

# R

## Appendix R: NOISE REPORT



Engineering  
for **people**



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## MEMORANDUM

<b>DATE:</b>	July 4, 2022	<b>RWDI Reference No.:</b> 2004435
<b>TO:</b>	Stephen Keen   Director Transportation, CIMA+ David Hiatt   Project Manager, CIMA+	<b>EMAIL:</b> Stephen.Keen@cima.ca David.Hiatt@cima.ca
<b>FROM:</b>	Slavi Grozev   Senior Noise Engineer, RWDI Alain Carrière   Senior Project Manager/Associate, RWDI	<b>EMAIL:</b> Slavi.Grozev@rwdi.com Alain.Carriere@rwdi.com
<b>RE:</b>	<b>Environmental Noise Assessment Clarkson Road and Lakeshore Road West Intersection Mississauga, Ontario</b>	

Dear Mr. Keen,

CIMA+ retained RWDI to complete an environmental noise assessment in support of the Clarkson Road and Lakeshore Road Intersection Municipal Class Environmental Assessment Study in Mississauga, Ontario. This assessment has been conducted in accordance with the Terms of Reference outlined in the City of Mississauga Request for Proposal (RFP) #PRC002193.

The objective of the assessment is to predict sound levels as related to the project, review municipal noise control by-laws, and provide conceptual construction mitigation measures to minimize the potential impacts.

A plain language description of the terminology and relationships between everyday sounds to aid the non-technical reader is provided in Appendix A.

## PROJECT DESCRIPTION

The intersections of Lakeshore Road West and Clarkson Road North / Clarkson Road South are offset by approximately 75 m, resulting in two closely spaced signalized intersections. The objective of the EA study was to review the Lakeshore Road West and Clarkson Road North / Clarkson Road South intersections and improve the operations, safety, and mobility for all road users at the intersections.

The study investigated several alternative solutions to improve traffic operations at both intersections and has recommended an Interim Preferred Solution and Preferred Solution that will be implemented on a phased basis in the short to medium term and the longer term respectively. The Interim Preferred Solution Improvements includes the introduction of a center median and side by side left turn lanes on Lakeshore Road West. The Preferred Solution improvements includes the realignment of Clarkson Road North.



The Interim Preferred Solution is illustrated in Figure 1 and includes the introduction of separate left-turning lanes on the Lakeshore Road West section between Clarkson Road North and Clarkson Road South instead of the existing back to back left turn lane configuration. The Interim Preferred Solution is not anticipated to impact the road traffic volumes and consequently the operational noise impacts (i.e. same traffic volumes are anticipated for the future build and future no build scenarios).

Although the current noise assessment is based on the Interim Preferred Solution, it should be noted that the Preferred Solution will be protected for implementation at a later date (see Figure 3). The Preferred Solution would avoid the offset alignment assumed in the Interim Preferred Solution and would result in a single intersection instead of two – with resulting improvements to traffic flow. Should this Preferred Solution be implemented, the changes in noise impacts would be expected to be minor – if anything they would decrease because of the improved traffic flow.

## APPLICABLE GUIDELINES

A number of guidelines and documents related to assessing road traffic and construction noise impacts have been reviewed that are applicable to this project and are presented herein.

### Operational Noise Guidelines and Policies

The proposed undertaking falls under the jurisdiction of the City of Mississauga in the Region of Peel. The Region of Peel has the following guidelines:

- General Guidelines for the Preparation of Acoustical Reports in the Region of Peel (Region of Peel, 2012)
- Policy # W30-04: Private Noise Attenuation Walls Conversion Policy (Region of Peel, 2012)

The Region of Peel guidelines for acoustical reports is applicable only to new developments in close proximity to major roadways but the information requirements have been considered and are provided within this memo. The noise wall policy is mainly applicable for regional roads which is not the case for the current project. Thus, the municipal guidelines will be applicable. The City of Mississauga has a Policy #09-03-03 (City of Mississauga, 2011) which governs noise attenuation barriers on major roadways. The installation criterion is determined based on the daytime equivalent sound level ( $LEQ, day$ ), averaged over the period from 7:00 am to 11:00 pm, being greater than 60 dBA. This criterion has to be assessed for any capital works project where no noise barriers currently exist which is the case for the current project. The criterion by the City of Mississauga matches the sound objectives of the noise policy of the Region of Peel for Regional Roads.



However, the regional and municipal documents do not provide a detailed methodology on how to assess the operational noise. Thus, guidelines for the assessment of operational traffic noise by the Ontario Ministry of Transportation (MTO) is adopted for the current assessment. The MTO has two current guidelines and documents related to assessing road traffic noise impacts. These documents and policies are:

- Ontario MTO, Environmental Guide for Noise (MTO 2006, Version 1.1 July 2008)
- Ontario MTO, Environmental Reference for Highway Design (MTO 2009)

These guidelines apply to construction of new provincial highways, and reconstruction of existing provincial highways. The Environmental Guide for Noise also includes guidance on roadway construction activities.

Sound impacts are assessed by comparing the future sound levels with and without the proposed undertaking. Sound levels are evaluated as 24-hour equivalent sound level ( $LEQ_{24}$ ) based on the Average Annual Daily Traffic (AADT). If the predicted changes are equal or greater than 5 dBA, or if the future sound levels with the undertaking are equal or greater than 65 dBA, mitigation efforts have to be assessed. Noise control measures have to be technically, economically and administratively feasible.

Based on the information provided by the traffic study conducted by CIMA+, the undertaking is not expected to alter the future traffic volumes. Thus, the only applicable MTO limit to assess is the future sound level impacts to remain less than 65 dBA. The need for a barrier as per the City of Mississauga noise policy will also be assessed.

## Noise Sensitive Areas

Noise Sensitive Areas (NSAs) are the locations where the MTO guidance sound level limits should be applied. NSAs includes private homes, apartment buildings, schools, hospitals, and campgrounds with overnight accommodation as long as these land uses are associated with an outdoor living area (MTO, 2008).

Clarkson Road has private homes along both sides of the street on the north and south links which are considered as NSAs. Most of the first-row buildings on Lakeshore West are commercial in nature and thus are considered non-sensitive. All the worst-case representative noise-sensitive receivers are shown in Figure 2.

## Construction Noise Guidelines

### Local Noise Control By-laws

The proposed project lies within the local jurisdiction of the City of Mississauga. The City of Mississauga has a noise control By-law No. 360-79 (City of Mississauga, 1980) which regulates noise that is likely to disturb residents within the city. The By-Law was first issued in 1980 and was further amended several instances until the most recent updates in 2020. The current version of By-law No. 360-79 is provided in Appendix B.



The noise by-law indicates that noise associated with any equipment in connection with construction activities is prohibited in residential areas from 7:00 pm any day to 07:00 am the next day in addition to being completely prohibited on Sundays and statutory holidays. However, the by-law indicates an exemption procedure where an application has to be filed to the city and potential exemptions may be granted for a temporary period up to six months.

## MECP Noise Control

The Ontario Ministry of the Environment, Conservation and Parks (MECP, previously known as Ministry of the Environment (MOE)) stipulates limits on sound levels from individual items of equipment, rather than for overall construction noise. In the presence of persistent noise complaints, sound emission standards for the various types of construction equipment used on the project should be checked to ensure that they meet the specified limits contained in MOE Publication NPC-115 - "Construction Equipment", as follows (MOE, 1977b):

**Table 1: NPC-115 Maximum Noise Emission Levels for Typical Construction Equipment**

Type of Unit	Maximum Sound Level <sup>[1]</sup> (dBA)	Distance (m)	Power Rating (kW)
Excavation Equipment <sup>[2]</sup>	83	15	Less than 75 kW
	85	15	75 kW or Greater
Pneumatic Equipment <sup>[3]</sup>	85	7	-
Portable Compressors	76	7	-

**Notes:** [1] Maximum permissible sound levels presented here are for equipment manufactured after Jan. 1, 1981.

[2] Excavation equipment includes bulldozers, backhoes, front end loaders, graders, excavators, steam rollers and other equipment capable of being used for similar applications.

[3] Pneumatic equipment includes pavement breakers.

## OPERATIONAL NOISE IMPACTS

Operation and maintenance noise, relating to noise from operations of the project following project completion, are generally of primary importance for surface transportation projects. The noise study primarily considered significant changes due to two separate left-turning lanes on the Lakeshore section between Clarkson Road North and South instead of the current back to back left turn lane. Based on the traffic study conducted for the chosen option, the future traffic volumes will remain unaltered. Thus, the project is expected to cause no change in future operational sound and vibration levels at the NSAs.

The applicable sound limit to assess the sound impact would be comparing the worst-case future sound levels to the MTO 65 dBA criteria ( $L_{EQ,24}$ ) and Mississauga's 60 dBA criteria ( $L_{EQ,day}$ ). However, even if exceedances were predicted, building barriers along would not be administratively feasible since multiple homes have driveway access to the roadways.



The City of Mississauga provided CIMA+ with the Turning Movement Counts (TMCs) of the intersection of Lakeshore Road West with Clarkson Road South, Clarkson Road North, Meadow Wood Road, and Plaza Entrance at 1865 Lakeshore Road West. The TMCs were conducted in 2019 at the peak AM and PM periods. The AADTs were estimated from the peak hourly volumes using the conversion factors of the HCM methodology (HCM, 2010). TMCs provided the vehicle breakdown percentages into autos and trucks. The trucks were further split into medium and heavy trucks based on typical breakdown percentages provided by the MTO Environmental Guide for Noise (MTO, 2008). The future traffic volume was estimated in the traffic study by CIMA+ for 20-year horizon (i.e. 2041). A summary of the current and future traffic volumes is provided in Table 2.

**Table 2: Summary of Road Traffic Volumes**

Roadway	Segment	Current AADT (2019)	Future AADT (2041)	% Medium Trucks	% Heavy Trucks
<b>Lakeshore Road West EB</b>	Between Clarkson Road South and North Links	11846	14543	2.6%	4.1%
<b>Lakeshore Road West WB</b>	Between Clarkson Road South and North Links	9359	11905	1.9%	3.1%
<b>Clarkson Road South</b>	South of lakeshore Road West	1761	2769	1.4%	2.2%
<b>Clarkson Road North</b>	North of lakeshore Road West	5479	8829	1.7%	2.7%

Environmental noise propagation was modelled using the FHWA Traffic Noise Model TNM version 2.5 (FHWA, 1998), which is an approved modeling software by MTO. The summary of predicted sound levels ( $LEQ_{24}$ ) at the worst-case noise-sensitive receivers is presented in Table 3 while comparing with the sound objectives of the MTO guidance. The predicted sound levels do not exceed 65 dBA (MTO absolute future sound threshold) at all receivers. Thus, no further noise mitigation investigation is required per the MTO guidance. An extra check, which is not required by MTO guidance but was completed from a due diligence perspective, is to compare the future sound levels with the current ones. The highest increase of sounds levels over the 20-year horizon is limited to approximately 2 dB which is not considered to be a significant change. Sound changes start to be perceptible when there is a difference of 3 dB or higher.

**Table 3: Predicted Road Traffic Sound Levels at Noise-Sensitive Receivers and Comparison with Sound Objectives of the MTO**

Receiver ID	Existing <sup>[1]</sup> (dBA)	Future <sup>[1]</sup> (dBA)	Future Increase Over Existing (dB)	≥ 65 dBA <sup>[2]</sup>
R01	29	30.6	1.6	No
R02	32.4	34.1	1.7	No
R03	34	35.7	1.7	No
R04	35.7	37.4	1.7	No
R05	37.8	39.4	1.6	No
R06	42.8	44.5	1.7	No



Receiver ID	Existing <sup>[1]</sup> (dBA)	Future <sup>[1]</sup> (dBA)	Future Increase Over Existing (dB)	≥ 65 dBA <sup>[2]</sup>
R07	34.1	35.6	1.5	No
R08	33.1	34.6	1.5	No
R09	32.2	33.6	1.4	No
R10	29.7	31.3	1.6	No
R11	32.2	33.9	1.7	No
R12	34.4	36	1.6	No
R13	36.4	38.1	1.7	No
R14	39.8	41.5	1.7	No
R15	45.3	47.1	1.8	No
R16	44.2	45.4	1.2	No
R17	45.6	46.7	1.1	No
R18	44.8	45.9	1.1	No
R19	47	48.1	1.1	No
R20	29.9	31.7	1.8	No
R21	31	32.8	1.8	No
R22	32	33.8	1.8	No
R23	33.3	35.2	1.9	No
R24	35.3	37.3	2	No
R25	36.3	38.2	1.9	No
R26	39.1	41.1	2	No
R27	43.9	46	2.1	No
R28	52.7	54.9	2.2	No
R29	47.4	49.5	2.1	No
R30	41	43.1	2.1	No
R31	39.4	41.4	2	No
R32	41.8	43.9	2.1	No
R33	54.4	56.5	2.1	No
R34	55	57.1	2.1	No
R35	47.3	49.2	1.9	No
R36	43.9	45.6	1.7	No
R37	43	44.3	1.3	No
R38	42.3	43.5	1.2	No
R39	41	42.1	1.1	No

**Notes:**

[1] The shown levels are  $L_{EQ,24}$  representing average sound levels over the 24-hour period as per the MTO guidance.

[2] MTO absolute future sound level objective of 65 dBA.

The presented sound levels in Table 3 are  $L_{EQ,24}$ , while the City of Mississauga noise barrier policy is based on  $L_{EQ,day}$ . Assuming that 90% of the traffic volume occurs during the daytime, based on the Ornament publication (MOE, 1989),  $L_{EQ,day}$  will be higher than  $L_{EQ,24}$  by approximately 1 dB. Thus, the highest predicted  $L_{EQ,day}$  at all receivers would be approximately 58 dBA at R34 which is still below the city's installation criterion for new noise barriers (i.e. 60 dBA  $L_{EQ,day}$ ).



## CONSTRUCTION NOISE IMPACTS

Construction activities are temporary in nature, and unavoidable to some extent. Construction activities will vary temporally and spatially as the project progresses. Sound levels from construction at a given receptor location will also vary over time as different activities take place, and as those activities change location within the right-of-way.

An analysis of potential worst-case construction sound levels has been conducted based on generic data (equipment types and activities). All construction activities will be confined within the existing right-of-way. The list of equipment used for roadway construction, their locations and the anticipated sound levels are summarized in Appendix C. The construction is assumed to be limited to Lakeshore Road West in the segment joining the north and south links of Clarkson Road. The closest receivers to the roadway construction on Lakeshore Road West are residential homes located approximately 90 meters south from the road centreline. The sound levels at these receivers resulting from roadway construction are predicted to be approximately 69 dBA. The analysis shows that construction sound levels generally decrease as distance to the NSAs increases. Moreover, the construction noise is temporary in nature and will vary based on the activities that take place. The presented sound levels are for the parallel operation of all the equipment, with the duty cycles and equipment distribution, provided in Appendix C.

The estimated sound levels have the potential to be an annoyance to homes within the study limits of this project. A comparative chart of sound pressure levels and human perception to aid the reader is found in Table 3 of Appendix A. There are presently no receptor-based limits for roadway construction noise impacts. MOE NPC-115 should be followed and actions are required if noise sensitive receptors create complaints. Conceptual noise mitigation measures have therefore been provided in the next section to minimize the potential for noise impacts.

### Conceptual Mitigation

Mitigation measures are provided below to minimize the potential for construction noise impacts. It is required that these be written into the contract documentation for the contractor.

- There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract and local noise by-laws. Enforcement of noise control by-laws is the responsibility of the Municipality for all work done by Contractors.
- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.
- Monitor and maintain haul routes to minimize movement over rough ground and potholes which in turn can generate noise.
- All equipment shall be kept in good working order as deterioration may increase equipment sound levels. A documented, regular inspection and maintenance program must be implemented.
- Vehicle on-site speed limits must be met and shall be enforced.
- Idling vehicles shall be kept to a minimum.





- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative and economic feasibility of the various alternatives.
- Additional means to reduce annoyance and the risk of persistent complaints may be beneficial for the closest residences. This can include installation of temporary localized noise barriers, such as those shown in Appendix D, or similar custom-built ones.

## CONCLUSION

The potential noise impacts of the roadway improvements of the intersection of Clarkson Road and Lakeshore Road West in Mississauga, Ontario have been assessed. The project is expected to cause no change in future operational sound levels which are anticipated to be within the provincial and city guidelines criteria. However, the primary noise impact will be from construction activities. Construction sound is temporary in nature but will be noticeable at times at existing noise sensitive areas in proximity to the activity. The estimated construction sound levels have the potential to be an annoyance to noise sensitive areas within the study limits of this project. Methods to minimize construction noise impacts should be included in the Special Provisions, as outlined herein. The City of Mississauga has a noise by-law which prohibits nighttime construction activities and on Sundays and statutory holidays unless an exemption is granted.

## CLOSURE

We trust the information included herein meets the current project requirements. Please, incorporate our recommendations from this report. RWDI are available for a conference call should you have any questions.

**RWDI**

A handwritten signature in blue ink, appearing to read 'Slavi Grozev', is positioned above the printed name.

Slavi Grozev, P.Eng., B.A.Sc.  
Senior Noise Engineer

AJC/klm



## REFERENCES

1. City of Mississauga, 1980, By-Law No. 360-79, Noise Control By-Law.
2. City of Mississauga, 2011, Policy #09-03-03, Noise Attenuation Barriers on Major Roadways.
3. Ontario Ministry of Transportation (MTO), 2006, Environmental Guide for Noise updated July 2008.
4. Ontario Ministry of Transportation (MTO), 2009, Environmental Reference for Highway Design.
5. Ontario Ministry of the Environment (MOE), 1977b, Model Municipal Noise Control Bylaw, which includes Publication NPC-115 – Construction Equipment.
6. Ontario Ministry of the Environment (MOE), 1989, ORNAMENT Ontario Road Noise Analysis Method for Environment and Transportation, Technical Publication.
7. Region of Peel, 2012, General Guidelines for the Preparation of Acoustical Reports in the Region of Peel.
8. Region of Peel, 2012, Policy # W30-04, Private Noise Attenuation Walls Conversion Policy.
9. TNM - FHWA Federal Highway Administration Model (<http://www.trafficnoise-model.org>) TNM Version 2.5, McTrans Center University of Florida, 2088 Northeast Waldo Road, Gainesville, FL 32609, <http://mctrans.ce.ufl.edu>.
10. Transportation Research Board, National Research Council, Washington, DC, 2010, Manual, Highway Capacity (HCM).

# FIGURES

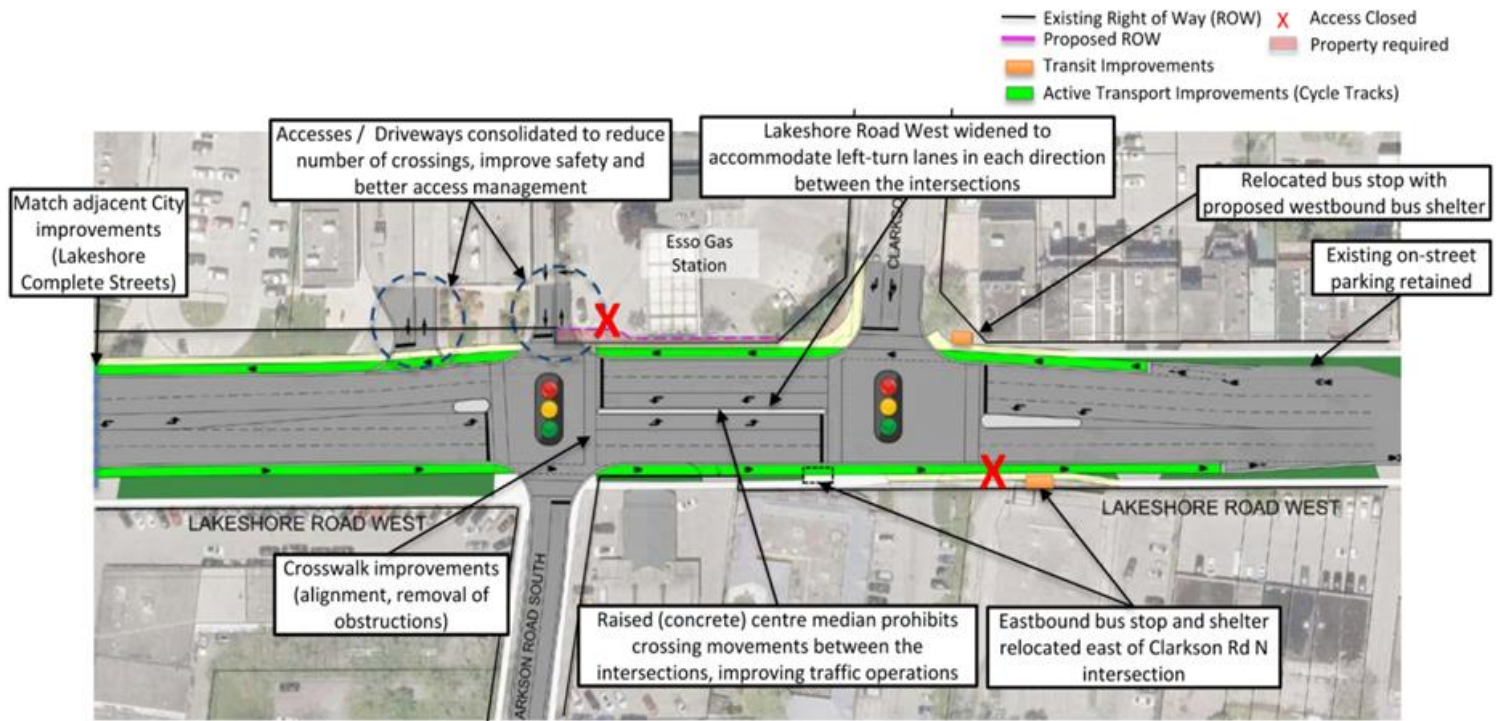


Figure 1: Interim Preferred Solution for the Undertaking





Figure 2: Worst-Case Noise-Sensitive Receivers



**Figure 3: Preferred Solution**

A large decorative graphic on the left side of the page, featuring a blue triangle at the top left and a large, light gray curved shape that resembles a quarter-circle or a stylized 'C' shape, with a white curved line separating the blue and gray areas.

# APPENDIX A





# TRANSPORTATION SOUND BASICS

## Sound Levels

Sound is, in its simplest form, a dynamic, fluctuating pressure, in a fluid medium. That medium can be air, other gases, or liquids such as water. These fluctuations are transmitted by pressure waves through the medium from the source to the receiver. For the majority of transportation engineering purposes, the primary interest is with sound waves in air, with human beings as the receptor. Noise is defined as unwanted sound. The standard practice within the acoustical industry is to use these two terms interchangeably.

## Decibels

A decibel (dB) is a logarithmic ratio of a value to a reference level. The general mathematical format is:

$$\text{Level in dB} = 10 \log (\text{Value} / \text{Reference})$$

Any value can be expressed in decibels. Decibels are very useful in performing comparisons where there are huge ranges in levels. For example, an acoustical engineer can expect to deal with acoustical energy values ranging from 0.00001 W to 100 W (sound power), and pressures ranging from 0.002 Pa to 200 Pa (sound pressure).<sup>1</sup> For completeness, decibels should always be stated with their reference level (e.g., 20 dB re: 20  $\mu$ Pa). However, in practice the reference level is often left out.

## Sound Pressure Level

Sound pressure level is what humans experience as sound. Sound waves create small fluctuations around the normal atmospheric pressure. These pressure fluctuations come into contact with eardrums and create the sensation of sound. Sound pressure is measured in decibels, according to the following equation:

$$\text{Sound Pressure Level, dB} = 10 \log (p^2 / p_o^2)$$

Where:  $p$  = root mean square (r.m.s.) sound pressure, in Pa  
 $p_o$  = reference sound pressure, 20  $\mu$ Pa

The reference pressure represents the faintest sound that a “typical” human being can hear. The typical abbreviation for sound pressure level is SPL, although  $L_p$  is also often used in equations. “Sound level” or “noise level” are also sometimes used.

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<sup>1</sup> Equivalent to Sound Power Levels ranging from 70 to 140 dB and Sound Pressure Levels ranging from 20 dB to 140 dB





# Octave Bands

Sounds are composed of varying frequencies or pitches. Human sensitivity to noise varies by frequency, with a greater sensitivity to higher frequency sounds. The propagation of sound also varies by frequency. The unit of frequency is Hertz (Hz), which refers the number of cycles per second (number of wave peaks per second of the propagating sound wave). The typical human hearing response runs from 20 Hz to 20,000 Hz. Frequencies below 20 Hz are generally inaudible, although response is variable, and some individuals may be able to hear or perceive them.

Sound is typically analysed in octave bands or 1/3-octave bands. An octave band is defined as a band or range of sound frequencies where the frequency range doubles for succeeding octave (alternately, the highest frequency in the range is twice the value of the lowest frequency). Octave band and 1/3-octave band frequencies of interest frequencies of interest are shown in the table on the following page. Road and rail transportation noise sources tend to be broadband in nature, having roughly equal sound energy in many octave bands. Heavy rail traffic and heavy truck traffic may produce significant noise in lower frequencies < 200 Hz.

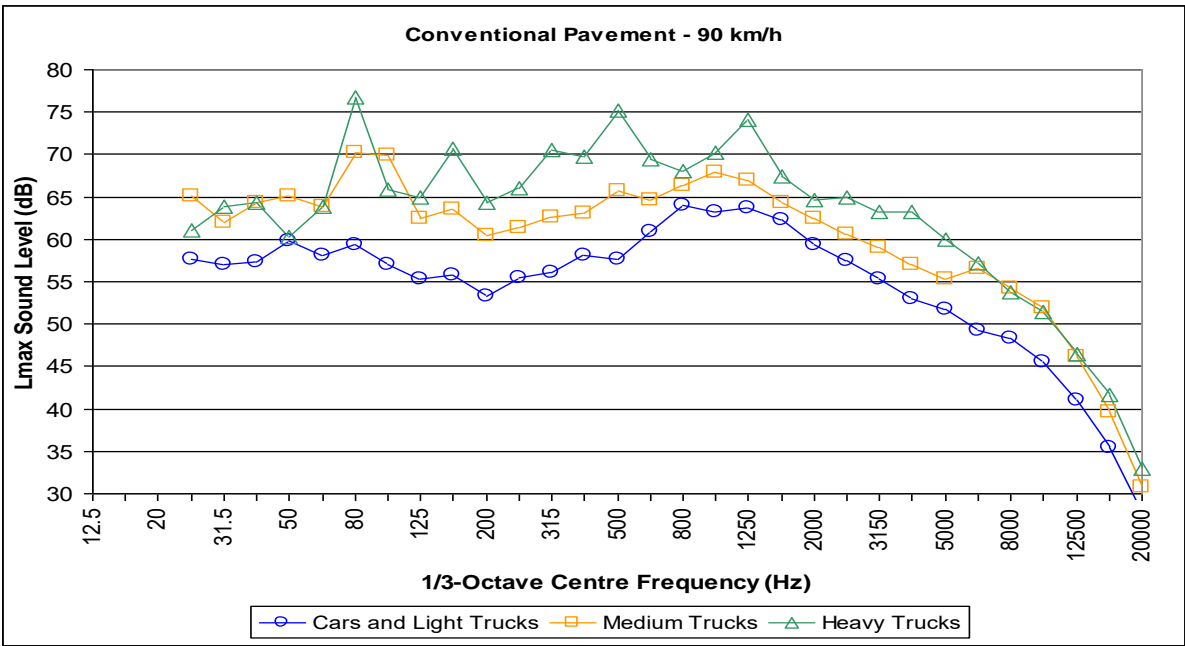
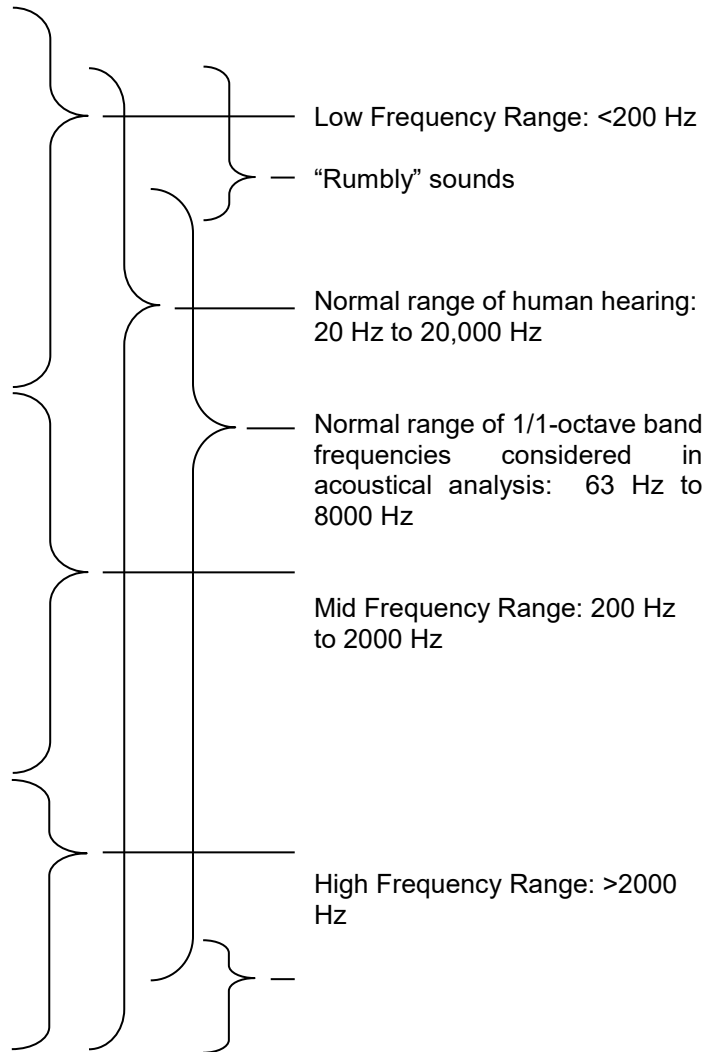


Figure 1: Typical Frequency Spectra of Traffic Noise - Vehicle Pass-bys at 90 km/h



**Table 1:** Octave Band Frequencies of Interest

Centre-Frequency (Hz)		Band No.	Frequency Range (Hz)
1/3-Octave	1/1-Octave		
12.5	16	N/A	11 to 22
16			
20			
25	31.5	0	22 to 45
31.5			
40			
50	63	1	45 to 89
63			
80			
100	125	2	89 to 177
125			
160			
200	250	3	177 to 345
250			
315			
400	500	4	345 to 707
500			
630			
800	1,000	5	707 to 1,414
1,000			
1,250			
1,600	2,000	6	1,414 to 2,828
2,000			
2,500			
3,150	4,000	7	2,828 to 5,657
4,000			
5,000			
6,300	8,000	8	5,657 to 11,314
8,000			
10,000			
12,500	16,000	N/A	11,314 to 22,627
16,000			
20,000			



**Note:** Per ISO 266-1975



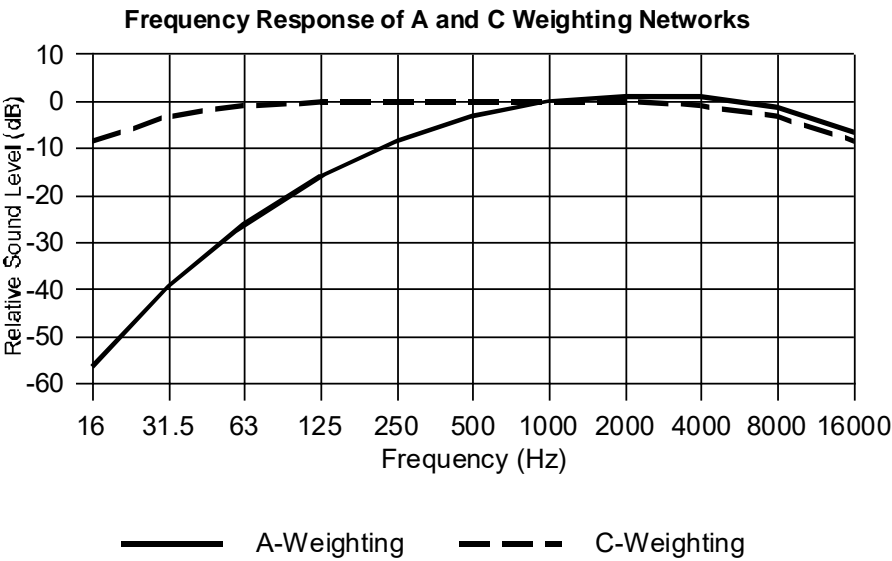
# A-Weighting

When the overall sound pressure level is expressed as a single value (i.e., not expressed in frequency band levels) the variation in human frequency response must be accounted for. People do not hear low frequency noise as well as noise in mid or high frequencies. To account for this, frequency-weighting networks have been developed to better account for human hearing response. The most frequently used networks are the A-Weighting and C-Weighting.

The A-Weighting network was developed to correspond to how humans hear low to medium levels of noise. The A-Weighting is the most frequently used scheme, and the majority of noise guidelines are expressed in A-Weighted decibel values, denoted as “dBA” levels. C-Weighted “dBC” values are sometimes used in assessing low-frequency noise impacts, which are generally not of concern in transportation noise impact assessment. The A-Weighting and C-Weighting values are shown in the following table and figure.

**Table 2:** A- and C-Weighting Values

1/1-Octave Frequency (Hz)	A-Weighting Value (dB)	C-Weighting Value (dB)
31.5	-39.4	-3.0
63	-26.2	-0.8
125	-16.1	-0.2
250	-8.6	0
500	-3.2	0
1,000	0	0
2,000	1.2	-0.2
4,000	1.0	-0.8
8,000	-1.1	-3.0



**Figure 2:** A-Weighting and C-Weighting Networks



## Ranges of Sound Levels

People experience a wide range of sound levels in their daily activities. The table below presents a graphical comparison of “typical” noise levels which might be encountered, and the general human perception of the level.

**Table 3:** Ranges of Sound Levels

Sound Levels		Sources of Noise
Human Perception	SPL, in dBA	
Deafening	125	Sonic booms
	120	Threshold of Feeling / Pain
	115	Maximum level, hard rock band concert
	110	Accelerating Motorcycle at a few feet away
Very Loud	105	Loud auto horn at 3 m (10 ft) away
	100	Dance club / maximum human vocal output at 1 m (3 ft) distance
	95	Jack hammer at 15 m (50 ft) distance
	90	Indoors in a noisy factory
Loud	85	Heavy truck pass-by at 15 m (50 ft) distance
	80	School cafeteria / noisy bar; Vacuum Cleaner at 1.5 m (5 ft)
	75	Near edge of major Highway
	70	Inside automobile at 60 km/h
	65	Normal human speech (unraised voice) at 1 m (3 ft) distance
Moderate	60	Typical background noise levels in a large department store
	55	General objective for outdoor sound levels; typical urban sound level
	50	Typical suburban / semi-rural sound level (24h)
	45	Typical noise levels in an office due to HVAC; typical rural levels (24h)
Faint	40	Typical background noise levels in a library
	35	
	30	Broadcast Studio
	25	Average whisper
Very Faint	20	Deep woods on a very calm day
	15	
	10	
	5	Human breathing
	0	Quietest sound that can be heard

Sound levels from 40 to 65 dBA are in the faint to moderate range. The vast majority of the outdoor noise environment, even within the busiest city cores, will lie within this area. Sound levels from 65 to 90 are perceived as loud. This area includes very noisy commercial and industrial spaces. Sound levels greater than 90 dB are very loud to deafening, and may result in hearing damage.



Transportation noise events, which vary with time, can also be considered in terms of their maximum noise level ( $L_{max}$ ) during a vehicle pass-by, as shown in the following table:

**Table 4:** Typical Pass-By Noise Levels at 15 m from Noise Source

Event	Range of Noise Levels (dBA) at 15 m
Semi-Trailer Trucks	75 - 85
Aircraft	69 - 85 <sup>[1]</sup>
Conventional Light Rapid Transit (Streetcars)	72 - 80 <sup>[2]</sup>
Large Trucks	71 - 78
Street Motorcycle	76
Diesel or Natural Gas Bus	70 - 78
Trolley Bus	69 - 73
Small Motorcycle	67
General Busy Auto Traffic	66 - 70
Individual Automobiles	63 - 69

**Notes:** Source: BKL Consultants Ltd.

[1] Aircraft flyover not at 15 m distance

[2] Based on data provided for the Calgary, Edmonton and Portland LRT systems.

## Noise Descriptors – Leq Values

At this time, the best available research indicates that long-term human responses to noise are best evaluated using energy equivalent sound exposure levels ( $L_{eq}$  values), in A-Weighted decibels ( $L_{eq}$  values in dBA)<sup>2, 3</sup> including adjustments to account for particularly annoying characteristics of the sounds being analyzed.

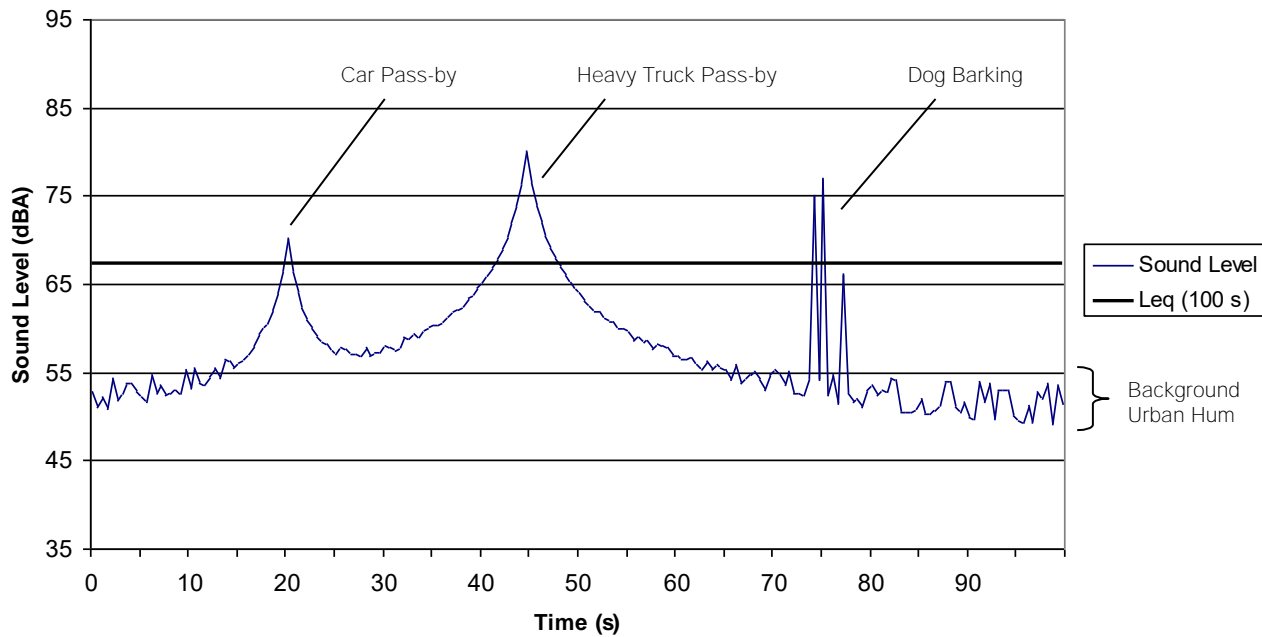
Sound levels in the ambient environment vary each instant. In a downtown urban environment, the background noise is formed by an “urban hum”, composed of noise from distant road traffic and from commercial sources. As traffic passes near a noise receptor, the instantaneous sound level may increase as a vehicle approaches, and then decrease as it passes and travels farther away. The energy equivalent sound exposure level  $L_{eq}$  is the average sound level over the same period of time with same acoustical energy as the actual environment (i.e., it is the average of the sound energy measured over a time period T). As a time-average, all  $L_{eq}$  values must have a time period associated with them. This is typically placed in brackets beside the  $L_{eq}$  tag. For example, a thirty-minute  $L_{eq}$  measurement would be reported as an  $L_{eq}$  (30 min) value.

The  $L_{eq}$  concept is illustrated in Figure 3, showing noise levels beside a small roadway, over a 100 second time period, with two vehicle pass-bys:

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<sup>2</sup> Berglund and Lindvall, Community Noise, 1995.

<sup>3</sup> ISO 1996:2003(E), *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*.



**Figure 3:** Example of the  $L_{eq}$  Concept

In this example, the background “urban hum” is between 47 and 53 dBA. A car passes by at 20 seconds. As it approaches, the noise level increases to a maximum, and then decreases as it speeds away. At 45 seconds, a heavy truck passes by. Near 75 seconds, a dog barks three times. The maximum sound level ( $L_{max}$ ) over the period is 80 dBA and the minimum is 47 dBA. For almost 50% of the time, the sound level is lower than 55 dBA.

The  $L_{eq}$  (100s) for the above example is 67 dBA, which is much higher than the statistical mean sound level of 55 dBA. This illustrates that the  $L_{eq}$  value is very sensitive to loud noise events, which contain much more sound energy (as sound is ranked on a logarithmic scale) than the normal background. It is also sensitive to the number of events during the time period, and the duration of those events. If only the truck had passed by during the measurement (no car and no dog barks), the  $L_{eq}$  (100s) would be 66 dBA. If only the car and dog barks had occurred, the  $L_{eq}$  (100s) would have been 61 dBA. This shows that the truck pass-by is the dominant event in our example, due to its level and duration.

The ability of the  $L_{eq}$  metric to account for the three factors of level, duration and frequency of events makes it a robust predictor of human response to noise. It is for this reason that the vast majority of noise standards are based on  $L_{eq}$  values.



## Typical Durations for Leq Analyses

For transportation noise impact analyses, the following durations are typically used:

Leq (24h)	-	The sound exposure level over then entire 24-hour day
Leq Day	-	Either: Leq (15h), from 7am to 10 pm; or Leq (16h), from 7am to 11 am
Leq Night	-	Either: Leq (9h), from 10 pm to 7 am; or Leq (8h), from 11 pm to 7 am
Ldn	-	A special Leq (24h) value with a 10 dB night-time penalty applied to overnight sound levels (10pm to 7am)
Leq (1-h)	-	The sound exposure over a 1-hour time period

Leq (24h) values are appropriate for examining impacts of transportation noise sources with small changes in sound exposure levels over the 24-hour day. For example, freeway noise levels are generally consistent over the 24-hour day. Therefore, for freeways, there is little difference between Leq (24h) values and the corresponding Leq Day and Leq Night values.

Leq Day values, covering off the AM-peak and PM-peak travel periods, are generally appropriate for examining the impacts of non-freeway highways and municipal arterial roadways. The vast majority of noise associated with these sources is concentrated in the daytime hours, where typically, 85% to 90% of the daily road traffic will occur.<sup>4</sup> Thus, if reasonable sound levels occur during the daytime (and appropriate guideline limits are met), they will also occur (and be met) at night.

To account for increased annoyance with noise overnight in a single value, the U.S. Environmental Protection Agency (U.S. EPA) developed the Ldn metric. It is a special form of the Leq (24h) with a +10 dB night-time penalty. Ldn values and a related metric, the day-evening-night level (Lden) are also used in some European guidelines. Ldn values are not used in Canadian Provincial jurisdictions in evaluating transportation noise. Instead, guideline limits for separate Leq Day and Leq Night periods are generally used.

Leq (1-h) values are the average sound levels over a one-hour time period. These tend to fluctuate more over the day, as traffic levels can fluctuate significantly hour to hour. Leq (1-h) values are useful in assessing the impact of transportation sources which also vary hourly, and which may vary in a different manner than the background traffic. These values are often used to assess haul route noise impacts, for example.

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<sup>4</sup> Based on research conducted by Ontario Ministry of Transportation, and provided in the *MTO Environmental Office Manual Technical Areas – Noise*. Daytime refers to a 16 hour day from 7am to 11 pm.



Some transportation noise sources may have significant traffic levels occurring over-night. For example, freight rail traffic in heavily used corridors can be shifted to over-night periods, with daytime track use being reserved for freight switcher traffic and passenger traffic. In situations such as this, an assessment of both daytime and night-time noise impacts may be appropriate.

### Decibel Addition

Decibels are logarithmic numbers, and therefore have special properties of addition. Decibel values must be added logarithmically. If two sources, each emitting the same amount of sound energy, are placed side-by-side, then the total increase in sound level will only be 3 dB. If the difference in sound energy emitted is greater than 10 dB, then effectively the sound level will be the same as for the loudest unit (i.e., the increase in noise will be less than a decibel). This is shown in Table 5.

**Table 5:** Decibel Addition Chart

dB Difference Of	dB Value to Add to Highest Number
0	3.0
1	2.5
2	2.1
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4

This affects transportation noise from projects, as noise emission is logarithmically related to traffic volume. Doubling the traffic volume (essentially the same as adding a source with the same sound emission) will only result in a 3 dB increase over the original levels. The decibel increase in noise due to the increase in traffic volume, assuming all other factors remain the same, can be estimated by:

$$\text{dB increase} = 10 \log (\text{new volume} / \text{original volume}).$$





## Human Response to Changes in Sound Levels

The human ear does not interpret changes in sound level in a linear manner. The general subjective human perception of changes in sound level is shown in the following table.

**Table 6:** Subjective Human Perception of Changes in Sound Level <sup>5,6</sup>

Change in Broadband Sound Level (dB)	Human Perception of Change
< 3	Imperceptible change
3	Just-perceptible change
4 to 5	Clearly noticeable change
6 to 9	Substantial change
> 10 and more	Very substantial change (half or twice as loud)
> 20 and more	Very substantial change (much quieter or louder)

**Notes:** Adapted from Bies and Hansen, p53, and MOE Noise Guidelines for Landfill Sites, 1998. Applies to changes in broadband noise sources only (i.e., increases or decreases in the same noise or same type of noise only). Changes in frequency content or the addition of tonal or temporal changes would affect the perception of the change.

The above table is directly applicable to changes in sound level where the noise sources are of the same general character. For example, existing road traffic noise levels can be directly compared to future road traffic noise levels, using the above relationships. In comparing road traffic noise to road plus rail traffic noise, the different frequency and temporal nature of the noise means that the rail noise may be more noticeable. Adjustments for the nature of the new sound can be applied to better account for temporal and frequency differences.

For transportation noise sources, research conducted by the U.S. Environmental Protection Agency indicates that a 5 dB change in sound levels is required to trigger a change in large-scale community response to noise. This correlates to a clearly noticeable increase in noise levels.

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<sup>5</sup> Bies, D.A., and C.H. Hansen 1988. *Engineering Noise Control – Theory and Practice*, 2<sup>nd</sup> Ed. E & FN Spon, London, p 53.

<sup>6</sup> Ontario Ministry of the Environment 1998. Noise Guidelines for Landfill Sites. Queen’s Printer for Ontario.

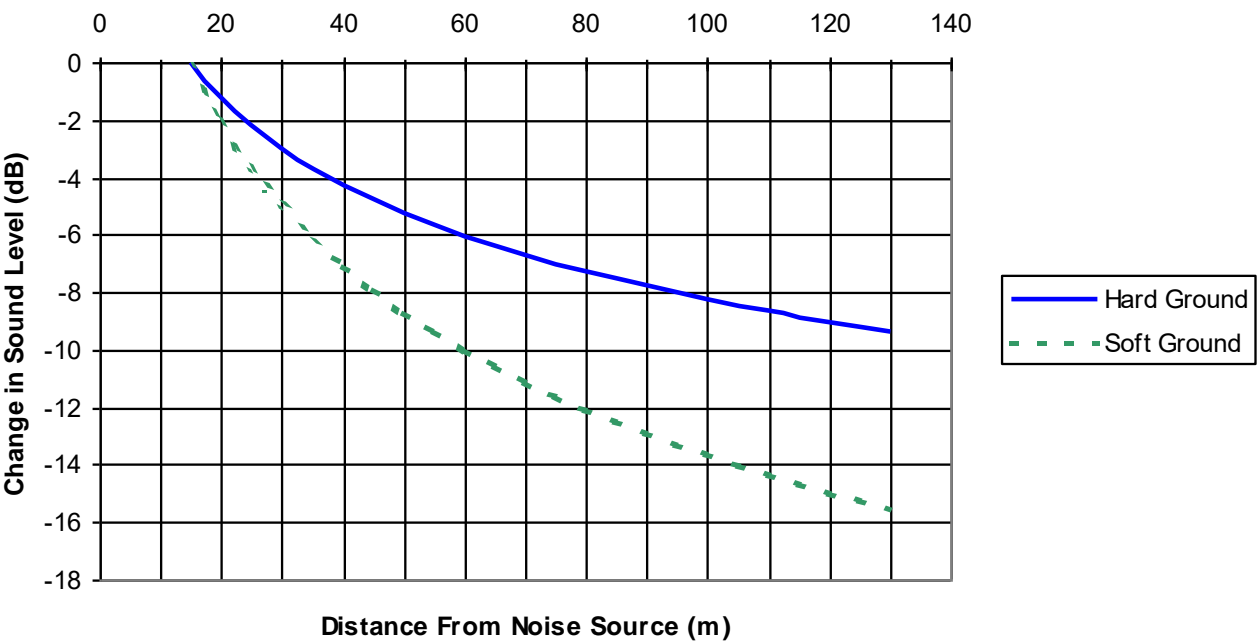


# Decay of Noise with Distance

Noise levels decrease with increasing distance from a source of noise. The rate of decay is partially dependent on the nature of the ground between the source: whether it is hard (acoustically reflective) or soft (acoustically absorptive). Transportation noise sources in general act as *line sources* of sound. For line sources, the rate of decay is approximately:

- Hard ground: 3 dB for each doubling of distance from the source
- Soft ground: 5 dB for each doubling of distance from the source

This is shown graphically in Figure 6, based on a reference distance of 15 m from the source:



**Figure 4:** Decay of Noise Versus Distance for Line Sources

A large decorative graphic on the left side of the page, featuring a blue triangle at the top left and a large, light gray curved shape that dominates the lower half of the page.

# APPENDIX B



**THE CORPORATION OF THE CITY OF MISSISSAUGA  
NOISE CONTROL BY-LAW 360-79**

(Amended by 77-85, 1298-86, 755-87, 63-92, 230-94, 303-00, 495-03, 124-05, 110-06, 92-07, 120-07, 127-07, 248-07, 73-08, 99-08, 299-08, 325-09, 243-13, 43-15, 60-15, 120-17, 125-18, 166-20, 188-20, 192-20)

***WHEREAS*** sections 8, 9 and 11 of the *Municipal Act, 2001*, authorize the Council of the Corporation of the City of Mississauga to pass by-laws necessary or desirable for municipal purposes, and in particular paragraphs 5, 6 and 8 of subsection 11(2) authorize by-laws respecting the economic, social and environmental well-being of the municipality, the health, safety and well-being of persons; and the protection of persons and property;

***AND WHEREAS*** section 129 of the *Municipal Act, 2001*, empowers a local municipality to prohibit and regulate with respect to noise and vibration;

**NOW THEREFORE** the Council of the Corporation of the City of Mississauga  
**ENACTS** as follows:

**INTERPRETATION**

1. In this by-law, (303-00)

**“City”** means the City of Mississauga in the Regional Municipality of Peel

**“Commissioner”** means the Commissioner of Transportation and Works for the City or his or her designate; (299-08)

**“construction”** includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, moving, land clearing, earth moving, grading, excavating, the laying of pipe and conduit whether above or below ground level, street and highway building, concreting, equipment installation and alteration and the structural installation of construction components and materials in any form or for any purpose, and includes any work in connection therewith;

**“construction equipment”** means any equipment or device designed and intended for use in construction or material handling, including but not limited to, air compressors, pile drivers, pneumatic or hydraulic tools, bulldozers, tractors, excavators, trenchers, cranes, derricks, loaders, scrapers, pavers, generators, off-highway haulers or trucks, ditchers, compactors and rollers, pumps, concrete mixers, graders or other material handling equipment;

**“Council”** means the Council of the Corporation of the City of Mississauga;

**“highway”** means a common and public highway and includes any bridge, trestle, viaduct, pathway, or other structure forming part of the highway, and except as otherwise provided, includes a portion of a highway and the area between the lateral property lines thereof; (125-18)

**“Minister”** means the Minister of the Environment;

**“Ministry”** means the Ministry of the Environment;

**“motor vehicle”** includes an automobile, motorcycle, motor assisted bicycle unless otherwise indicated in The Highway Traffic Act, and any other vehicle propelled or driven otherwise than by muscular power, but does not include the cars of electric or steam railways, or other motor vehicles running only upon rails, or a motorized snow vehicle, traction engine, farm tractor, self-propelled implement of husbandry or road-building machine within the meaning of The Highway Traffic Act.

**“motorized conveyance”** includes a vehicle and any other device employed to transport a person or persons or goods from place to place, but does not include any such device or vehicle if operated only within the premises of a person or if propelled or driven only by muscular, gravitational or wind power;

**“noise”** means unwanted sound;

**“Noise Control Officer”** means a person designated by the Commissioner for the City as a noise control officer; (1298-86, 755-87, 299-08)

**“point of reception”** means any point on the premises of a person where sound or vibration originating from other than those premises is received;

**“public notice”** means written notice provided by regular mail or delivery in person which includes information regarding the type of construction, the address or general area where the construction will take place, the date(s) and time(s) of construction, the source of construction noise and mitigation measures, that will be taken to reduce the noise or vibration from construction; (125-18)

**“Quiet Zone”** means those areas of the City where quiet is of particular importance and as more particularly designated in Schedule 4 to this By-law.

**“Residential Area”** means any area containing dwellings which are normally used for human habitation.

**“temporary outdoor patio”** means an accessory seating area, located adjacent to or within proximity of a restaurant, convenience restaurant or take-out restaurant. (166-20)

## **ADMINISTRATION**

2. The Commissioner shall be responsible for the administration and enforcement of this by-law. (1298-86, 755-87, 495-03, 299-08)

## **GENERAL PROHIBITION**

3. No person shall emit or cause or permit the emission of sound resulting from an act listed in Schedule 1 to this by-law and which sound is likely to disturb a reasonable person in the City. (188-20)

## **PROHIBITION BY TIME AND PLACE**

4. No person shall emit or cause or permit the emission of sound resulting from any act listed in Column 1 to Schedule 2 to this by-law if clearly audible at a point of reception located in a residential area or quiet zone within a prohibited period of time for such an area as set out in Column 2 to Schedule 2 to this By-law.

## **PUBLIC SAFETY EXEMPTION**

5. The provisions of Section 3 and 4 do not apply to the emission of a sound or vibration in connection with emergency measures undertaken:
  - (a) for the immediate health, safety or welfare of the inhabitants of the City or any of them; or
  - (b) for the preservation or restoration of property.

## **EXEMPTION OF TRADITIONAL FESTIVE OR RELIGIOUS ACTIVITIES**

6. The provisions of Section 3 and 4 do not apply to the emission of sounds or vibrations made by persons in connection with any of the traditional, festive, religious or other activities set out in Schedule 3 to this by-law.

## **GRANT OF EXEMPTION**

7.
  - (1) Any person may apply for an exemption from the provisions of Sections 3 and 4 of this By-law, with respect to any source of sound or vibration. (299-08)
  - (2) An application for exemption under Subsection (1) shall be in writing and shall contain:
    - (a) the name and address of the applicant,
    - (b) a description of the source of sound or vibration in respect of which exemption is being sought,

- (c) a statement of the section of the by-law from which exemption is sought,
  - (d) the period of time (not in excess of six (6) months) for which the exemption is sought,
  - (e) the reasons why the exemption is being sought,
  - (f) proof of publication for two consecutive days within the preceding ten (10) days in a newspaper of general circulation within the City, of a notice of intention to apply for any exemption to this by-law, received or by the distribution of a flyer as prescribed by the City to all residences within a 500 meter radius of the subject property containing the information required by Clauses (a) through (e) hereof, stating the date upon which objections may be submitted to City staff. (299-08)
  - (g) the application fee. (299-08)
- (3) An application for an exemption completed in accordance with section 7(2) shall be delivered to the Commissioner. (299-08)
  - (4) The Commissioner may grant an exemption, in whole or in part, with terms and conditions, subject to the provisions of this By-law. (299-08)
  - (5) In considering the completed application for any exemption, the Commissioner shall take into account the following: (299-08)
    - (a) If an exemption is granted, a time limit shall be specified, and an exemption shall not exceed six months.
    - (b) The Commissioner shall consult with the affected Ward Councillor on an application for an exemption and the consultation shall include any terms and conditions that may be attached to an exemption.
    - (c) Any correspondence received regarding the application as a result of the distribution of the Notice or newspaper advertisement referred to in Section 7(2)(f).
    - (d) The proximity of the sound to a Residential Area and the likelihood that the sound for which an exemption is requested may negatively affect persons in a Residential Area.
    - (e) Whether any negative impacts under clauses (c) or (d) can be reduced with the use of mitigation measures including limiting the sound to certain days or times of the day.
  - (6) A breach by the applicant of any of the terms or conditions imposed by the Commissioner in granting an exemption shall immediately render the exemption null and void. (299-08)

- (7) Notwithstanding that the authority to grant an exemption is delegated to the Commissioner, and that he or she may have already exercised the delegated power, Council shall retain the right to exercise the authority to grant or deny an exemption in accordance with the conditions set out in section 7 (5) of this By-law. (299-08)
- (8) Notwithstanding any other provisions in this By-law, where the grant of an exemption under section 7 of this By-law relates to construction on a City Highway: (125-18)
  - (i) subparagraphs 7(2)(f), (g) and 7(5)(c) do not apply;
  - (ii) the period of time for the exemption may be greater than six months; and
  - (iii) the applicant shall, following notification of approval of the exemption and at least two weeks prior to the commencement of construction, circulate a public notice to all residences within a 500 meter radius of the source of sound or vibration.
- (9) Any person operating a temporary outdoor patio who applies for an exemption from the provisions of Sections 3 and 4 of this By-law shall not be subject to subsection 7(2)(g) of this By-law. (166-20)
- (10) Any person operating a temporary outdoor patio who applies for an exemption from Section 4 of this By-law as it relates to an act listed in Column 1, section 2 of Schedule 2 during a prohibited period of time as set out in Column 2 of Schedule 2, shall not be subject to subsection 7(2)(f) of this By-law. (192-20)

#### **SEVERABILITY**

- 8. (1) If a court of competent jurisdiction declares any section or part of a section of this by-law invalid, such section or part of a section shall not be construed as having persuaded or influenced Council to pass the remainder of the by-law and it is hereby declared that the remainder of the by-law shall be valid and shall remain in force. (166-20)
- (2) The defined term "temporary outdoor patio" in section 1, subsection 7(9) and subsection 7(10), shall only apply for a temporary period from the date of enactment and passing of this By-law until December 31, 2020, and shall be deemed to be deleted from this By-law effective January 1, 2021. (166-20, 192-20)

#### **PENALTY**

- 9. (1) Every person who contravenes any provision of this by-law is guilty of an offence. Pursuant to the provisions of the Provincial Offences Act, R. S. O. 1990, c.P. 33 upon conviction a person is liable to a fine of not more than \$5,000, exclusive of costs. (77-85, 63-92)



- (2) In addition to the provisions of Subsection (1), the Court in which the information is first laid and any court of competent jurisdiction thereafter, may issue an order prohibiting the contravention and repetition of the offence by the person convicted, and such order shall be in addition to any penalty imposed on the person convicted.
10. (1) By-law Number 7364 enacted by the former Town of Mississauga and any other by-law passed by the former Town of Mississauga to control noise is hereby repealed.
- (2) By-law Number 957, enacted by the former Village of Port Credit and any other by-law passed by the former Village of Port Credit to control noise is hereby repealed.
- (3) By-law Number 66-36, enacted by the former Town of Streetsville and any other by-law passed by the former Town of Streetsville to control noise is hereby repealed.
- (4) By-law 2370 enacted by the former Township of Toronto and any other by-law passed by the former Township of Toronto to control noise is hereby repealed.
- (5) Any Noise Control By-law, enacted by the Town of Oakville in that part of Oakville which was annexed by the City of Mississauga, and more particularly described in Section 2(1)(a) of The Regional Municipality of Peel Act, 1973, S.O. 1973, c. 60, is hereby repealed.

**READ A FIRST AND SECOND TIME THIS 28<sup>TH</sup> DAY OF MAY, 1979.**

**READ A THIRD TIME AND FINALLY PASSED THIS 28<sup>TH</sup> DAY OF JANUARY 1980.**

**Signed by: "Hazel McCallion", Mayor "Terence L. Julian", Clerk**

**This by-law is approved pursuant to the provisions of The Environmental Protection Act, 1971, as amended, at Toronto, this 9<sup>th</sup> day of April, 1980.**

**Signed by: "Harry Parrott", Minister of the Environment**

**SCHEDULE 1 TO BY-LAW NUMBER 360-79**  
**GENERAL PROHIBITIONS**  
**(Amended by 188-20)**

- 1. An unnecessary or unreasonable noise emanating from a motor vehicle, which includes but is not limited to the following:**
  - a) A noise caused from a bell, horn or other signalling device except when required or authorized by law or in accordance with good safety practices.**
  - b) A noise caused from an engine, a muffler and/or any other part of the emission control system.**
  - c) A noise caused by the operation of a motor vehicle, trailer or parts thereof related to the motor vehicle's disrepair or maladjustment.**
  - d) A noise caused from the operation of a motor vehicle in a manner which causes its tires to squeal.**
  - e) An amplified sound caused by the operation of any electronic device or group of connected devices emitting from the motor vehicle.**
- 2. The operation of an engine or motor in, or on, any motor vehicle or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such vehicle is stationary in a Residential Area or a Quiet Zone unless:**
  - a) the original equipment manufacturer specifically recommends a longer idling period for normal and efficient operation of the motor vehicle in which case such recommended period shall not be exceeded; or,**
  - b) operation of such engine or motor is essential to a basic function of the vehicle or equipment, including but not limited to, operation of ready-mixed concrete trucks, lift platforms and refuse compactors; or,**
  - c) weather conditions justify the use of heating or refrigerating systems powered by the motor or engine for the safety and welfare of the operator, passengers or animals, or the preservation of perishable cargo, and the vehicle is stationary for purposes of delivery or loading; or,**
  - d) prevailing low temperatures make longer idling periods necessary immediately after starting the motor or engine; or,**
  - e) the idling is for the purpose of cleaning and flushing the radiator and associated circulation system for seasonal change of antifreeze, cleaning of the fuel system, carburettor or the like, when such work is performed other than for profit.**
- 3. The operation of any item of construction equipment in a Quiet Zone or Residential Area without effective muffling devices in good working order and in constant operation.**

**SCHEDULE 2 TO BY-LAW NUMBER 360-79**  
**PROHIBITED PERIODS OF TIME:**

- A - 23:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. Sundays)**
- B - 19:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. Sundays)**
- C - 17:00 hrs. of one day to 07:00 hrs. next day (09:00 hrs. Sundays)**
- D - All Day Sundays and Statutory Holidays**
- E - 17:00 hrs. of one day to 07:00 hrs. next day**
- F - 19:00 hrs. of one day to 07:00 hrs. next day**

**SCHEDULE 2 TO BY-LAW NUMBER 360-79**  
**PROHIBITED PERIODS OF TIME:**

**COLUMN 1**

**COLUMN 2**

**PROHIBITED PERIOD OF TIME**  
**QUIET ZONE**      **RESIDENTIAL**  
**AREA**

- |    |  |             |   |
|----|--|-------------|---|
| 1. | The operation of any auditory signalling device, including but not limited to the ringing of bells or gongs and the blowing of horns or sirens or whistles, or the production, reproduction or amplification of any similar sounds by electronic means except where required or authorized by law or in accordance with good safety practices. | At Any Time | B & D   |
| 2. | The operation of any electronic device or group of connected devices incorporating one or more loudspeakers or other electro-mechanical transducers, and intended for the production, reproduction or amplification of sound.  | At Any Time | C   |
| 3. | All selling or advertising by shouting or outcry or amplified sound.   | At Any Time | B & D   |
| 4. | Loading, unloading, delivering, packing, unpacking, or otherwise handling any containers, products, materials, or refuse, whatsoever, unless necessary for the maintenance of essential services or the moving of private household effects.   | B           | B & D   |
| 5. | The operation of any construction equipment in connection with construction.   | E & D       | F & D   |
| 6. | The detonation of fireworks or explosive devices not used in construction.   | At Any Time | A - unless otherwise permitted in accordance with the provisions of By-law 160-74 or its successors |

**SCHEDULE 2 TO BY-LAW NUMBER 360-79**  
**PROHIBITED PERIODS OF TIME:**

<b><u>COLUMN 1</u></b>		<b><u>COLUMN 2</u></b> <b><u>PROHIBITED PERIOD OF TIME</u></b>	
		<b><u>QUIET ZONE</u></b>	<b><u>RESIDENTIAL AREA</u></b>
7.	The discharge of firearms.	At Any Time	At Any time-unless in accordance with the provisions of By-law 331-77 or its successors.
8.	The operation of a combustion engine which (i) is, or (ii) is used in, or (iii) is intended to be used in, a toy, or a model or replica of any device, which model or replica has no function other than amusement and which is not a conveyance.	At Any Time	A
9.	The operation of any powered rail car including but not limited to refrigeration cars, locomotives or self-propelled passenger cars, while stationary on property not owned or controlled by a railway governed by The Canada Railway Act	At Any Time	A
10.	The operation of any motorized conveyance other than on a highway or other place intended for its operation.	At Any Time	B
11.	The venting, release or pressure relief of air, steam or other gaseous material, product or compound from any autoclave, boiler, pressure vessel, pipe, valve, machine, device or system.	At Any Time	A
12.	Persistent barking, calling or whining or other persistent noise making by any domestic pet.	At Any Time	At Any Time
13.	The operation of any powered or nonpowered tool for domestic purposes other than snow removal.	A	A

**SCHEDULE 2 TO BY-LAW NUMBER 360-79**  
**PROHIBITED PERIODS OF TIME:**

<b><u>COLUMN 1</u></b>		<b><u>COLUMN 2</u></b>	
		<b><u>PROHIBITED PERIOD OF TIME</u></b>	
		<b><u>QUIET ZONE</u></b>	<b><u>RESIDENTIAL AREA</u></b>
14.	The operation of solid waste bulk lift or refuse compacting equipment.	B	A
15.	The operation of a commercial car wash with air drying equipment.	B	B
16.	Yelling, shouting, hooting, whistling or singing.	At Any Time	A

**SCHEDULE 3 TO BY-LAW 360-79**  
**ACTIVITIES TO WHICH THE BY-LAW DOES NOT APPLY**

(amended by 230-94, 495-03, 124-05, 110-06, 92-07, 120-07, 127-07, 248-07, 73-08, 99-08, 325-09, 243-13, 43-15, 60-15, 120-17)

<b>ACTIVITIES TO WHICH THE BY-LAW DOES NOT APPLY</b>	<b>LOCATION</b>
<b>Applewood Acres Homeowners Association</b> – Annual Family Fun Day	West Acres Park 2166 Westfield Drive
<b>Banares Museum</b> - Exemption applies to all approved events and activities at this location.	Banares Museum 1507 Clarkson Road North
<b>Bradley Museum</b> - Exemption applies to all approved events and activities at this location.	Bradley Museum 1620 Orr Road
<b>Can-Sikh Festival</b>	Paul Coffey Park 3430 Derry Road West
<b>Canada Day</b> (various locations throughout the City) <ul style="list-style-type: none"> <li>• Churchill Meadows Friends</li> <li>• Malton BIA and Partners</li> <li>• Port Credit Paint the Town Red</li> <li>• Streetsville BIA and Partners</li> </ul>	Churchill Meadows Park 3370 McDowell Drive  West Wood Mall 7205 Goreway Drive  Port Credit Memorial Park 32 Stavebank Rd N - (plus designated locations throughout Port Credit Village)  Streetville Memorial Park 335 Church Street - (plus designated locations throughout the Village)
<b>Caroling in the Park</b>	Port Credit Memorial Park 32 Stavebank Road North
<b>Cavalía</b>	Hershey Centre 5399 Rose Cherry Place
<b>Desh Bhagat</b>	Paul Coffey Park 3430 Derry Road West
<b>Filming Activities</b> Authorized by the City's Film Unit via a Film Permit issued in accordance with Corporate Policy and Procedure No. 06-03-02 - "Filming on City of Mississauga Property"	Approved designated locations

<b>Lakeside Park</b> - Exemption applies to all approved events and activities at this location.	Lakeside Park 2268 Lakeshore Rd West
<b>Leslie Log House</b> - Exemption applies to all approved events and activities at this location.	Leslie Log House 4415 Mississauga Rd
<b>Malton Festival</b>	Paul Coffey Park 3430 Derry Road West
<b>Mississauga Celebration Square</b>  Exemption applies to appropriately approved events and activities that appear on the MCS calendar of events, programs and activities	Civic Square 300 City Centre Drive,  Library Square 301 Burnhamthorpe Road West  Living Arts Centre Park 4141 Living Arts Centre Drive
<b>Mississauga Marathon</b>	City Centre Drive, Lakefront Promenade Park 800 Lakefront Promenade PLUS designated locations
<b>Mississauga Waterfront Festival</b>	Port Credit Memorial Park 32 Stavebank Road North  PLUS Port Credit Library and Port Credit Arena
<b>Mount Zion Apostolic Church - Picnic</b>	Paul Coffey Park 3430 Derry Road West
<b>Movies In The Park - Rotary Series</b>	Port Credit Memorial Park 32 Stavebank Road North
<b>Palestine House Educational and Cultural Centre</b>	Mississauga Valley Park 1275 Mississauga Valley Boulevard
<b>Port Credit Art Fest</b>	Port Credit Memorial Park, 32 Stavebank Road North
<b>Port Credit Busker Fest</b>	Port Credit Memorial Park 32 Stavebank Road North  PLUS event designated sites throughout Port Credit Village
<b>Rebel – National Youth Week</b>	Mississauga Celebration Square PLUS approved designated locations



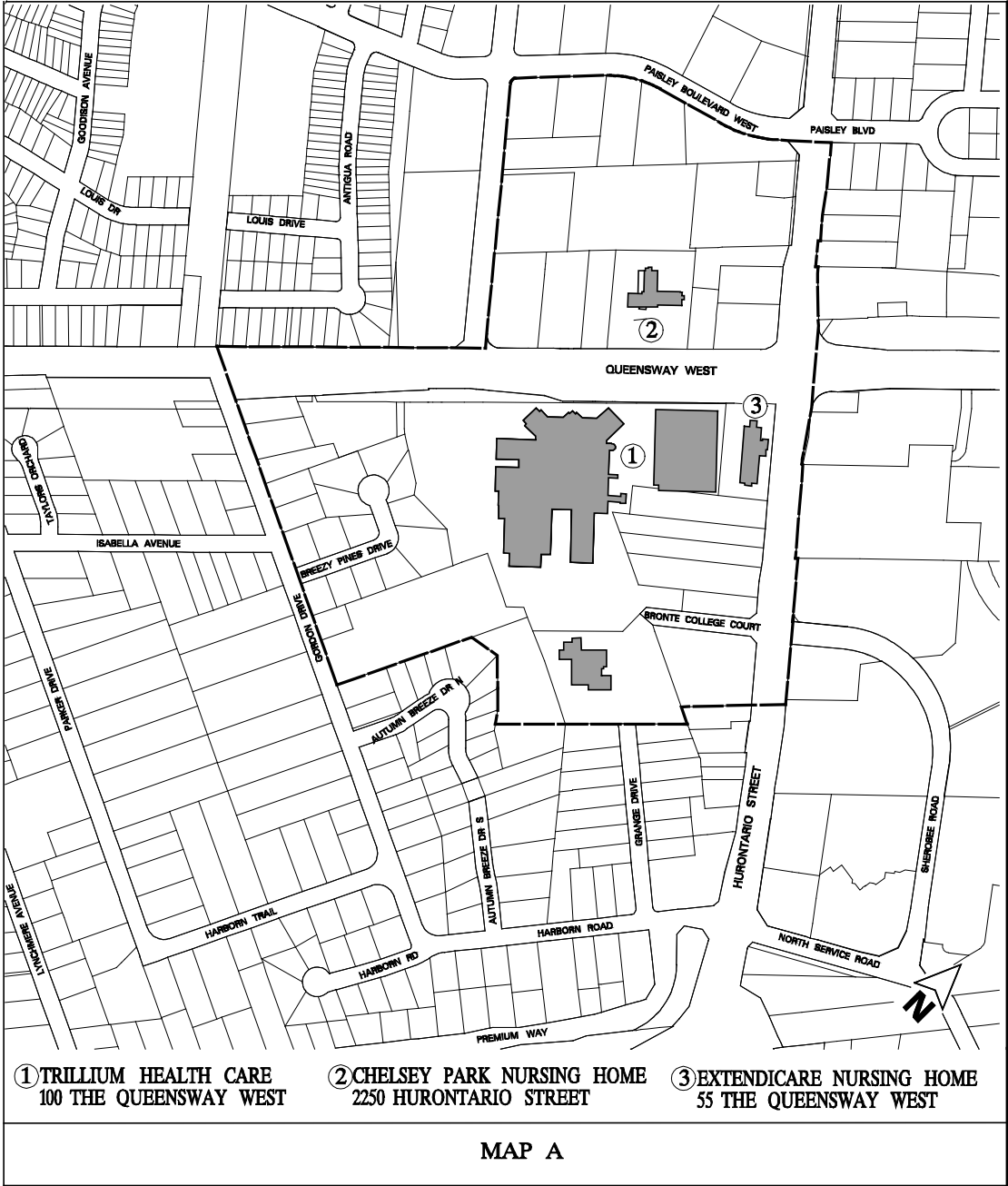
<b>Safe City Mississauga – Neighbours Night Out</b>	Approved designated locations
<b>Sherwood Forrest - Annual Family Fun Day</b>	Sherwood Green Park 1864 Deer's Wold
<b>St Gabriel Lebanese Festival</b>	Streetsville Memorial Park 335 Church Street
<b>Southside Shuffle – Blues and Jazz Festival</b>	Port Credit Memorial Park 32 Stavebank Road North  PLUS event designated sites throughout Port Credit Village
<b>Streetsville Founders - Bread &amp; Honey Festival</b>	Streetsville Memorial Park 335 Church Street
<b>Sunset Concert Series</b> (Culture Division Program)	Port Credit Memorial Park 32 Stavebank Road North  Lake Aquitaine 2750 Lake Aquitaine Avenue
<b>University of Santos Thomas Alumni - Annual Picnic</b>	Mississauga Valley Park 1275 Mississauga Valley Boulevard

**THE CORPORATION OF THE CITY OF MISSISSAUGA**  
**SCHEDULE 4 TO BY-LAW NUMBER 360-79**

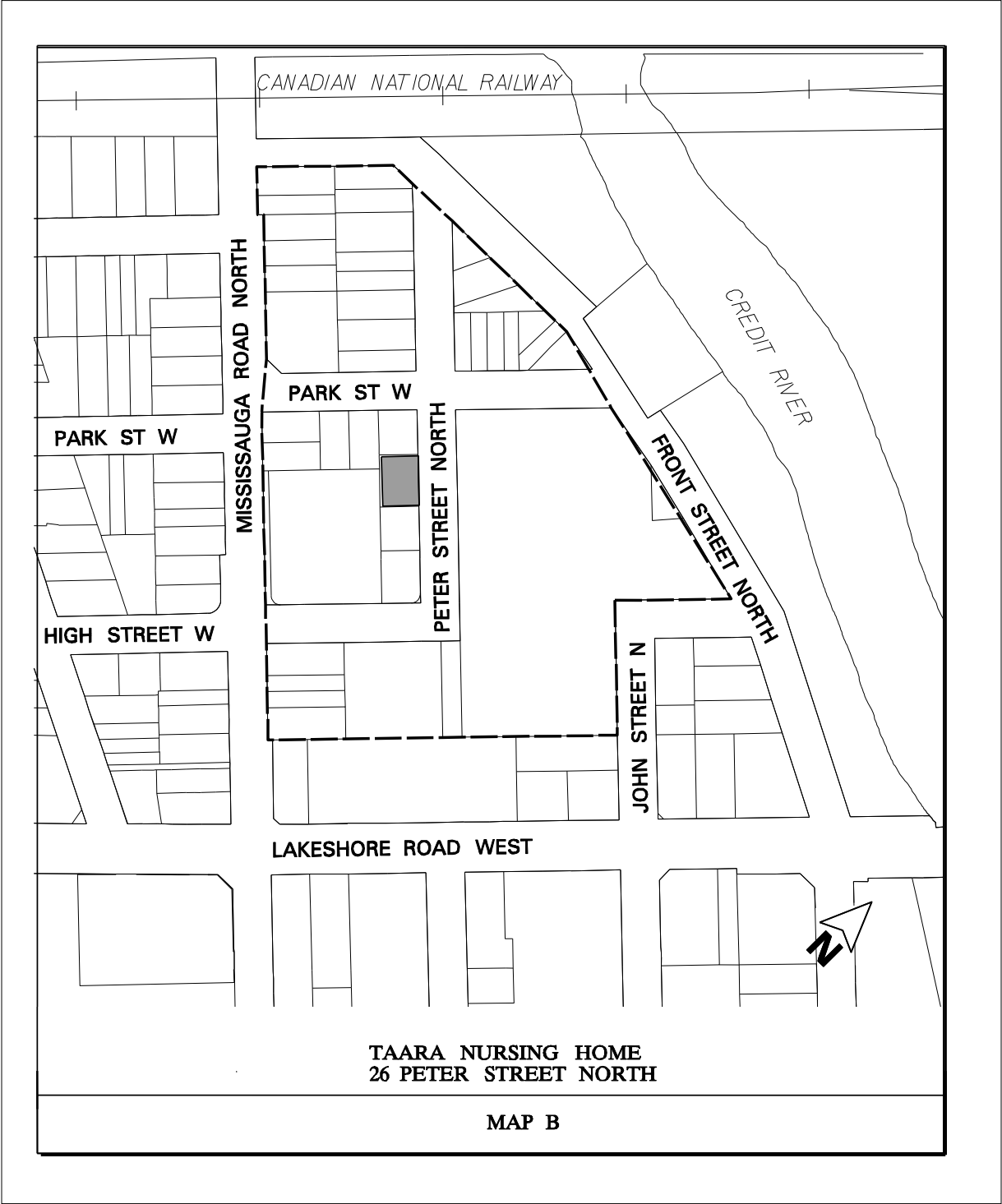
**QUIET ZONES**

**The Quiet Zones are those areas contained within the dotted lines on Maps A, B, C and D which are attached to By-law 360-79**

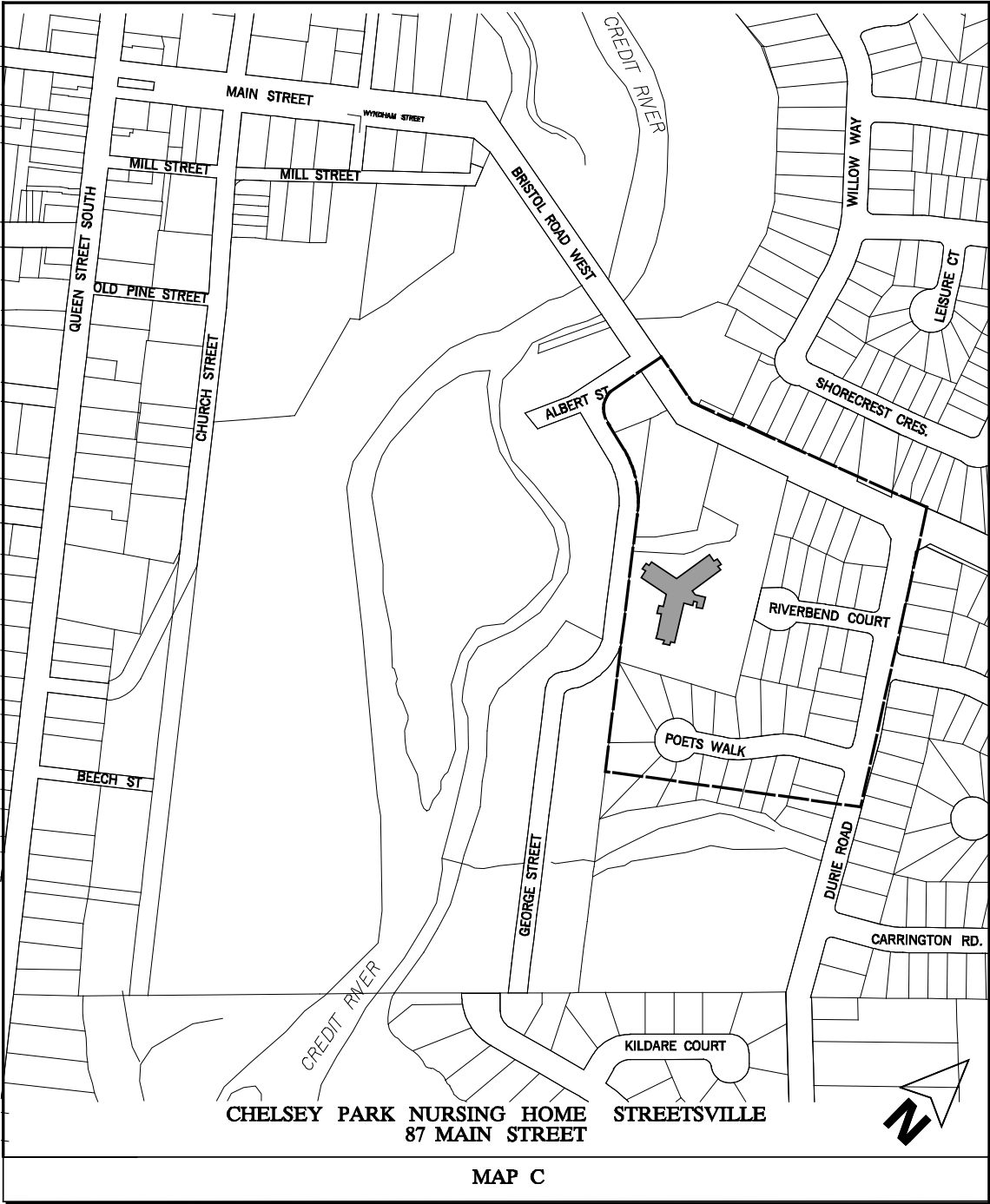
THE CORPORATION OF THE CITY OF MISSISSAUGA  
NOISE CONTROL BY-LAW



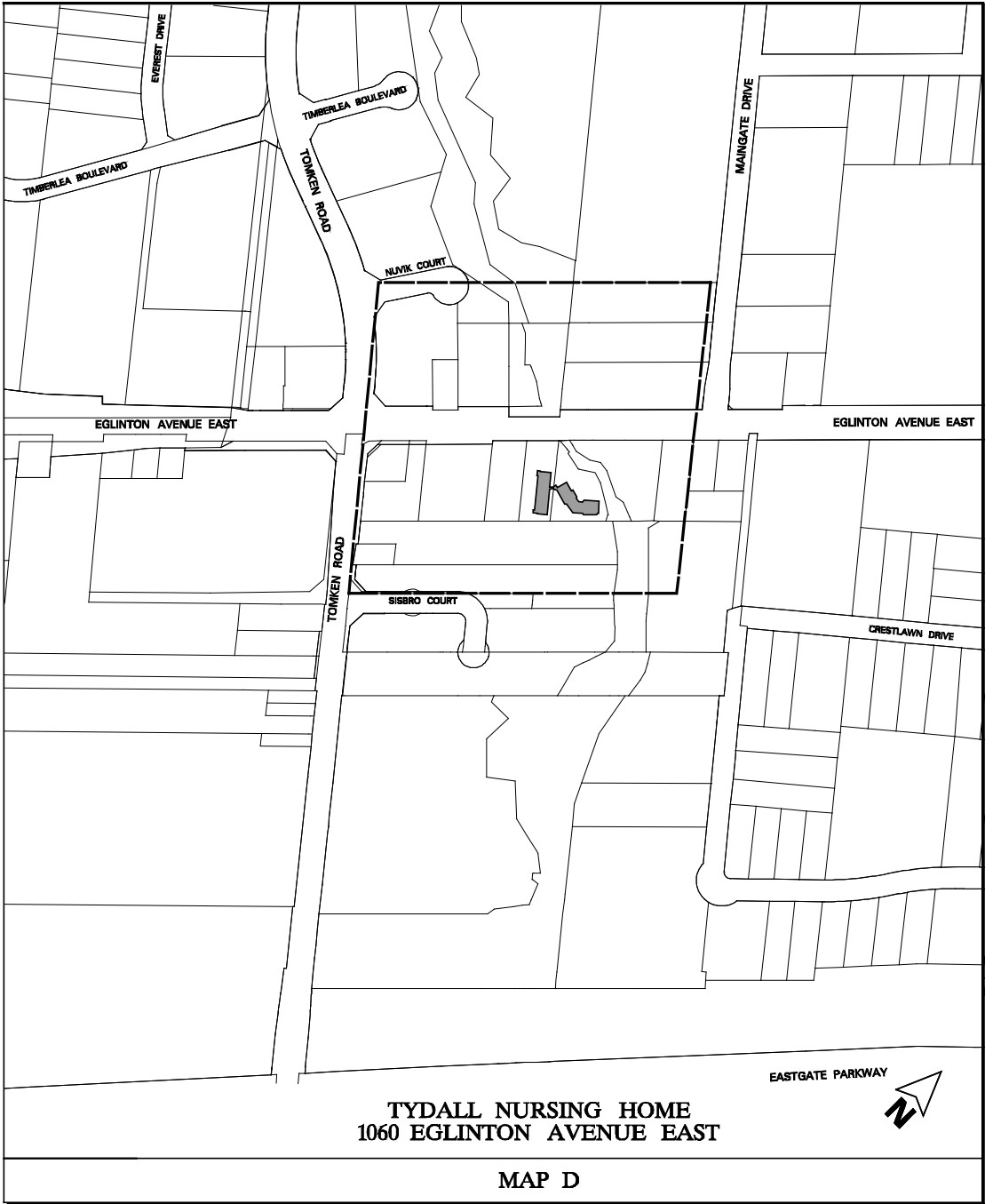
THE CORPORATION OF THE CITY OF MISSISSAUGA  
NOISE CONTROL BY-LAW



THE CORPORATION OF THE CITY OF MISSISSAUGA  
NOISE CONTROL BY-LAW



THE CORPORATION OF THE CITY OF MISSISSAUGA  
NOISE CONTROL BY-LAW



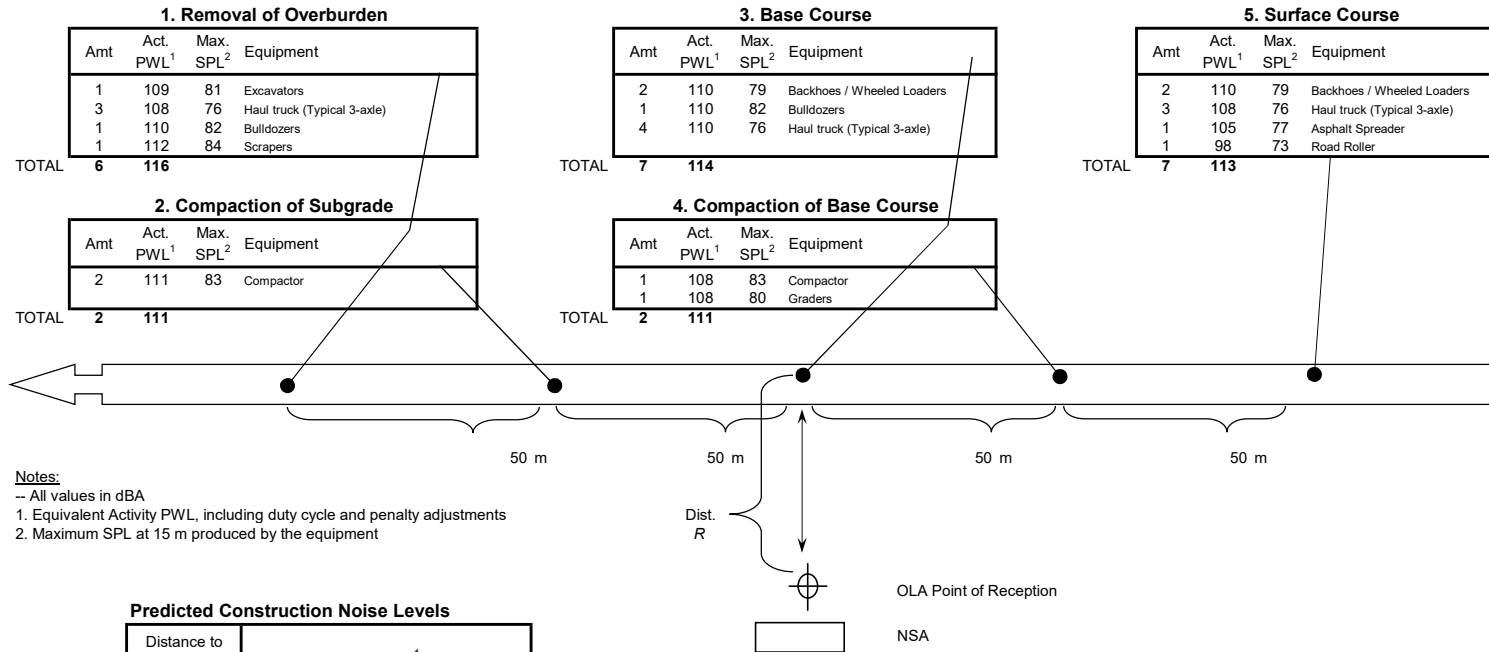
A large decorative graphic on the left side of the page, featuring a blue triangle at the top left and a large, light gray curved shape that dominates the lower half of the page.

# APPENDIX C



## Highway Construction Noise Assessment - Roadway Construction

Job No: 2004435  
Job Name: Clarkson Road and Lakeshore Road West Intersection - EA



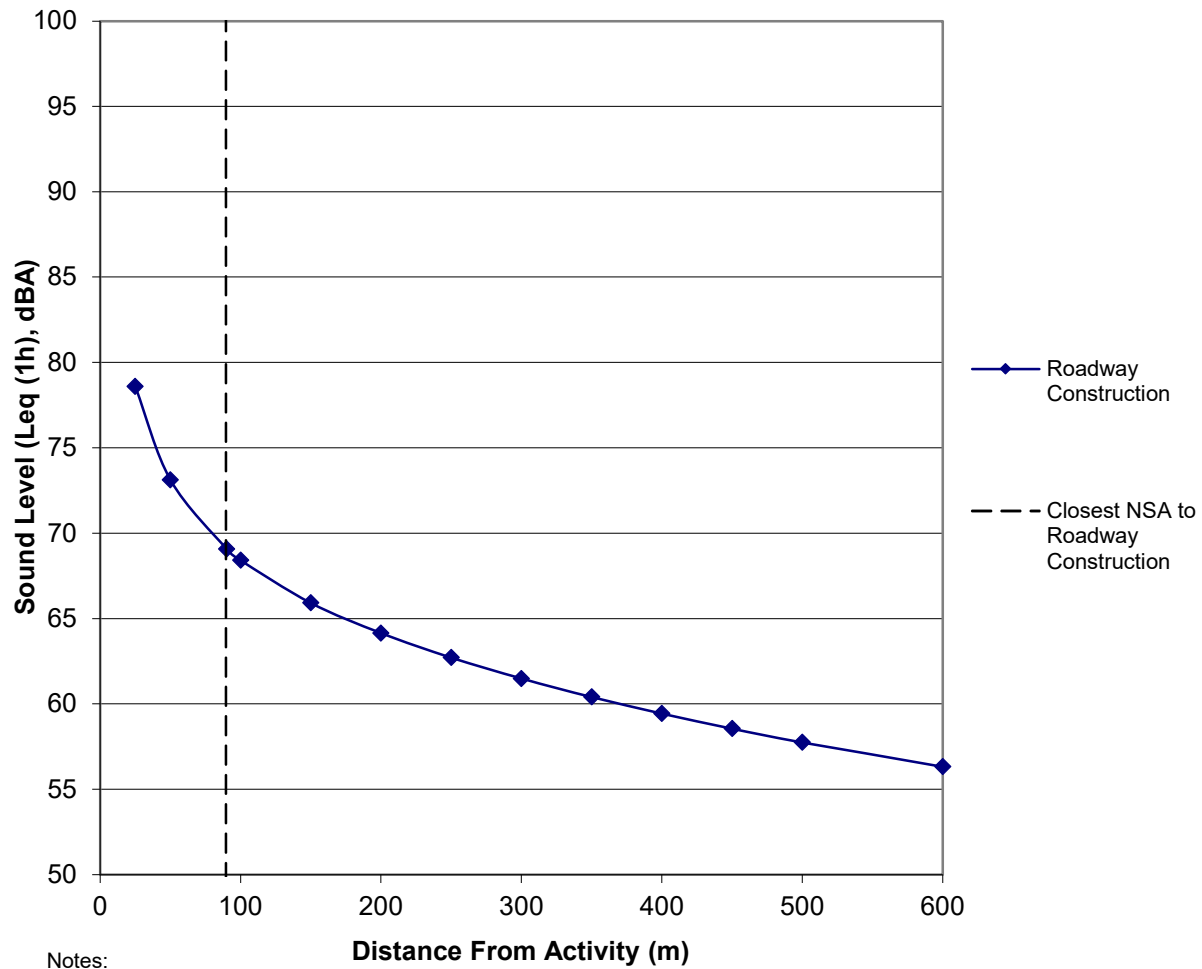
### Predicted Construction Noise Levels

Distance to Centre-line R (m)	L <sub>eq</sub> (1h) <sup>1</sup>
25	79
50	73
90	69
100	68
150	66
200	64
250	63
300	61
350	60
400	59
450	59
500	58
600	56

#### Notes:

- All values are in dBA unless otherwise noted
- 1. Equivalent Activity PWL for the group (includes duty cycle, penalties and no of vehicle adjustments) + 10 log (2 / (4\*3.14\* S-R dist<sup>2</sup>))





Notes:

Predicted noise levels account for distance attenuation (geometric spreading) only. Actual sound levels at distances greater than 300 m would be expected to be much less than those shown.

*Roadway Construction* scenario assumes 24 items of construction equipment spread out over 100 m on either side of a given NSA. Equipment generally operates at a 40% duty cycle.

A decorative background graphic featuring a large, light gray circular shape on the right side of the page. On the left side, there is a blue triangular shape pointing towards the center, separated from the gray circle by a thin white curved line.

## APPENDIX D



## ENVIRONMENTAL NOISE CONTROL

### ACOUSTICAL K-RAIL / JERSEY BARRIER MOUNTED SOUND WALL

ENC's K-Rail/Jersey barrier mounted sound walls allow for **quick** and **easy** positioning and movement throughout the site to provide a flexible noise control solution for mobile equipment or operations. The K-Rail/Jersey mounted barrier panels can be **customized** to meet your needs, with heights from 8-16 feet. This product line is an effective solution if the site does not allow earth boring.



#### BARRIER BLANKET SPECIFICATIONS

- Sound Transmission Class rated STC-25, 32 & 43 in accordance with ASTM E-413
- Engineered to meet IBC Wind Load requirements
- Flame Retardant to California Fire Marshall F-419.01 Specifications  
Length of Char: 3.5, After Flame: 2 Seconds
- Working Temperature: -40 °F to +200 °F
- Oil resistant, UV resistant, Fiber-Free, Anti-Fungal, Self-Drying Poly-Vinyl Chloride Outer Shell with specially developed inner core septum barrier

***FREESTANDING ACOUSTICAL PANELS ARE NOT INTENDED FOR USE IN HIGH WIND CONDITIONS WITHOUT A SUPPORTING STRUCTURAL ANALYSIS***

#### TEMPORARY ACOUSTICAL NOISE BARRIER SYSTEMS

Designed to provide optimum sound control in blocking and absorbing unwanted noise.

#### ENVIRONMENTAL



#### ENTERTAINMENT



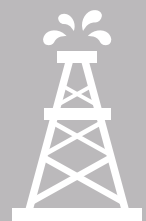
#### CONSTRUCTION



#### INDUSTRIAL



#### OIL & GAS



Learn more about commercial noise control at  
[www.environmental-noise-control.com](http://www.environmental-noise-control.com) or call us at 1-800-679-8633

# TEMPORARY NOISE BARRIER PANEL SYSTEM

At the heart of our temporary sound wall is our Environmental Noise Control (ENC) acoustical noise barrier panel system, which is manufactured using state-of-the-art acoustical composite materials. Our sound panels are fabricated with a polyvinyl-chloride coated outer shell, multiple layers of noise absorbing and blocking material and feature a specially developed septum barrier inner core. The ENC temporary sound wall system is available from 6 to 40 ft. high.

## Temporary Sound Panel Systems



**FREE  
STANDING**

**AUGERED  
STRUCTURE**

### Sound Transmission Loss (dB)

% Octave Band Center Frequency	STC 25 Transmission Loss	STC 32 Transmission Loss
63 Hz	8 dB	16 dB
80 Hz	10 dB	20 dB
100 Hz	11 dB	18 dB
125 Hz	10 dB	16 dB
160 Hz	7 dB	16 dB
200 Hz	7 dB	17 dB
250 Hz	11 dB	19 dB
315 Hz	17 dB	23 dB
400 Hz	23 dB	26 dB
500 Hz	28 dB	32 dB
630 Hz	33 dB	34 dB
800 Hz	36 dB	35 dB
1000 Hz	39 dB	35 dB
1250 Hz	41 dB	36 dB
1600 Hz	41 dB	36 dB
2000 Hz	40 dB	36 dB
2500 Hz	41 dB	37 dB
3150 Hz	44 dB	39 dB
4000 Hz	46 dB	40 dB
5000 Hz	50 dB	43 dB

**The modular design of ENC's temporary sound panel systems meets or exceeds code requirements.**

An independent acoustical laboratory has conducted tests in accordance with ASTM E-90 and ASTM E-413 requirements, to measure sound transmission loss and validating the Sound Transmission Class rating of STC-25, STC-32 and STC-43. The ENC composite barrier/absorber blankets, which are laboratory tested and certified, meet or exceed the specifications in the Sound Transmission Loss Data Table.

**1 (800) 679 8633 | International +1 310 679 8633 | [www.environmental-noise-control.com](http://www.environmental-noise-control.com)**

**CORPORATE OFFICE**  
Hawthorne, CA

**REGIONAL OFFICES & FIELD OPERATIONS**  
Aledo, TX; Carson, CA; Firestone, CO  
Napa, CA; Shreveport, LA; Washington, PA  
Calgary, Alberta

For more information on our quality products or possible applications, please see our website or call to speak with one of our ENC representatives. Rapid engineering and deployment response is available worldwide.

**Behrens & Associates, Inc.**  
*Environmental Noise Control*



**ENVIRONMENTAL  
NOISE CONTROL**



**Soft dB**

# Heavy Duty Soundproofing



Soundproofing Blankets  
**Isotex-dB**

SOFTDB.COM

Distributed by:







## Who Are We?

**Soft dB** has been providing acoustical and vibration consulting services since 1996. Its PhDs, engineers and technicians have undertaken numerous environmental, industrial, architectural, mining, commercial, institutional and residential projects.

For all types of noise and vibration control problems, **Soft dB** has expertise at the cutting edge of acoustical knowledge.

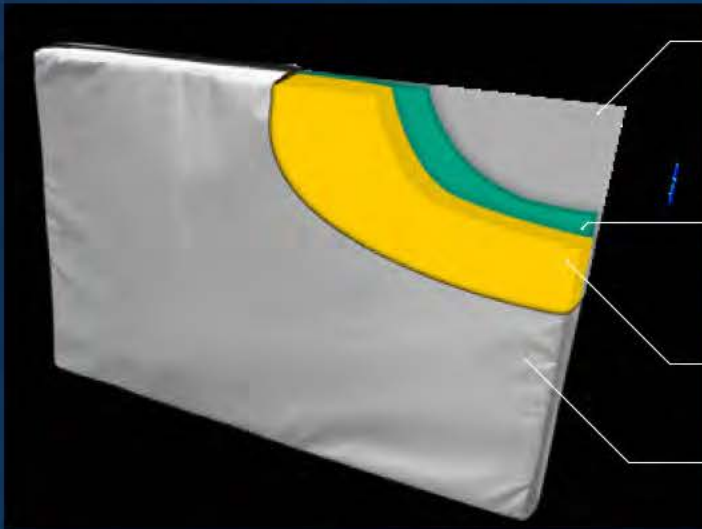
**Soft dB** has offices located in Boston, Montreal, Quebec City, Malartic and Luxembourg. Our acoustics & vibration experts provide consulting services all across United States, Canada, Europe, and Africa.





# Isotex-dB

## INDUSTRIAL GRADE COMPOSITION



1. An outer protective fabric layer with robust bands and fasteners prevents noise leakage and makes the cover both waterproof and UV resistant.

2. A sound-blocking layer composed of a mass-loaded polymer material prevents noise propagation.

3. A high-performance mineral fibre layer efficiently absorbs sound.

4. A Silicone-impregnated inner fabric layer provides industrial strength over a wide range of temperatures and contaminants.



## OPTIMAL PERFORMANCE

**Isotex-dB** soundproofing blankets are effective in reducing noise from industrial equipment, especially at low frequencies. Having an STC 33 sound insulation index, these covers are the ideal solution for your noise problems.

Before / After



# Turnkey Solution



## 1 Quotation and Evaluation On-Site

Our team will travel to the project site to evaluate the facility and accurately assess your needs.



## 2 Design and Manufacturing

The design is customized for the exact dimensions of your equipment. The manufacture of the panels is then made in the factory.



## 3 Installation

We provide detailed installation plans so that your team or ours can install the blankets.

## VARIOUS APPLICATIONS

Isotex-dB soundproofing blankets are suitable for industrial use both outdoors and indoors. They make a significant difference to the sound level radiated by the equipment they cover by acting directly at the source of the problem.

### STATIONARY EQUIPMENT

- Lightweight Structures;
- Machinery;
- Compressors;
- Pipelines;
- Etc.



### MOBILE EQUIPMENT

- Trucks;
- Heavy Machinery;
- Ships;
- Etc.





# Electrical Equipment

**Soft dB** has installed the **Isotex-dB** soundproofing blanket system on several electrical transformers to significantly reduce the noise emitted by these devices.

Electrical equipment such as power transformers generally produce noise at low frequencies, which are the most difficult to attenuate.

**Isotex-dB** soundproofing blankets have been specially designed to effectively reduce this type of noise radiation.



# A Unique Solution!

Based on an exclusive patented design\*, **Isotex-dB** soundproofing blankets are the only ones to provide the ease of installation provided by magnetic anchors. The panelized blankets are mounted to a stainless-steel frame fitted with magnetic anchors, allowing the frame to be installed and removed rapidly, without drilling or damaging the equipment being treated. The system is ideal for all types of metal surfaces.

Thanks to its flexible and customized designs, **Isotex-dB** soundproofing blankets perfectly fit the shapes of geometrically problematic equipment to ensure maximum efficiency.

*\* A system and a method of attaching and supporting sound reduction or thermal insulation blankets to metallic machinery or structural frames. ID: 773/12562.35*



## AN OUTSTANDING PARTNER

Developed in collaboration with our insulation partner, **Isotex-Pro International (IPI)**, **ISOTEX-dB** soundproofing blankets ensure impeccable quality.





## SPECIFICATIONS

Transmission Loss						
125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	STC
14	22	29	39	41	38	33

Assessed according to ASTM E2249-02 (2016)

Absorption Coefficients						
125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	NRC
0.52	0.76	0.83	0.73	0.54	0.41	0.72

Assessed according to ASTM C 0423 (2002)

Environmental	
Temperature	-40 °C to 149 °C (-40 °F to 300 °F)*
Water	Water Repellent

\*High-temperature resistant and spark resistant versions are available

Physical	
Thickness	100 mm (4")*
Area Density	16.1 kg/m <sup>2</sup> (2.4 lbs/sqft)

\*50 mm (2") thickness are available.

Options and Accessories	
Fastening	Velcro, Hem or Eyelet
Mounting	Custom Aluminium Frame and Hardware available
Sealing	Velcro Sound Barrier Strips



Soft dB



# Contact Us

## USA

Columbus, OH  
Houston, TX  
(614) 290-9791



## Canada

Cambridge, ON  
(519) 651-3330



### Technical Support

[info@dbnoisereduction.com](mailto:info@dbnoisereduction.com)

### Sales & Estimating

[sales@dbnoisereduction.com](mailto:sales@dbnoisereduction.com)

[www.dbnoisereduction.com](http://www.dbnoisereduction.com)

Soft dB

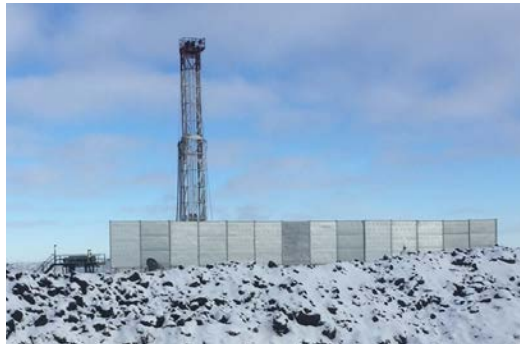
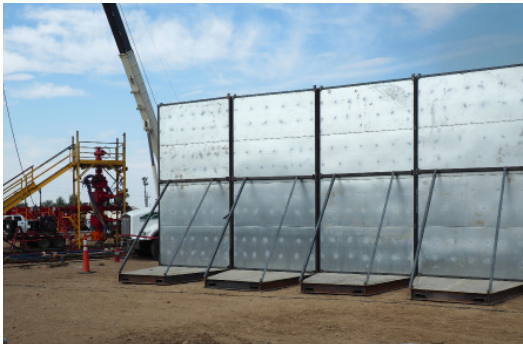




# ENVIRONMENTAL NOISE CONTROL

## FREESTANDING SK-8 NOISE CONTROL PANEL PORTABLE LOW FREQUENCY NOISE BARRIER/ABSORBER PANELS

The freestanding, portable SK-8 acoustical panels are **engineered** for **quick** positioning close to noise sources and are designed for maximum **low frequency** sound blocking and absorbing. Structurally engineered to be **freestanding** and meet regulatory code requirements. Heights available from 16 to 24 feet with accommodations for doors, gates, truck loading and emergency exits.



### SK-8 BARRIER PANEL SPECIFICATIONS

- Sound Transmission Class rated STC-43 in accordance with ASTM E-413
- Sound Absorption Rating of N.R.C. 1.00
- Engineered to meet UBC/IBC Wind Load requirements
- Panels available with emergency exit signs and doors
- Sizes: 8 feet wide by 16 to 24 feet high

### TEMPORARY ACOUSTICAL NOISE BARRIER SYSTEMS

Designed to provide optimum sound control in blocking and absorbing unwanted noise.

#### ENVIRONMENTAL



#### ENTERTAINMENT



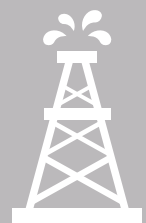
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#### INDUSTRIAL



#### OIL & GAS



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[www.environmental-noise-control.com](http://www.environmental-noise-control.com) or call us at 1-800-679-8633

# FREESTANDING SK - 8 NOISE BARRIER PANELS

At the heart of our freestanding sound wall is our Environmental Noise Control (ENC) acoustical noise barrier panel system, which is manufactured with state-of-the-art acoustical composite materials. Our proprietary SK-8 sound panels are fabricated with a galvanized steel exterior, absorptive acoustical insulation with a septum barrier and perforated metal panels. The ENC SK-8 temporary sound wall system is available in 8 feet wide modules with heights of 16, 20 or 24 feet.

## Freestanding SK-8 Sound Panel System



### Sound Transmission Loss (dB)

% Octave Band Center Frequency	Transmission Loss
31.5 Hz	21
63 Hz	14
125 Hz	26
250 Hz	32
500 Hz	28
1000 Hz	51
2000 Hz	60
4000 Hz	67
STC	43

**The modular design of ENC's temporary SK-8 sound panel system is engineered to meet or exceed UBC and IBC code requirements.**

An independent acoustical laboratory has conducted tests in accordance with ASTM E-90 and ASTM E-413 requirements to measure sound transmission loss and to validate a Sound Transmission Class rating of STC-43 for the SK-8 panel. The ENC SK-8 panels meet or exceed the specifications in the Sound Transmission Loss Data Table.

**1 (800) 679 8633 | International +1 310 679 8633 | [www.environmental-noise-control.com](http://www.environmental-noise-control.com)**

**CORPORATE OFFICE**  
Hawthorne, CA

**REGIONAL OFFICES & FIELD OPERATIONS**  
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Napa, CA; Shreveport, LA; McDonald, PA  
Calgary, Alberta

For more information on our quality products or possible applications, please see our website or call to speak with one of our ENC representatives. Rapid engineering and deployment response is available worldwide.

**Behrens & Associates, Inc.**

*Environmental Noise Control*



**ENVIRONMENTAL  
NOISE CONTROL**