seems this rail corridor is part of the Halton Subdivision. I would suggest reaching out to CN Rail and requesting their rail data traffic.

Best regards,

Harrison Rong
Project Coordinator, Third Party Projects Review
Metrolinx
10 Bay Street | Toronto | Ontario | M5J 2W3
T: 416.202.7517 C: 647.328.4891

From: Victor Garcia <vgarcia@hgcengineering.com>
Sent: October 8, 2021 9:34 AM
To: Rail Data Requests <RailDataRequests@metrolinx.com>
Subject: Rail Traffic Data Request - Upper Middle Road and Country Club Dr, Burlington, Ontario

EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.
EXPÉDITEUR EXTERNE: Ne cliquez sur aucun lien et n'ouvrez aucune pièce jointe à moins qu'ils ne proviennent d'un expéditeur fiable, ou que vous ayez l'assurance que le contenu provient d'une source sûre.

Good morning,

HGC Engineering is conducting a noise feasibility study for a proposed development located near the intersection of Upper Middle Road and Country Club Drive in Burlington, Ontario. A google link is included for your reference below:

https://goo.gl/maps/xaAEsTq7FmwthdEr8

Does Metrolinx operate trains on this railway? If so, can you please provide traffic data along the railway?

Thanks,

Victor Garcia, P.Eng
Associate

HGC Engineering NOISE | VIBRATION | ACOUSTICS
Howe Gastmeier Chapnik Limited
2000 Argentia Road, Plaza One, Suite 203, Mississauga, Ontario, Canada L5N 1P7
t: 905.826.4044 e: vgarcia@hgcengineering.com
Visit our website – www.hgcengineering.com **Follow Us** – LinkedIn | Twitter | YouTube

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APPENDIX D

Sample STAMSON 5.04 Output

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:35:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_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 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	: -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	: 140.00 m
Receiver elevation	: 140.90 m
Barrier elevation	: 142.33 m
Reference angle	: 0.00

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld

ACOUSTICS NOISE VIBRATION www.hgcengineering.com

```
* 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 (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          : 140.00 m
Receiver elevation        : 140.90 m
Barrier elevation         : 142.33 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 !        2.39 !       144.72
       0.50 !        4.50 !        0.69 !       143.02

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  -4.32  46.34*
   -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 !        2.87 !       145.20
       0.50 !        4.50 !        2.37 !       144.70

LOCOMOTIVE (0.00 + 60.23 + 0.00) = 60.23 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.50  74.40 -10.00  -4.18   0.00   0.00  -0.18  60.05*
     0     90   0.50  74.40 -10.00  -4.18   0.00   0.00   0.00  60.23
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 52.60 + 0.00) = 52.60 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.60  67.67 -10.70  -4.37   0.00   0.00  -0.27  52.33*
     0     90   0.60  67.67 -10.70  -4.37   0.00   0.00   0.00  52.60
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 60.92 dBA

Total Leq All Segments: 63.02 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	2.39	144.72
0.50	4.50	0.69	143.02

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	-4.32	45.17*
-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 Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	2.87	145.20
0.50	4.50	2.37	144.70

LOCOMOTIVE (0.00 + 58.92 + 0.00) = 58.92 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.50	73.09	-10.00	-4.18	0.00	0.00	-0.18	58.74*
0	90	0.50	73.09	-10.00	-4.18	0.00	0.00	0.00	58.92

* Bright Zone !

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```
WHEEL (0.00 + 51.42 + 0.00) = 51.42 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.60  66.49 -10.70  -4.37   0.00   0.00  -0.27  51.16*
     0     90   0.60  66.49 -10.70  -4.37   0.00   0.00   0.00  51.42
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.63 dBA

Total Leq All Segments: 61.73 dBA

Road data, segment # 1: Upper Middle (day/night)
------------------------------------------------
Car traffic volume  : 13857/2445  veh/TimePeriod  *
Medium truck volume :   112/20    veh/TimePeriod  *
Heavy truck volume  :    56/10    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     :   0.80
    Heavy Truck  % of Total Volume     :   0.40
    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  : 13857/2445  veh/TimePeriod  *
Medium truck volume :   112/20    veh/TimePeriod  *
Heavy truck volume  :    56/10    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     :   0.80
    Heavy Truck  % of Total Volume     :   0.40
    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 = 0.79 m

ROAD (0.00 + 60.71 + 0.00) = 60.71 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.48   0.00  -4.77   0.00   0.00   0.00   0.00  60.71
-------------------------------------------------------------------------------

Segment Leq : 60.71 dBA

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

Source height = 0.79 m

ROAD (0.00 + 59.61 + 0.00) = 59.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.48   0.00  -5.87   0.00   0.00   0.00   0.00  59.61
-------------------------------------------------------------------------------
```


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Segment Leq : 59.61 dBA

Total Leq All Segments: 63.21 dBA

Results segment # 1: Upper Middle (night)

Source height = 0.80 m

ROAD (0.00 + 56.20 + 0.00) = 56.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.97	0.00	-4.77	0.00	0.00	0.00	0.00	56.20

Segment Leq : 56.20 dBA

Results segment # 2: Upper Middle (night)

Source height = 0.80 m

ROAD (0.00 + 55.10 + 0.00) = 55.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.97	0.00	-5.87	0.00	0.00	0.00	0.00	55.10

Segment Leq : 55.10 dBA

Total Leq All Segments: 58.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.12 dBA
(NIGHT): 63.48 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:38:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_aola.te Time Period: 16 hours

Description: OLA of lot with expousre to railway and Upper Middle Road with no mitigation

Rail data, segment # 1: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	13.1/29.4	80.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	2.6/1.7	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	10.0/22.4	2.50	11.00
2.	Way Freight	2.0/1.3	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	: 140.00 m		
Receiver elevation	: 140.90 m		
Barrier elevation	: 140.90 m		
Reference angle	: 0.00		

Rail data, segment # 2: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont 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          : 140.00 m
Receiver elevation        : 140.90 m
Barrier elevation         : 142.33 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            :   0.00 m
Barrier receiver distance :  10.00 m
Source elevation          : 140.00 m
Receiver elevation        : 140.90 m
Barrier elevation         :   0.00 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 !        1.56 !       142.46
       0.50 !        1.50 !        1.43 !       142.32

LOCOMOTIVE (0.00 + 43.93 + 0.00) = 43.93 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 -15.38  43.93
-------------------------------------------------------------------------

WHEEL (0.00 + 35.73 + 0.00) = 35.73 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 -15.60  35.73
-------------------------------------------------------------------------

Segment Leq : 44.54 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	0.79	143.12
0.50	1.50	-0.78	141.55

LOCOMOTIVE (0.00 + 50.10 + 0.00) = 50.10 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	-6.59	50.10

WHEEL (0.00 + 38.55 + 0.00) = 38.55 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	-10.60	38.55

Segment Leq : 50.39 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	142.61	142.61
0.50	1.50	142.15	142.15

LOCOMOTIVE (0.00 + 59.50 + 0.00) = 59.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.58	74.40	-11.17	-3.73	0.00	0.00	-0.00	59.50*
-10	90	0.58	74.40	-11.17	-3.73	0.00	0.00	0.00	59.50

* Bright Zone !

WHEEL (0.00 + 52.13 + 0.00) = 52.13 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-10	90	0.66	67.67	-11.70	-3.84	0.00	0.00	-0.00	52.13*
-10	90	0.66	67.67	-11.70	-3.84	0.00	0.00	0.00	52.13

* Bright Zone !

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```
Segment Leq : 60.23 dBA

Total Leq All Segments: 60.76 dBA

Road data, segment # 1: Upper Middle
-----------------------------------
Car traffic volume  : 13857 veh/TimePeriod  *
Medium truck volume :   112 veh/TimePeriod  *
Heavy truck volume  :    56 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                   :      2       (Reflective ground surface)
Receiver source distance  :  42.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 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: Upper Middle
-----------------------------------
Car traffic volume  : 13857 veh/TimePeriod  *
Medium truck volume :   112 veh/TimePeriod  *
Heavy truck volume  :    56 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                   :      2       (Reflective ground surface)
Receiver source distance  :  55.00 m
Receiver height           :   1.50 m
Topography                :      2       (Flat/gentle slope; with barrier)
```

```
Barrier angle1            : -45.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 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: Upper Middle
---------------------------------

Source height = 0.79 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.79 !        1.50 !        1.33 !         1.33

ROAD (0.00 + 59.76 + 0.00) = 59.76 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.00  65.48   0.00  -4.47  -1.25   0.00   0.00  -0.51  59.24*
   -45     90   0.00  65.48   0.00  -4.47  -1.25   0.00   0.00   0.00  59.76
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.76 dBA

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

Source height = 0.79 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.79 !        1.50 !        1.37 !         1.37

ROAD (0.00 + 58.59 + 0.00) = 58.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.00  65.48   0.00  -5.64  -1.25   0.00   0.00  -0.52  58.06*
   -45     90   0.00  65.48   0.00  -5.64  -1.25   0.00   0.00   0.00  58.59
```

---

* Bright Zone !

Segment Leq : 58.59 dBA

Total Leq All Segments: 62.22 dBA

TOTAL Leq FROM ALL SOURCES: 64.57 dBA

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:41:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_a.te Time Period: Day/Night 16/8 hours

Description: Lot with exposure to Upper Middle Road and 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

* 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	0.80
Heavy Truck % of Total Volume	0.40
Day (16 hrs) % of Total Volume	85.00

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	: 140.00 m

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Receiver elevation : 140.46 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: CN (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	144.66	144.66
0.50	4.50	143.56	143.56

LOCOMOTIVE (0.00 + 59.51 + 0.00) = 59.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.50	74.40	-12.82	-2.08	0.00	0.00	-0.00	59.51*
-45	90	0.50	74.40	-12.82	-2.08	0.00	0.00	0.00	59.51

* Bright Zone !

WHEEL (0.00 + 51.73 + 0.00) = 51.73 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.60	67.67	-13.72	-2.22	0.00	0.00	-0.00	51.73*
-45	90	0.60	67.67	-13.72	-2.22	0.00	0.00	0.00	51.73

* Bright Zone !

Segment Leq : 60.18 dBA

Total Leq All Segments: 60.18 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	144.66	144.66
0.50	4.50	143.56	143.56

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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 !

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)	

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	: 13857/2445	veh/TimePeriod	*
Medium truck volume	: 112/20	veh/TimePeriod	*
Heavy truck volume	: 56/10	veh/TimePeriod	*
Posted speed limit	: 60 km/h		

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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 : 0.80
Heavy Truck % of Total Volume : 0.40
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 = 0.79 m

ROAD (0.00 + 60.16 + 0.00) = 60.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.48	0.00	-5.31	0.00	0.00	0.00	0.00	60.16

Segment Leq : 60.16 dBA

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Total Leq All Segments: 66.14 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 = 0.80 m

ROAD (0.00 + 55.66 + 0.00) = 55.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.97	0.00	-5.31	0.00	0.00	0.00	0.00	55.66

Segment Leq : 55.66 dBA

Total Leq All Segments: 61.60 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.12 dBA
(NIGHT): 63.46 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:43:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_aola.te Time Period: 16 hours

Description: OLA of lot with exposure to Upper Middle Road and some exposure to CN, with no mitigation

Rail data, segment # 1: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont 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: No	Name	Unadj. Trains	Annual % Increase	Years of 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	: 0.00 m	
Barrier receiver distance	: 7.00 m	
Source elevation	: 140.00 m	
Receiver elevation	: 139.80 m	
Barrier elevation	: 139.80 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	1.68	141.48
0.50	1.50	1.45	141.25

LOCOMOTIVE (0.00 + 58.81 + 0.00) = 58.81 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.58	74.40	-13.39	-2.20	0.00	0.00	-0.26	58.55*
-45	90	0.58	74.40	-13.39	-2.20	0.00	0.00	0.00	58.81

* Bright Zone !

WHEEL (0.00 + 51.35 + 0.00) = 51.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	90	0.66	67.67	-14.03	-2.29	0.00	0.00	-0.36	50.99*
-45	90	0.66	67.67	-14.03	-2.29	0.00	0.00	0.00	51.35

* Bright Zone !

Segment Leq : 59.53 dBA

Total Leq All Segments: 59.53 dBA

Road data, segment # 1: Upper Middle

Car traffic volume	: 13857 veh/TimePeriod	*
Medium truck volume	: 112 veh/TimePeriod	*
Heavy truck volume	: 56 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	: 0.00 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
Reference angle           :   0.00

Road data, segment # 2: Upper Middle
-----------------------------------
Car traffic volume  : 13857 veh/TimePeriod  *
Medium truck volume :   112 veh/TimePeriod  *
Heavy truck volume  :    56 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            :   0.00 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 = 0.79 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.79 !        1.50 !        1.35 !         1.35

ROAD (0.00 + 61.92 + 0.00) = 61.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.48   0.00  -3.55   0.00   0.00   0.00  -0.54  61.39*
```


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-90	90	0.00	65.48	0.00	-3.55	0.00	0.00	0.00	0.00	61.92

* Bright Zone !

Segment Leq : 61.92 dBA

Results segment # 2: Upper Middle

Source height = 0.79 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.79	1.50	1.40	1.40

ROAD (0.00 + 60.43 + 0.00) = 60.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.48	0.00	-5.05	0.00	0.00	0.00	-0.55	59.88*
-90	90	0.00	65.48	0.00	-5.05	0.00	0.00	0.00	0.00	60.43

* Bright Zone !

Segment Leq : 60.43 dBA

Total Leq All Segments: 64.25 dBA

TOTAL Leq FROM ALL SOURCES: 65.51 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:45:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_a.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 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

* 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	0.80
Heavy Truck % of Total Volume	0.40
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	140.00 m

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Receiver elevation : 140.11 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: CN (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	144.59	144.59
0.50	4.50	144.44	144.44

LOCOMOTIVE (0.00 + 51.94 + 0.00) = 51.94 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.50	74.40	-15.88	-6.59	0.00	0.00	-0.00	51.94*
30	90	0.50	74.40	-15.88	-6.59	0.00	0.00	0.00	51.94

* Bright Zone !

WHEEL (0.00 + 43.77 + 0.00) = 43.77 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.60	67.67	-16.99	-6.91	0.00	0.00	-0.00	43.77*
30	90	0.60	67.67	-16.99	-6.91	0.00	0.00	0.00	43.77

* Bright Zone !

Segment Leq : 52.56 dBA

Total Leq All Segments: 52.56 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	144.59	144.59
0.50	4.50	144.44	144.44

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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	-0.00	50.63*
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	-0.00	42.60*
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	: 13857/2445	veh/TimePeriod *
Medium truck volume	: 112/20	veh/TimePeriod *
Heavy truck volume	: 56/10	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	:	0.80
Heavy Truck % of Total Volume	:	0.40
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  : 13857/2445  veh/TimePeriod  *
Medium truck volume :   112/20    veh/TimePeriod  *
Heavy truck volume  :    56/10    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     :   0.80
    Heavy Truck  % of Total Volume     :   0.40
    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 = 0.79 m

ROAD (0.00 + 58.43 + 0.00) = 58.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  65.48   0.00  -7.05   0.00   0.00   0.00   0.00  58.43
-------------------------------------------------------------------------------

Segment Leq : 58.43 dBA

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

Source height = 0.79 m

ROAD (0.00 + 57.70 + 0.00) = 57.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.48	0.00	-7.78	0.00	0.00	0.00	0.00	57.70

Segment Leq : 57.70 dBA

Total Leq All Segments: 61.09 dBA

Results segment # 1: Upper Middle (night)

Source height = 0.80 m

ROAD (0.00 + 53.93 + 0.00) = 53.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.97	0.00	-7.05	0.00	0.00	0.00	0.00	53.93

Segment Leq : 53.93 dBA

Results segment # 2: Upper Middle (night)

Source height = 0.80 m

ROAD (0.00 + 53.19 + 0.00) = 53.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.97	0.00	-7.78	0.00	0.00	0.00	0.00	53.19

Segment Leq : 53.19 dBA

Total Leq All Segments: 56.59 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.66 dBA
(NIGHT): 57.70 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:47:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_aola.te Time Period: 16 hours

Description: OLA of lot backing onto SWM pond, exposure to Upper Middle Road, with no mitigation

Rail data, segment # 1: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	13.1/28.7	80.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	2.6/1.7	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	10.0/21.9	2.50	11.00
2.	Way Freight	2.0/1.3	2.50	11.00

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	: 0.00 m	
Barrier receiver distance	: 7.00 m	
Source elevation	: 140.00 m	
Receiver elevation	: 139.30 m	
Barrier elevation	: 0.00 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 !      140.93 !       140.93
       0.50 !        1.50 !      140.79 !       140.79

LOCOMOTIVE (0.00 + 50.59 + 0.00) = 50.59 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.58  74.40 -16.95  -6.86   0.00   0.00  -0.00  50.59*
    30     90   0.58  74.40 -16.95  -6.86   0.00   0.00   0.00  50.59
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 42.83 + 0.00) = 42.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
    30     90   0.66  67.67 -17.75  -7.08   0.00   0.00  -0.00  42.83*
    30     90   0.66  67.67 -17.75  -7.08   0.00   0.00   0.00  42.83
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 51.26 dBA

Total Leq All Segments: 51.26 dBA

Road data, segment # 1: Upper Middle
------------------------------------
Car traffic volume  : 13857 veh/TimePeriod  *
Medium truck volume :   112 veh/TimePeriod  *
Heavy truck volume  :    56 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                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -70.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 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
Reference angle           :   0.00

Road data, segment # 2: Upper Middle
-----------------------------------
Car traffic volume  : 13857 veh/TimePeriod  *
Medium truck volume :   112 veh/TimePeriod  *
Heavy truck volume  :    56 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                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -70.00 deg   Angle2 : 90.00 deg
Barrier height            :   0.00 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 = 0.79 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.79 !        1.50 !        1.43 !         1.43

ROAD (0.00 + 57.56 + 0.00) = 57.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70     90   0.00  65.03   0.00  -6.96  -0.51   0.00   0.00  -0.32  57.24*
```


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```
   -70     90   0.00  65.03   0.00  -6.96  -0.51   0.00   0.00   0.00  57.56
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 57.56 dBA

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

Source height = 0.79 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.79 !        1.50 !        1.44 !         1.44

ROAD (0.00 + 56.81 + 0.00) = 56.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -70     90   0.00  65.03   0.00  -7.71  -0.51   0.00   0.00  -0.32  56.49*
   -70     90   0.00  65.03   0.00  -7.71  -0.51   0.00   0.00   0.00  56.81
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 56.81 dBA

Total Leq All Segments: 60.21 dBA

TOTAL Leq FROM ALL SOURCES: 60.73 dBA
```


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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:53:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_b.te Time Period: Day/Night 16/8 hours

Description: Lot with backing 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	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	: 141.00	m
Receiver elevation	: 141.00	m
Barrier elevation	: 143.00	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	2.22	145.22
0.50	4.50	0.27	143.27

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	-0.54	63.59*
-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	-4.92	51.65*
-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 Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	4.50	2.22	145.22
0.50	4.50	0.27	143.27

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	-0.54	62.28*
-90	90	0.50	73.09	-9.11	-1.17	0.00	0.00	0.00	62.82

* Bright Zone !

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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	-4.92	50.47*
-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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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:55:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_bola.te Time Period: 16 hours

Description: OLA of lot with backing exposure to the railway

Rail data, segment # 1: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
* 1. Freight	13.1/29.4	80.0	4.0	140.0	Diesel	Yes
* 2. Way Freight	2.6/1.7	80.0	4.0	25.0	Diesel	Yes

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

No	Train type: Name	Unadj. Trains	Annual % Increase	Years of Growth
1.	Freight	10.0/22.4	2.50	11.00
2.	Way Freight	2.0/1.3	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	: 141.00 m	
Receiver elevation	: 141.00 m	
Barrier elevation	: 143.00 m	
Reference angle	: 0.00	

Results segment # 1: CN

Barrier height for grazing incidence

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4_BOLA

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	0.97	143.97
0.50	1.50	-1.09	141.91

LOCOMOTIVE (0.00 + 57.81 + 0.00) = 57.81 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.44	74.40	-8.43	-1.05	0.00	0.00	-7.12	57.81

WHEEL (0.00 + 46.27 + 0.00) = 46.27 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.54	67.67	-9.04	-1.25	0.00	0.00	-11.10	46.27

Segment Leq : 58.10 dBA

Total Leq All Segments: 58.10 dBA

TOTAL Leq FROM ALL SOURCES: 58.10 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:56:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_b.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	-45.00 deg
Wood depth	0	(No woods.)
No of house rows	1 / 1	
House density	90 %	
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 : -45.00 deg
Barrier height	0.00 m	
Barrier receiver distance	64.00 / 64.00	m
Source elevation	141.00 m	
Receiver elevation	141.20 m	
Barrier elevation	143.00 m	
Reference angle	0.00	

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont 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 (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  :  86.00 / 86.00  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 :  64.00 / 64.00  m
Source elevation          : 141.00 m
Receiver elevation        : 141.20 m
Barrier elevation         : 143.00 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 !        2.18 !       145.18
       0.50 !        4.50 !       -0.43 !       142.57

LOCOMOTIVE (0.00 + 47.00 + 0.00) = 47.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -45   0.50  74.40 -11.34  -8.38   0.00  -7.68   0.00  47.00
   -90    -45   0.50  74.40 -11.34  -8.38   0.00   0.00  -1.33  53.35*
   -90    -45   0.50  74.40 -11.34  -8.38   0.00   0.00   0.00  54.68
```


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-------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 39.04 + 0.00) = 39.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -45   0.60  67.67 -12.13  -8.81   0.00  -7.68   0.00  39.04
   -90    -45   0.60  67.67 -12.13  -8.81   0.00   0.00  -5.11  41.61
-------------------------------------------------------------------

Segment Leq : 47.64 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 !        2.18 !       145.18
       0.50 !        4.50 !       -0.43 !       142.57

LOCOMOTIVE (0.00 + 56.81 + 0.00) = 56.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -45      0   0.50  74.40 -11.34  -6.25   0.00   0.00   0.00  56.81*
   -45      0   0.50  74.40 -11.34  -6.25   0.00   0.00   0.00  56.81
-------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 43.97 + 0.00) = 43.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -45      0   0.60  67.67 -12.13  -6.30   0.00   0.00  -5.26  43.97
-------------------------------------------------------------------

Segment Leq : 57.03 dBA

Total Leq All Segments: 57.50 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	2.18	145.18
0.50	4.50	-0.43	142.57

LOCOMOTIVE (0.00 + 45.69 + 0.00) = 45.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.50	73.09	-11.34	-8.38	0.00	-7.68	0.00	45.69
-90	-45	0.50	73.09	-11.34	-8.38	0.00	0.00	-1.33	52.04*
-90	-45	0.50	73.09	-11.34	-8.38	0.00	0.00	0.00	53.37

* Bright Zone !

WHEEL (0.00 + 37.86 + 0.00) = 37.86 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.60	66.49	-12.13	-8.81	0.00	-7.68	0.00	37.86
-90	-45	0.60	66.49	-12.13	-8.81	0.00	0.00	-5.11	40.44

Segment Leq : 46.35 dBA

Results segment # 2: 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	2.18	145.18
0.50	4.50	-0.43	142.57

LOCOMOTIVE (0.00 + 55.50 + 0.00) = 55.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	0	0.50	73.09	-11.34	-6.25	0.00	0.00	0.00	55.50*
-45	0	0.50	73.09	-11.34	-6.25	0.00	0.00	0.00	55.50

* Bright Zone !

WHEEL (0.00 + 42.80 + 0.00) = 42.80 dBA

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

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```
                                                5_B
   -45      0   0.60  66.49 -12.13  -6.30   0.00   0.00  -5.26  42.80
-------------------------------------------------------------------------

Segment Leq : 55.73 dBA

Total Leq All Segments: 56.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.50 dBA
                           (NIGHT): 56.20 dBA
```

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:58:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_bola.te Time Period: 16 hours

Description: Ola of lot with some exposure to railway

Rail data, segment # 1: CN

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

Angle1 Angle2	: -90.00 deg	-45.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1	
House density	: 90 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 89.00 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	: 0.00 m	
Barrier receiver distance	: 64.00 m	
Source elevation	: 141.00 m	
Receiver elevation	: 141.20 m	
Barrier elevation	: 143.00 m	
Reference angle	: 0.00	

Rail data, segment # 2: CN

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont 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: 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 # 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	: 89.00 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	: 2.50 m	
Barrier receiver distance	: 64.00 m	
Source elevation	: 141.00 m	
Receiver elevation	: 141.20 m	
Barrier elevation	: 143.00 m	
Reference angle	: 0.00	

Rail data, segment # 3: CN

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

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Data for Segment # 3: CN

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 : 89.00 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 : 7.00 m
Barrier receiver distance : 3.00 m
Source elevation : 141.00 m
Receiver elevation : 141.20 m
Barrier elevation : 143.00 m
Reference angle : 0.00

Results segment # 1: CN

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.35	144.35
0.50	1.50	-1.16	141.84

LOCOMOTIVE (0.00 + 45.74 + 0.00) = 45.74 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.58	74.40	-12.26	-8.75	0.00	-7.66	0.00	45.74
-90	-45	0.58	74.40	-12.26	-8.75	0.00	0.00	-3.82	49.58*
-90	-45	0.58	74.40	-12.26	-8.75	0.00	0.00	0.00	53.40

* Bright Zone !

WHEEL (0.00 + 38.12 + 0.00) = 38.12 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-45	0.66	67.67	-12.84	-9.05	0.00	-7.66	0.00	38.12
-90	-45	0.66	67.67	-12.84	-9.05	0.00	0.00	-5.67	40.11

Segment Leq : 46.43 dBA

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Results segment # 2: CN

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
4.00	1.50	1.35	144.35
0.50	1.50	-1.16	141.84

LOCOMOTIVE (0.00 + 51.44 + 0.00) = 51.44 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	10	0.44	74.40	-11.10	-5.32	0.00	0.00	-6.56	51.44

WHEEL (0.00 + 37.37 + 0.00) = 37.37 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-45	10	0.54	67.67	-11.91	-5.36	0.00	0.00	-13.03	37.37

Segment Leq : 51.61 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	-0.22	142.78
0.50	1.50	-0.34	142.66

LOCOMOTIVE (0.00 + 43.69 + 0.00) = 43.69 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
10	90	0.17	74.40	-9.01	-4.03	0.00	0.00	-17.67	43.69

WHEEL (0.00 + 35.75 + 0.00) = 35.75 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
10	90	0.27	67.67	-9.82	-4.32	0.00	0.00	-17.77	35.75

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Segment Leq : 44.34 dBA

Total Leq All Segments: 53.34 dBA

TOTAL Leq FROM ALL SOURCES: 53.34 dBA

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 08:59:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_b.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	-30.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 90 %	
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 : -30.00 deg
Barrier height	: 0.00 m	
Barrier receiver distance	: 81.00 / 81.00 m	
Source elevation	: 141.00 m	
Receiver elevation	: 141.50 m	
Barrier elevation	: 143.00 m	
Reference angle	: 0.00	

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

Train Type	Trains	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont 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 (day/night)
------------------------------------
Angle1   Angle2           : -30.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
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            : -30.00 deg   Angle2 : 0.00 deg
Barrier height            :   0.00 m
Barrier receiver distance :  81.00 / 81.00  m
Source elevation          : 141.00 m
Receiver elevation        : 141.11 m
Barrier elevation         : 143.00 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 !        2.21 !       145.21
       0.50 !        4.50 !       -0.57 !       142.43

LOCOMOTIVE (0.00 + 47.82 + 0.00) = 47.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -30   0.50  74.40 -12.45  -6.59   0.00  -7.55   0.00  47.82
   -90    -30   0.50  74.40 -12.45  -6.59   0.00   0.00  -0.95  54.42*
   -90    -30   0.50  74.40 -12.45  -6.59   0.00   0.00   0.00  55.37
```


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

 * Bright Zone !

WHEEL (0.00 + 39.89 + 0.00) = 39.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -30   0.60  67.67 -13.32  -6.91   0.00  -7.55   0.00  39.89
   -90    -30   0.60  67.67 -13.32  -6.91   0.00   0.00  -5.24  42.20
-------------------------------------------------------------------

Segment Leq : 48.47 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 !        2.13 !       145.13
       0.50 !        4.50 !       -0.65 !       142.35

LOCOMOTIVE (0.00 + 54.08 + 0.00) = 54.08 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -30      0   0.50  74.40 -12.45  -7.88   0.00   0.00   0.00  54.08*
   -30      0   0.50  74.40 -12.45  -7.88   0.00   0.00   0.00  54.08
-------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 40.83 + 0.00) = 40.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -30      0   0.60  67.67 -13.32  -7.90   0.00   0.00  -5.61  40.83
-------------------------------------------------------------------

Segment Leq : 54.28 dBA

Total Leq All Segments: 55.29 dBA

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

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	2.21	145.21
0.50	4.50	-0.57	142.43

LOCOMOTIVE (0.00 + 46.51 + 0.00) = 46.51 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.50	73.09	-12.45	-6.59	0.00	-7.55	0.00	46.51
-90	-30	0.50	73.09	-12.45	-6.59	0.00	0.00	-0.95	53.11*
-90	-30	0.50	73.09	-12.45	-6.59	0.00	0.00	0.00	54.06

* Bright Zone !

WHEEL (0.00 + 38.72 + 0.00) = 38.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-30	0.60	66.49	-13.32	-6.91	0.00	-7.55	0.00	38.72
-90	-30	0.60	66.49	-13.32	-6.91	0.00	0.00	-5.24	41.03

Segment Leq : 47.18 dBA

Results segment # 2: 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	2.13	145.13
0.50	4.50	-0.65	142.35

LOCOMOTIVE (0.00 + 52.77 + 0.00) = 52.77 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-30	0	0.50	73.09	-12.45	-7.88	0.00	0.00	0.00	52.77*
-30	0	0.50	73.09	-12.45	-7.88	0.00	0.00	0.00	52.77

* Bright Zone !

WHEEL (0.00 + 39.66 + 0.00) = 39.66 dBA

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

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```
                                                6_B
   -30      0   0.60  66.49 -13.32  -7.90   0.00   0.00  -5.61  39.66
-------------------------------------------------------------------------

Segment Leq : 52.98 dBA

Total Leq All Segments: 53.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.29 dBA
                           (NIGHT): 53.99 dBA
```

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:01:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_b.te Time Period: Day/Night 16/8 hours

Description: Lot with flanking exposure to Millcroft Park

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

Car traffic volume	6345/705	veh/TimePeriod *
Medium truck volume	196/22	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	16.00
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 + 59.22 + 0.00) = 59.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.71	0.00	-0.49	0.00	0.00	0.00	0.00	59.22

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Segment Leq : 59.22 dBA

Total Leq All Segments: 59.22 dBA

Results segment # 1: Millcroft (night)

Source height = 0.50 m

ROAD (0.00 + 52.70 + 0.00) = 52.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	53.19	0.00	-0.49	0.00	0.00	0.00	0.00	52.70

Segment Leq : 52.70 dBA

Total Leq All Segments: 52.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.22 dBA
(NIGHT): 52.70 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:03:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_bola.te Time Period: 16 hours

Description: OLA of lot with flanking exposure to Millcroft Park Drive

Road data, segment # 1: Millcroft

Car traffic volume : 6345 veh/TimePeriod *
Medium truck volume : 196 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 : 6345 veh/TimePeriod *
Medium truck volume : 196 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             :   0.00 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 + 35.99 + 0.00) = 35.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -45   0.00  59.71   0.00  -1.60  -6.02   0.00   0.00 -16.09  35.99
-------------------------------------------------------------------------------

Segment Leq : 35.99 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 + 56.86 + 0.00) = 56.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -45     90   0.00  59.71   0.00  -1.60  -1.25   0.00   0.00  -0.62  56.24*
```


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7_BOLA

-45	90	0.00	59.71	0.00	-1.60	-1.25	0.00	0.00	0.00	56.86

---

* Bright Zone !

Segment Leq : 56.86 dBA

Total Leq All Segments: 56.90 dBA

TOTAL Leq FROM ALL SOURCES: 56.90 dBA

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:05:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: Lot with flanking exposure to Millcroft Park Drive

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

Car traffic volume	6345/705	veh/TimePeriod *
Medium truck volume	196/22	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	3.00
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 + 59.71 + 0.00) = 59.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.71	0.00	0.00	0.00	0.00	0.00	0.00	59.71

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Segment Leq : 59.71 dBA

Total Leq All Segments: 59.71 dBA

Results segment # 1: Millcroft (night)

Source height = 0.50 m

ROAD (0.00 + 53.19 + 0.00) = 53.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	53.19	0.00	0.00	0.00	0.00	0.00	0.00	53.19

Segment Leq : 53.19 dBA

Total Leq All Segments: 53.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.71 dBA
(NIGHT): 53.19 dBA

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:06:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Description: OLA of lot with flanking exposure to Millcroft Park Drive

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

Car traffic volume	: 6345/705	veh/TimePeriod *
Medium truck volume	: 196/22	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	3.00
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	45.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 18.00 / 18.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

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

Car traffic volume	: 6345/705	veh/TimePeriod *
Medium truck volume	: 196/22	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:

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```
    24 hr Traffic Volume (AADT or SADT):   6749
    Percentage of Annual Growth        :   2.50
    Number of Years of Growth          :   3.00
    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 # 2: Millcroft (day/night)
-------------------------------------------
Angle1   Angle2           :  45.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  18.00 / 18.00  m
Receiver height           :   1.50 / 4.50   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 / 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 (day)
------------------------------------

Source height = 0.50 m

ROAD (0.00 + 57.67 + 0.00) = 57.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     45   0.00  59.71   0.00  -0.79  -1.25   0.00   0.00   0.00  57.67
-------------------------------------------------------------------------------

Segment Leq : 57.67 dBA

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

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
```


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```
ROAD (0.00 + 36.66 + 0.00) = 36.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    45     90   0.00  59.71   0.00  -0.79  -6.02   0.00   0.00 -16.23  36.66
-------------------------------------------------------------------------------

Segment Leq : 36.66 dBA

Total Leq All Segments: 57.70 dBA

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

Source height = 0.50 m

ROAD (0.00 + 51.15 + 0.00) = 51.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     45   0.00  53.19   0.00  -0.79  -1.25   0.00   0.00   0.00  51.15
-------------------------------------------------------------------------------

Segment Leq : 51.15 dBA

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

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 !        4.50 !        3.83 !         3.83

ROAD (0.00 + 32.93 + 0.00) = 32.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    45     90   0.00  53.19   0.00  -0.79  -6.02   0.00   0.00 -13.45  32.93
-------------------------------------------------------------------------------

Segment Leq : 32.93 dBA

Total Leq All Segments: 51.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.70 dBA
                           (NIGHT): 51.21 dBA
```


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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:08:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_e.te Time Period: Day/Night 16/8 hours

Description: 6-storey condo with exposure to DUndas Street West, 6th Floor

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

Car traffic volume : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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 : 2.30
Heavy Truck % of Total Volume : 1.10
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 : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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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```
                                        10_E
    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     :   2.30
    Heavy Truck  % of Total Volume     :   1.10
    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 = 1.02 m

ROAD (0.00 + 67.61 + 0.00) = 67.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.81   0.00  -1.21   0.00   0.00   0.00   0.00  67.61
-------------------------------------------------------------------------------

Segment Leq : 67.61 dBA

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

Source height = 1.02 m

ROAD (0.00 + 65.43 + 0.00) = 65.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.81   0.00  -3.38   0.00   0.00   0.00   0.00  65.43
-------------------------------------------------------------------------------

Segment Leq : 65.43 dBA

Total Leq All Segments: 69.67 dBA

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

Source height = 1.02 m

ROAD (0.00 + 61.06 + 0.00) = 61.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.27	0.00	-1.21	0.00	0.00	0.00	0.00	61.06

Segment Leq : 61.06 dBA

Results segment # 2: Dundas (night)

Source height = 1.02 m

ROAD (0.00 + 58.88 + 0.00) = 58.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.27	0.00	-3.38	0.00	0.00	0.00	0.00	58.88

Segment Leq : 58.88 dBA

Total Leq All Segments: 63.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.67 dBA
(NIGHT): 63.12 dBA

ACOUSTICS NOISE VIBRATION www.hgcengineering.com

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:10:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_gf_e.te Time Period: Day/Night 16/8 hours

Description: Ground floor of 6-storey condo with exposure to Dundas Street West, 6th Floor

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

Car traffic volume : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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 : 2.30
Heavy Truck % of Total Volume : 1.10
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 : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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:

ACOUSTICS NOISE VIBRATION www.hgcengineering.com

```
    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     :   2.30
    Heavy Truck  % of Total Volume     :   1.10
    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 = 1.02 m

ROAD (0.00 + 67.61 + 0.00) = 67.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.81   0.00  -1.21   0.00   0.00   0.00   0.00  67.61
-------------------------------------------------------------------------------

Segment Leq : 67.61 dBA

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

Source height = 1.02 m

ROAD (0.00 + 65.43 + 0.00) = 65.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.81   0.00  -3.38   0.00   0.00   0.00   0.00  65.43
-------------------------------------------------------------------------------

Segment Leq : 65.43 dBA

Total Leq All Segments: 69.67 dBA

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

Source height = 1.02 m

ROAD (0.00 + 61.06 + 0.00) = 61.06 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.27	0.00	-1.21	0.00	0.00	0.00	0.00	61.06

Segment Leq : 61.06 dBA

Results segment # 2: Dundas (night)

Source height = 1.02 m

ROAD (0.00 + 58.88 + 0.00) = 58.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.27	0.00	-3.38	0.00	0.00	0.00	0.00	58.88

Segment Leq : 58.88 dBA

Total Leq All Segments: 63.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.67 dBA
(NIGHT): 63.12 dBA

ACOUSTICS NOISE VIBRATION www.hgcengineering.com

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:42:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_ew_e.te Time Period: Day/Night 16/8 hours

Description: East/west facade of 6-storey condo, 6th floor

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

Car traffic volume : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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 : 2.30
Heavy Truck % of Total Volume : 1.10
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 : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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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```
                                        10_E_E
    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     :   2.30
    Heavy Truck  % of Total Volume     :   1.10
    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           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.02 m

ROAD (0.00 + 63.58 + 0.00) = 63.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  68.81   0.00  -2.22  -3.01   0.00   0.00   0.00  63.58
-------------------------------------------------------------------------------

Segment Leq : 63.58 dBA

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

Source height = 1.02 m

ROAD (0.00 + 61.69 + 0.00) = 61.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  68.81   0.00  -4.12  -3.01   0.00   0.00   0.00  61.69
-------------------------------------------------------------------------------

Segment Leq : 61.69 dBA

Total Leq All Segments: 65.75 dBA

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

Source height = 1.02 m

ROAD (0.00 + 57.04 + 0.00) = 57.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	62.27	0.00	-2.22	-3.01	0.00	0.00	0.00	57.04

Segment Leq : 57.04 dBA

Results segment # 2: Dundas (night)

Source height = 1.02 m

ROAD (0.00 + 55.14 + 0.00) = 55.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	62.27	0.00	-4.12	-3.01	0.00	0.00	0.00	55.14

Segment Leq : 55.14 dBA

Total Leq All Segments: 59.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.75 dBA
(NIGHT): 59.20 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:44:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_ew_e.te Time Period: Day/Night 16/8 hours

Description: East/west facade of 6-storey condo, 1st floor

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

Car traffic volume : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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 : 2.30
Heavy Truck % of Total Volume : 1.10
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 : 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 : 23909/2657 veh/TimePeriod *
Medium truck volume : 569/63 veh/TimePeriod *
Heavy truck volume : 272/30 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     :   2.30
    Heavy Truck  % of Total Volume     :   1.10
    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 = 1.02 m

ROAD (0.00 + 63.58 + 0.00) = 63.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  68.81   0.00  -2.22  -3.01   0.00   0.00   0.00  63.58
-------------------------------------------------------------------------------

Segment Leq : 63.58 dBA

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

Source height = 1.02 m

ROAD (0.00 + 61.69 + 0.00) = 61.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  68.81   0.00  -4.12  -3.01   0.00   0.00   0.00  61.69
-------------------------------------------------------------------------------

Segment Leq : 61.69 dBA

Total Leq All Segments: 65.75 dBA

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

Source height = 1.02 m

ROAD (0.00 + 57.04 + 0.00) = 57.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	62.27	0.00	-2.22	-3.01	0.00	0.00	0.00	57.04

Segment Leq : 57.04 dBA

Results segment # 2: Dundas (night)

Source height = 1.02 m

ROAD (0.00 + 55.14 + 0.00) = 55.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	62.27	0.00	-4.12	-3.01	0.00	0.00	0.00	55.14

Segment Leq : 55.14 dBA

Total Leq All Segments: 59.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.75 dBA
(NIGHT): 59.20 dBA

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STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:49:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10eola.te Time Period: 16 hours

Description: Potential OLA to east, ground level

Road data, segment # 1: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 : 0.00 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 : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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

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```
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             :   0.00 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 = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !        1.40 !         1.40

ROAD (0.00 + 66.02 + 0.00) = 66.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -35     90   0.00  68.81   0.00  -1.21  -1.58   0.00   0.00  -0.20  65.82*
   -35     90   0.00  68.81   0.00  -1.21  -1.58   0.00   0.00   0.00  66.02
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 66.02 dBA

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

Source height = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !        1.44 !         1.44

ROAD (0.00 + 63.84 + 0.00) = 63.84 dBA
```

10_E_O

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	90	0.00	68.81	0.00	-3.38	-1.58	0.00	0.00	-0.21	63.63*
-35	90	0.00	68.81	0.00	-3.38	-1.58	0.00	0.00	0.00	63.84

* Bright Zone !

Segment Leq : 63.84 dBA

Total Leq All Segments: 68.08 dBA

TOTAL Leq FROM ALL SOURCES: 68.08 dBA

STAMSON 5.0 NORMAL REPORT Date: 28-01-2022 09:37:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10rola.te Time Period: 16 hours

Description: OLA on 5th floor with 1.07 m solid parapet wall

Road data, segment # 1: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 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 : -15.00 deg
Barrier height : 3.00 m
Elevation : 15.00 m
Barrier receiver distance : 4.00 m
Source elevation : 0.00 m
Receiver elevation : 15.00 m
Barrier elevation : 15.00 m
Reference angle : 0.00

Road data, segment # 2: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 deg
Wood depth : 0 (No woods.)

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```
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 : -15.00 deg
Barrier height            :   3.00 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 3: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 4: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
```

```
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 4: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.07 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

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

Source height = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !       -0.98 !        14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -15   0.00  68.81   0.00  -2.22  -3.80   0.00   0.00 -15.11  47.68
-------------------------------------------------------------------------------

Segment Leq : 47.68 dBA

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

Source height = 1.02 m

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


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Height (m)	Height (m)	Height (m)	Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.00	68.81	0.00	-2.22	-3.80	0.00	0.00	-15.11	47.68

Segment Leq : 47.68 dBA

Results segment # 3: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 52.83 + 0.00) = 52.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-11.43	52.83

Segment Leq : 52.83 dBA

Results segment # 4: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 52.83 + 0.00) = 52.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-11.43	52.83







Segment Leq : 52.83 dBA

Total Leq All Segments: 57.00 dBA

TOTAL Leq FROM ALL SOURCES: 57.00 dBA

STAMSON 5.0 NORMAL REPORT Date: 28-01-2022 09:32:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10rola.te Time Period: 16 hours

Description: OLA on 5th floor with 1.4 m solid parapet wall

Road data, segment # 1: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 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 : -15.00 deg
Barrier height : 3.00 m
Elevation : 15.00 m
Barrier receiver distance : 4.00 m
Source elevation : 0.00 m
Receiver elevation : 15.00 m
Barrier elevation : 15.00 m
Reference angle : 0.00

Road data, segment # 2: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 deg
Wood depth : 0 (No woods.)

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```
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 : -15.00 deg
Barrier height            :   3.00 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 3: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.40 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 4: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
```


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```
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 4: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   1.40 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

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

Source height = 1.02 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !       -0.98 !        14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -15   0.00  68.81   0.00  -2.22  -3.80   0.00   0.00 -15.11  47.68
-------------------------------------------------------------------------------

Segment Leq : 47.68 dBA

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

Source height = 1.02 m

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


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Height (m)	Height (m)	Height (m)	Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.00	68.81	0.00	-2.22	-3.80	0.00	0.00	-15.11	47.68

Segment Leq : 47.68 dBA

Results segment # 3: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 51.83 + 0.00) = 51.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-12.42	51.83

Segment Leq : 51.83 dBA

Results segment # 4: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 51.83 + 0.00) = 51.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-12.42	51.83

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Segment Leq : 51.83 dBA

Total Leq All Segments: 56.25 dBA

TOTAL Leq FROM ALL SOURCES: 56.25 dBA

STAMSON 5.0 NORMAL REPORT Date: 28-01-2022 09:28:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10rola.te Time Period: 16 hours

Description: OLA on 5th floor with 2.0 m solid parapet wall

Road data, segment # 1: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 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 : -15.00 deg
Barrier height : 3.00 m
Elevation : 15.00 m
Barrier receiver distance : 4.00 m
Source elevation : 0.00 m
Receiver elevation : 15.00 m
Barrier elevation : 15.00 m
Reference angle : 0.00

Road data, segment # 2: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 -15.00 deg
Wood depth : 0 (No woods.)

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```
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 : -15.00 deg
Barrier height            :   3.00 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 3: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 3: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.00 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

Road data, segment # 4: Dundas
------------------------------
Car traffic volume  : 23909 veh/TimePeriod  *
Medium truck volume :   569 veh/TimePeriod  *
Heavy truck volume  :   272 veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
```

```
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 4: Dundas
----------------------------
Angle1   Angle2           : -15.00 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            : -15.00 deg   Angle2 : 90.00 deg
Barrier height            :   2.00 m
Elevation                 :  15.00 m
Barrier receiver distance :   4.00 m
Source elevation          :   0.00 m
Receiver elevation        :  15.00 m
Barrier elevation         :  15.00 m
Reference angle           :   0.00

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

Source height = 1.02 m

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.02 !        1.50 !       -0.98 !        14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -15   0.00  68.81   0.00  -2.22  -3.80   0.00   0.00 -15.11  47.68
-------------------------------------------------------------------------------

Segment Leq : 47.68 dBA

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

Source height = 1.02 m

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


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Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-15	0.00	68.81	0.00	-2.22	-3.80	0.00	0.00	-15.11	47.68

Segment Leq : 47.68 dBA

Results segment # 3: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 50.25 + 0.00) = 50.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-14.00	50.25

Segment Leq : 50.25 dBA

Results segment # 4: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	-0.98	14.02

ROAD (0.00 + 50.25 + 0.00) = 50.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	90	0.00	68.81	0.00	-2.22	-2.34	0.00	0.00	-14.00	50.25

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Segment Leq : 50.25 dBA

Total Leq All Segments: 55.17 dBA

TOTAL Leq FROM ALL SOURCES: 55.17 dBA

STAMSON 5.0 NORMAL REPORT Date: 25-11-2021 09:47:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10sola.te Time Period: 16 hours

Description: Potential OLA to south of building

Road data, segment # 1: Dundas

Car traffic volume : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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 : 23909 veh/TimePeriod *
Medium truck volume : 569 veh/TimePeriod *
Heavy truck volume : 272 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

10_E_SO

```
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 = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	1.49	1.49

ROAD (39.06 + 45.43 + 44.05) = 48.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-85	0.66	68.81	0.00	-5.00	-24.76	0.00	0.00	0.00	39.06
-85	80	0.00	68.81	0.00	-3.01	-0.38	0.00	0.00	-20.00	45.43
80	90	0.66	68.81	0.00	-5.00	-19.76	0.00	0.00	0.00	44.05

Segment Leq : 48.35 dBA

Results segment # 2: Dundas

Source height = 1.02 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.02	1.50	1.49	1.49

10_E_SO

ROAD (39.06 + 45.56 + 39.06) = 47.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-85	0.66	68.81	0.00	-5.00	-24.76	0.00	0.00	0.00	39.06
-85	85	0.00	68.81	0.00	-3.01	-0.25	0.00	0.00	-20.00	45.56
85	90	0.66	68.81	0.00	-5.00	-24.76	0.00	0.00	0.00	39.06

Segment Leq : 47.16 dBA

Total Leq All Segments: 50.81 dBA

TOTAL Leq FROM ALL SOURCES: 50.81 dBA

APPENDIX E

HGC Engineering Responses to Comments from the City, Region, and CN Railway

Responses to Comments from the City of Burlington

HGC Engineering has reviewed the comments from the City of Burlington dated September 22, 2021 and our responses in *italics* follow below:

a. Please add the addresses of the development parcels on the cover page of the report (2155 Country Club Drive and 4274 Dundas Street)

   Addresses have been added to the cover page.

b. Please also provide an area context figure (or update Figure 1a) labeling the sources of noise within 1000m of the site, i.e. Upper Middle Road, Dundas Street, Millcroft Park Drive, CN Railway, Commercial Plaza on Appleby Line, high school and community center on Dundas, etc. Figure 1a doesn't show/label the CNR line to the full extents adjacent to Area D, the high school/community center, or the Appleby Line commercial plaza.

   Figure 1a has been updated with the corresponding labels.

c. Section 2, please confirm if aircraft noise needs to be considered or not. (we appreciate that it is likely not a concern, but do ask that it be clarified/stated in the report)

   Aircraft noise is not a concern. Is stated in updated report.

d. Section 3.1, please add a statement summarizing the velocity plots, i.e. 5 pass-by measurements were conducted on XX date and the measured vibratory velocity level and the acceleration spectrum @ peak level (1 sec. duration) were below (or met) MECP and CNR guidelines, in whatever wording you recommend. We do see that this is further discussed in Section 5.4.

   Section 3.1 discusses the criteria for which vibration is evaluated against. Our findings are discussed in Section 5.4.

e. Section 5.1 discusses 59dBA for the OLA at lots with exposure to railway and upper middle road, generally speaking the City does not accept OLA sound levels above 58dBA, therefore we would ask that a 3.8 or 4m wall be provided for this area.

   Acoustic barrier requirements have updated to include the latest grading information and the new proposed location for the acoustic fence along Upper Middle Road as requested by the Region of Halton.

f. Section 5.3, similar to Figures 3a to 3c, please provide a corresponding figure showing which lots will require brick or masonry exterior walls and upgraded glazing requirements. We acknowledge that this is subject to change at the detailed noise study stage.

Figure has been updated to show brick or masonry exterior construction requirements for the proposed development.

g. Section 5.4 what was the date the vibration measurements were preformed?

Date has been added to the report.

h. Section 5.5 please provide a corresponding figure showing which lots require which warning clauses. Table 9 outlines the warning clauses at prediction locations, but the warning clause requirements are not clearly identified on Figures 3a to 3c which show barrier and ventilation requirements.

Due to the number of warning clauses, required it would be difficult to show this on a figure. At the detailed report stage when the lot numbering is available, the lot numbers will be added to the summary table to clarify which lots require which warning clauses.

i. Figure 2a notes a prediction location M1, but Tables 4, 5 and 6 don't have an M1, please include M1 in the calculations and in the tables.

Prediction location M1 is the vibration measurement location as stated in Section 5.4 of the report.

j. Should Figures 3b and 3c be titled ".... showing barrier and ventilation requirements" like 3a is labeled?

Titles have been corrected on these figures.

k. Warning Clauses (if the application is approved and proceeds to site plan/subdivision, the warning clauses would also be required to be included in the condo declarations):

    i. CN Rail has advised the following warning clauses shall be included 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:

        i. "Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 meters 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."

        Noted.

ii. Section 5.5 of the HGC Engineering outlines suggested warning clauses, we have requested a figure detailing which lots require which warning clauses. If the application is approved and proceeds to site plan/subdivision, warning clauses will be included in the site plan/subdivision agreements and condo declaration listing the lots, areas, etc. that the warning clauses apply to. Table 9 outlines the types of warning clauses for the prediction locations, but there is no figure showing the prediction locations included int eh report, please provide.

Due to the number of warning clauses required, it would be difficult to show this on a figure. At the detailed report stage when the lot numbering is available, the lot numbers will be added to the summary table to clarify which lots require which warning clauses.

l. Table 7, please provide a column for the NPC-300 criteria, identify façade requirements for the prediction locations, and the (estimated) mitigated (after upgraded façade/glazing) dBA for the prediction locations, we acknowledge that this is based on estimated floor/window ratios as detailed building plans are not available, however this report will advise the developer on the future building plans. Updated estimates will be included in the detailed study if the application is approved and proceeds to site plan/subdivision stage.

Preliminary STC requirements provided in Table 7 are what is required based on assumed window to floor area ratios. With the stated assumptions the STC requirements listed in the Table will provide sufficient mitigation for the indoor spaces such that they meet MECP sound level criteria.

m. Section 8, please note that at the Site Plan/Subdivision stage, the City will require a letter from the acoustical consultant confirming they have reviewed the final building plans to confirm recommendations have been incorporated.

Noted.

n. Appendix D provides sample STAMSON calculations that should coordinate with Tables 4, 5 and 6.

i. There looks to be a discrepancy between Table 6 and the calculations for Location 1 OLA Area A, the calculations state that for a 3.5m barrier 57.81dBA is achieved, but Table 6 states that a 3.8m barrier is required to achieve 58dBA, please clarify

Due to the complex geometry of the site at Upper Middle Road, updated calculations have been conducted in Cadna.

ii. Location 4 OLA Area B, calculations look to show 2.5m barrier achieves 58.32dBA, but Table 6 has no value in the row, please clarify

This included the existing barrier along the railway and as such was not included in the table as it only considers existing conditions.

iii. Location 5 OLA Area B calculations look to show 7m barrier achieves 55.25dBA but Table 6 has no value in row, please clarify

The 7 m barrier in the STAMSON calculation is the effect of the house and not a stand-alone acoustic barrier.

iv. Location 6 OLA Area B, calculations look to show 7m barrier achieves 50.79dBA, but Table 6 has no value in row, please clarify

The 7 m barrier in the STAMSON calculation is the effect of the house and not a stand-alone acoustic barrier.

v. Location 7 OLA Area B, calculations look to show 7.0m/2.0m barrier achieves 49.39dBA but Table 6 looks to show 2.0m barrier, please clarify

The 7 m barrier in the STAMSON calculation is the effect of the house and not a stand-alone acoustic barrier

vi. Location 10, Area E, calculation, should the description state 6th floor, to be consistent with Tables 4 & 5?

Corrected in updated report.

vii. Location 10, ground floor Area E, calculations description says south façade, should that state "with exposure to Dundas..." to be consistent with Tables 4 & 5?

Corrected in updated report.

viii. Location 10, east façade, Area E at top of page

Corrected in updated report.

ix. Location 10, east/west façade, Area E, is there a calculation for the first floor?

Has been added into updated report.

x. Location 10, potential east OLS, Area E, the calculations look to show 3.5m barrier providing 55.52dBA (56dBA), but Table 6 indicates 3.3m barrier for 56dBA, please clarify.

Calculation corrected in updated report

xi. Location 10, potential roof OLA Area E, calculations indicate 1.07m barrier provides 54.37dBA, Table 6 has 1.07m barrier across the row for

55 to 59dBA, should the 1.07m just be listed under the first column for 55dBA?

Corrected in updated report.

xii. Location 8, OLA Area D, calculations look to indicate 2.0m/7.0m barrier height for 49.46dBA, Table 6 indicates 2.0 for 55dBA, please clarify.

The 7 m barrier in the STAMSON calculation is the effect of the house and not a stand-alone acoustic barrier

o. The response letter item 10 l), on-site noise measurements were not taken, HGC advised they were not required under MECP regulations, please be advised that on-site noise measurements of stationary (adjacent commercial) and ambient sources may be required at the subdivision/site plan stage (and included in the detailed noise study) if the application is approved.

Noted.

p. The response letter item 12 discusses vibration from construction activities. HGC states *"In our experience, vibration studies during construction are not generally required for single family homes in the area."* Does that mean that your professional opinion is that it is not required because the construction related vibration will not impact adjacent structures/infrastructure? Or does it mean that your experience is that municipalities don't require it? if the latter, we do require the acoustical and/or geotechnical consultant to confirm if construction related vibration could have a negative impact on surrounding structures/infrastructure for both the proposed single family home areas and the 6-storey building, and if so what is the estimated zone of influence that a precondition survey should be undertaken in, and what type of monitoring during construction should be undertaken? We do not require a detailed plan at this time, just the consultants professional (estimated based on the information they have available to them at this early stage) recommendations based on type of construction, soil conditions, etc., i.e. for Area E all structures and buried infrastructure (sewers, watermain, gas mains, etc.) within XX of the proposed construction should have a precondition survey and approximately XX number of vibration monitors be installed and monitored during construction, details to be firmed up at the site plan stage when detailed building plans are available. Same for the other Single-family home areas, do you recommend pre-condition surveys, if so, what radius from the site, and do you recommend vibration monitoring during construction? or not? We understand this is early stages and detailed building plans are not available, however we trust the experts have experience on similar sites and can provide guidance in this matter.

Our experience indicates only certain municipalities require construction vibration monitoring or assessment. This is outside of the scope of the environmental noise and vibration study. If the City of Burlington requires this assessment, we can complete a separate fee proposal and provide this information.

q. Are there any impulsive sounds in the area? if not, please just include a brief statement that there are no impulsive noises in the area.

Statement added into our report.

r. For Area E (4274 Dundas) the 6 story building, are the hydro lines a source of noise?

Hydro lines are not considered to be a source of noise. There are several existing dwellings within the same distance of the hydro lines as the proposed building.

s. Please include a copy of the survey(s) in the appendix of the report

Noted.

t. Location 1 has 2 CNR segments in the STAMSON calculations, Location 1 OLA, Location 5 OLA and Location 6 OLA all have 3 CNR segments, whereas Location 2 and 2 OLA, 3 and 3 OLA, 4 and 4 OLA, 5, 6, all have only 1 segment, please clarify.

The number of segments included depending on exposure. If the railway is partially shielded, a segment including shielding is included to account for it.

u. Locations 7 & 8 only have one segment for Millcroft whereas Location 7 & 8 OLAs have two, please clarify.

Please see response to comment t.

v. A revised report signed/sealed by the engineer is needed before a recommendation on the application can be made

Noted.

APPENDIX 'C'
DETAILED REGIONAL TRANSPORTATION COMMENTS

Transportation Impact Study:
The transportation impact study by C.F. Crozier & Associates dated October 2020, submitted as part of this application review, has been reviewed by staff and peer reviewed. A Study resubmission is required.

Development Details: The project proposal is for 98 detached residential units and 126 condominium units split across four holes and the maintenance facility at the Millcroft Golf Club. Full movement accesses are being proposed at Millcroft Park Drive and Country Club Drive, and a right-in right-out access is being proposed at Dundas Street.

Site Traffic Volumes: The proposed development is expected to generate 125 two-way (32 inbound and 93 outbound) trips during the weekday a.m. peak hour and 151 two-way (94 inbound and 57 outbound) trips during the weekday p.m. peak hour.

Halton Region provides the following recommendations and comments as they relate to the Millcroft Greens Transportation Impact Study:

- Provide the HCM reports for all study intersections;
- Calibrate Synchro model for the existing 2020 intersection operations and update Synchro results accordingly;
- Provide calculations in the Appendix for future background volumes shown in Figure 4;
- Update Synchro models with optimized signal timings/progressions for all future scenarios;
- Provide mitigation measures where intersections or movements are operating above capacity;
- Provide calculations in Appendix G for site traffic distribution percentages and provide trip assignment for each site;
- Update turning arrows in Figures 6 and 7 to a RIRO restricted access;
- Provide the SimTraffic 95th percentile queue summary results for all intersections and scenarios;
- Provide mitigation measures for the northbound and westbound left movements in the PM peak hour at the Dundas Street and Walkers Line intersection;
- Provide operational analysis for 2025 future total traffic operations with mitigation measures such as split optimization;
- Provide documentation from the Region for the approval of the analysis conducted in Section 7.1;
- Calculate the sight distance requirement based on an 80 km/h design speed for Dundas Street;
- Provide mitigation measures in the case that a centre median island is not installed by the 2025 horizon year; and
- Evaluate site accesses with respect to pedestrian, cyclist and BRT facilities.

Noise Impact Study:
A Noise and Vibration Feasibility Study was completed by HGC Engineering dated November 2020. A Study resubmission is required based upon the following:

- Truck percentages for Upper Middle Road must be based on existing truck percentages. A request can be made to Halton Road Operations for the latest area turning movement count to determine the existing truck percentages – traffdatarequests@halton.ca Noted.
- The proposed noise barrier along the Upper Middle Road development area lands, must be located along the Regional right-of-way, as it will be owned and maintained by Halton Region. The Study analysis must be revised based on the new location of the noise barrier in this area. Additionally, the barrier must connect to the existing rail line noise barrier to the east along Upper Middle Road. Halton's preferred and recommended noise barrier material is durisol/concrete. Noted.

Parcel A – Upper Middle Road Area:

- A detailed noise study would be required when siting/grading information, detailed floor plans and building elevations are available for the building in Area A as part of a detailed design/implementation. Noted.
- Ownership of walls near Upper Middle Road: The ownership and future maintenance of the noise barrier will be the responsibility of the owner until the subdivision is assumed by the Municipality, at which time ownership and maintenance will become the responsibility of Halton Region. Noted.
- The heights of noise walls will require confirmation following finalization of site plan details. Noted.
- Warning clauses:
- An additional warning clause is required - "Purchasers are advised that the construction of elevated decks within their yards may compromise the effectiveness of the noise mitigation measures and controls which have been established within the subdivision for their lots." Has been updated in latest noise report.

Parcel E – Dundas Street Area:

- A detailed noise study would be required when siting/grading information, detailed floor plans and building elevations are available for the building in Area E as part of a detailed design/implementation. Noted.
- Potential East OLA: The proposed location of the East OLA must be relocated on site or eliminated from the plan, in order to avoid the requirement for a noise barrier. Noted.

Regional Land Dedications Requirements (to be addressed/confirmed on the Submitted Draft Plan & Parcel E Concept Plan):

Regional Official Plan/Transportation Master Plan Right-of-Way Requirements:

- Any lands within 25m of the centre line of the original right-of-way of Dundas Street (Regional Road 5) that are part of the subject property shall be dedicated to the Regional Municipality of Halton for the purpose of road right-of-way widening and future road improvements.
- Any lands within 17.5m of the centre line of the original right-of-way of Upper Middle Road (Regional Road 38) that are part of the subject property shall be dedicated to the Regional Municipality of Halton for the purpose of road right-of-way widening and future road improvements.
- Daylight triangles measuring 15m along Upper Middle Road (Regional Road 38) and 15m along Country Club Drive shall be dedicated to the Regional Municipality of Halton for the purpose of road right-of-way widening and future road improvements.

Municipal Class Environmental Assessment Study/Environmental Study Report (Transportation Planning) Right-of-Way Requirements – Dundas Street:

Responses to Comments from the Peer Review Prepared by Jade Acoustics

HGC Engineering has reviewed the comments from the City of Burlington dated September 22, 2021 and our responses in *italics* follow below:

Noise Report (Relative to Areas A and B)

1. Sample STAMSON rail calculations for the proposed dwellings in close proximity to the railway line (identified as Receptors 1 through 6 in the report) were included in the report. There are several discrepancies noted in the calculations, as listed below, which require clarification or modification. Revised sample calculations should be included in the updated report. The result of the revised calculations may impact acoustical mitigation measures for the subject site.

- There is inconsistent use of the "barrier" element in the STAMSON calculations and it is unclear whether these – when used – are intended to reflect the existing berm/fence adjacent to the rail line or a property line barrier as mitigation. The use of barrier, base elevation and height of barrier (if used) and barrier-receiver distance should all be clarified;

- There is inconsistent use of multiple segments to model the rail line. Some calculations use one segment, while others (having similar exposure to the rail line) use multiple. This should be consistently applied and clarified;

- For the calculation of *Location 1, Area A*, rail Segment #2 uses the incorrect escalated train volumes;

- Although not related to the rail calculations, there are differences in the use of road gradient when modelling Upper Middle Road, with a gradient ranging from 0% to 8%. This comment is included as modifications may affect the overall predicted sound levels and may potentially influence architectural component requirements for proposed dwellings with exposure to the rail line;

- For the *Location 1, Area A* calculations, the rear wall calculation uses an angle of exposure of -45 degrees to 90 degrees, while the rear yard (OLA) calculation uses an angle of exposure of -90 to 90. It is anticipated that the angle of exposure for the rear yard calculation should be reduced. This should be confirmed;

- There are discrepancies across the calculations adjacent to the rail line in terms of the source and barrier elevations. There is at times large variability shown over a relatively small area. The base of source/receiver/barrier elevation inputs should be confirmed for all presented calculations;

- For several of the calculations, the Way Freight input parameters are incorrect. The inputs show 1 locomotive per train and 10 cars per train, whereas the CN data included in Appendix C reflects 4 locomotives per train and 25 cars per train. The input parameters are to be updated;

- For the *Location 3, OLA Area A* calculation, the escalation of train volumes is inconsistent relative to the other calculations. It is escalated ten years here, whereas the other calculations escalate 11 years (10 years beyond report preparation); and

- For *Locations 5 and 6, Area B*, the calculations use 'rows of houses' as screening. The application is not consistent across the building façade and rear yard (OLA) calculations in all cases. Additionally, the dwellings used as screening are not located between the source and receiver for the entire angle of exposure. The calculations need to be revised. In lieu of rows of houses, it is recommended that the screening dwellings be used to reduce the overall angle of exposure, in the same way the subject dwelling of the respective calculation has been used to terminate the angle of exposure.

Calculations have been corrected in the updated report.

2. As there are comments that necessitate updates to the analysis, we recommend that the rail traffic data be updated.

Rail traffic data has been verified by CN; email included in Appendix B.

3. The CN Rail correspondence included in Appendix C indicates that Metrolinx/GO should be contacted to confirm any operations at this location. It is not clear if Metrolinx/GO was contacted to confirm. This should be clarified. If Metrolinx does use the rail line, the analysis, mitigation and warning clauses will need to be updated.

Metrolinx has confirmed they do not operate on the railway line. Email included in Appendix B.

4. Section 1 of the report indicates that "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." This is not accurate and we anticipate this is a typographical error, but should be corrected/clarified.

Wording has been corrected in the updated report.

5. Tables 4 and 5 should clarify which façade of a respective dwelling has been considered in the analysis.

The most exposed façade is what is considered in the calculation. Notes added in Tables 4 and 5.

6. Tables 4 and 5 may need to be updated following the calculation revisions.

Tables updated with updates to traffic data and corrections.

7. Sample mitigated STAMSON calculation printouts should be included in support of the mitigated sound level reported for the rear yards (Section 5.1 and Table 6).

Calculations for mitigation required along Upper Middle Road has been conducted in Cadna due to the complex geometry of the site.

8. As a point of clarification, the report notes the need for exterior wall construction of "brick or masonry exterior" for the first row of dwellings adjacent to the rail line. For completeness, we note that the requirement is for brick veneer or acoustically equivalent masonry construction.

Noted.

9. Section 5.3 specifies Acoustic Insulation Factor (AIF) values for bedrooms and living/dining/family rooms. Please clarify how these ratings were determined. A sample calculation/output should be provided.

AIF values were determined via established tables in LU-131 and takes into account if the exterior façade is required to be brick.

10. Further to Comment #9, Table 7 in the report specifies the minimum glazing requirements in terms of an STC rating. Table 9 of the report returns to specifying AIF and not STC. The requirements should be provided consistently. The preferred approach is STC as CN includes the acoustic requirements in the CN Agreement with the developer.

Table 9 is meant to be a sample STC requirement based on assumed window to floor area ratios. STC values are typically included in the summary Table once requirements have been determined based on actual window to floor area ratios. Preliminary STC requirements based on assumed window to floor ratios have been included in Table 9.

11. In reviewing Table 9 and comparing Locations 1 and 4, the results show that the bedroom requirements are worse for Location 4 but the living/dining room requirements are worse for Location 1. This appears to be a discrepancy and should be clarified and revised as necessary. The need for updated STAMSON calculations may affect the results of the glazing requirements.

Corrected in updated report.

12. The Federation of Canadian Municipalities (FCM) and Railway Association of Canada (RAC) "Guidelines for New Development in Proximity to Railway Operations" (RAC/FCM guidelines) were not consulted in the report and need to be included in the final report.

Consideration has been included in the final report.

13. It is acknowledged that the noise study indicates the first row of dwellings require brick veneer or masonry equivalent wall construction. The guideline discussed on page 4 is the MOE requirement for brick veneer. To clarify, CN generally requires that the first row of dwellings be constructed of brick veneer or acoustically equivalent masonry construction, regardless of the predicted sound level at the façade. Based on Table 9, the extent of dwellings for which brick veneer or acoustically equivalent masonry construction is proposed is unclear. Please specify which dwellings are proposed to have this exterior wall construction.

Noted.

14. Although not reviewed relative to noise and vibration exposure due to separation distance, intervening uses, and the findings relevant to Areas A and B, we note that there may be dwellings within Area D that will be located within 300 m of the railway right-of-way and will therefore require Warning Clause 'Type G' (lettering as per the HGC report).

Noted.

15. Warning Clause "G", the CN warning clause, should be updated to be consistent with the wording typically used by CN.

Noted.