

APPENDIX G.1 – Environmental Noise Report



Environmental Noise Assessment

Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

125 Commerce Valley Drive West, Suite 300, Markham, ON L3T 7W4

Prepared by:

SLR Consulting (Canada) Ltd.

100 Stone Road West, Suite 201, Guelph, ON N1G 5L3

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Executive Summary

SLR Consulting (Canada) Ltd. (SLR), was retained by Morrison Hershfield Limited on behalf of the Regional Municipality of York (York Region) to conduct an environmental noise assessment in the City of Vaughan, Ontario. The purpose of the study is to address the proposed Teston Road roadway improvements from Highway 400 to Bathurst Street. This work is being done as part of the Individual Environmental Assessment process. The study length is approximately 7.2 km. The objectives of this study are as follows:

- To assess future “build” and “no-build” sound levels from road traffic noise sources in the area (i.e., noise levels with and without the proposed project taking place);
- To use these predictions to assess potential impacts according to the applicable guidelines;
- To specify mitigation measures where required; and
- To assess the potential for construction noise and provide a Code of Practice to minimize potential impacts.

The potential environmental noise impacts of the proposed undertaking have been assessed. Both operational and construction noise impacts have been considered. The conclusions and recommendations are as follows:

- The results show that changes in sound levels resulting from the proposed project (without the grade raise) are expected to be very minor for the homes west of Keele Street and for the homes located between Dufferin Street and Bathurst Street.
- Noise impacts of the proposed future conditions with and without the proposed grade raise west of Keele Street were quantitatively assessed. Receptors on the south side were the focus of our assessment. It is very likely that remediation/mitigation is required and located within the ROW in the vicinity of the elevated portion if the grade raise is included in the road design.
- The noise sensitive areas shown as Receptors 4, 6 to 9, 18 and 19 will experience significant increases in sound levels.
- The feasibility of mitigation should be further assessed at detail design for Receptor 4, 6, and 26, however, noise mitigation is unlikely due to the presence of driveways that need to be maintained.
- Receptors 7 to 9, 18 and 19 will experience a significant change in noise levels once the new Teston Road Bridge is constructed and in operation. There are anticipated noise impacts for this project that are above some of the noise impact criteria in the York Region Policy for analyzing mitigation. However, sound levels are still predicted to be below 60 dBA and the need for noise mitigation should be reassessed during detail design due to potential changes to traffic volumes.
- Proposed developer-constructed noise barriers for the development at Receptors 7-20 were included in the assessment based on plans provided in the Detailed Environmental Noise Report conducted by Jade Acoustics Inc., for the 1600 Teston Road development. The proposed barriers reduce the future noise levels to below 60 dBA which falls within the guideline limits of MECP Guideline NPC-300 for outdoor living areas with the inclusion of appropriate warning clauses and York Region’s Policy.



- These locations may be candidates for a potential noise barrier and will be reviewed/confirmed using the current policies and site conditions at the time of detail design in the future. It is highly recommended that an additional noise impact study be undertaken closer to the anticipated date of construction as traffic volumes, truck percentages and overall emission levels from vehicles may change.
- It is very difficult to make any recommendations at this point as site conditions, the road design and traffic volumes will likely be different than those assumed in this study.
- Construction noise impacts are temporary in nature but may be noticeable at times in nearby residential NSAs. Methods to minimize construction noise impacts should be included in the Construction Code of Practice, as outlined in Sections 3.1.3 and Section 3.3.



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Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
dB	decibel
dBA	A-weighted decibel
EA	Environmental Assessment
kg	kilogram
km	kilometre
L _{eq}	equivalent continuous sound level
m	metre
MECP	Ministry of the Environment, Conservation and Parks, Ontario
MTO	Ministry of Transportation, Ontario
NSA	Noise Sensitive Area
OLA	Outdoor Living Area
OPSS	Ontario Provincial Standard Specification
SLR	SLR Consulting (Canada) Ltd.
SOP	Standard Operating Procedure



1.0 Introduction

SLR Consulting (Canada) Ltd. (SLR), was retained by Morrison Hershfield Limited on behalf of York Region to conduct an environmental noise assessment in Vaughan, Ontario. The purpose of the study is to address the proposed Teston Road roadway improvements from Highway 400 to Bathurst Street. This work is being done as part of the Individual Environmental Assessment (EA) process. The study length is approximately 7.2 kilometres (km).

The objectives of this study are as follows:

- To assess existing sound levels at the anticipated date of construction and the future “build” sound levels from road traffic noise sources in the area (i.e., noise levels with and without the proposed project taking place);
- To use these predictions to assess potential impacts according to the applicable guidelines;
- To specify mitigation measures where required; and
- To assess the potential for construction noise and provide a Code of Practice to minimize potential impacts.

1.1 Project Description

York Region is completing an Individual Environmental Assessment for Teston Road from Highway 400 to Bathurst Street, including the intersections. A context plan and an overview of the study area for the project is shown in Figure 1 (attached). Plans showing the technically preferred alternative are shown in Appendix B.

2.0 Road Traffic Noise Impacts (Operational Noise)

For roadway projects, operational noise is of primary importance. This section of the report provides an analysis of operational noise impacts from road traffic noise related to this undertaking.

2.1 Applicable Guidelines

There are several transportation noise guidelines that are applicable to this project. Ontario provincial policies and guidelines from the Ministry of Transportation, Ontario (MTO) and the Ministry of the Environment, Conservation and Parks, Ontario (MECP) are directly applicable under the Individual EA process for transportation projects and are discussed in detail in this report. In addition to provincial policies and guidelines, York Region has its own policy and operating procedure that applies to roadways under its jurisdiction.

2.1.1 Ontario Provincial and York Region Guidelines and Policies

Ontario has several guidelines and documents related to assessing road traffic noise impacts. The document most applicable to municipal roadway projects is:

- Ontario MECP/MTO, “Joint Protocol”, A Protocol for Dealing with Noise concerns during the Preparation, Review and Evaluation of Provincial Highway’s Environmental Assessments (MTO & MECP 1986).



2.1.1.1 York Region Policy

The York Region policy and operating procedure has been applied to this project because the project falls under its jurisdiction, and it is more stringent than the Joint Protocol. Following are the policy and operating procedure that are applied to this project:

- Regional Municipality of York, York Region Traffic Noise Mitigation Policy for Regional Roads, (March 23, 2006) (York Policy).
- Regional Municipality of York, Standard Operating Procedures (SOPs) for Traffic Noise Mitigation on Regional Roads, (July 2010) (York SOPs).

York Region policy specifies where noise mitigation is to be built on York Regional Roads. The York Region Policy sets out the following criteria to determine if noise mitigation is required with the implementation of capital road projects:

- 1 For projected noise level increases from 0-5 A-weighted decibels (dBA) on adjacent residential properties, no mitigation be considered unless projected noise levels are greater than 60 dBA (either at the start of construction or at the mature state of development); and,
- 2 For projected sound levels at the start of construction greater than 55 dBA, and projected future noise level increases greater than 5 dBA, the feasibility of noise reduction measures shall be investigated where a minimum attenuation of 6 dBA can be achieved.
- 3 As per the York Region Policy, if noise mitigation is required, the following guidelines apply:
 - a) If it is deemed that noise mitigation is to be implemented, York Region shall assume the full cost of implementing the noise control measures;
 - b) York Region shall assume the ownership and maintenance of any noise control measures when constructed under the Capital Program;
 - c) Noise mitigation implemented as part of capital road projects will only be permitted along the property line at the extreme outer edge of York Region's ultimate right-of-way or along the flanking ends of the subdivision where required; and,
 - d) When noise mitigation is not warranted based on projected noise levels not exceeding 60 dBA, the mitigation may be deferred until noise levels exceed 60 dBA.

Additionally, mitigation should reduce noise levels as much as is technically and economically practicable towards the 60 dBA goal. Mitigation measures are restricted to within the transportation corridor right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning are not considered. Noise mitigation requirements specified under the York Region Policy are summarized in Table 1.



Table 1: Summary of Mitigation Efforts Under the York Region Policy

Future Sound Levels	Change in Noise Level Above “No-Build” Ambient (dBA)	Mitigation Effort Required
< 55 dBA	Any	None
55 dBA to 60 dBA	0 to 5	
		>5
> 60 dBA	Any	Noise control measures where used must provide a minimum of 6 dBA of attenuation, averaged over the first row of receptors in the area where there is an impact.
Notes: Values are overall daytime energy equivalent sound levels (L_{eq}) (16h) in dBA, between 7 AM and 11 PM.		

In summary, noise mitigation is warranted when increases in sound level over the “no-build” ambient are greater than 5 dBA or sound levels are greater than 60 dBA with the new project in place. Mitigation measures can include changes in vertical profiles and horizontal alignments and noise barriers. Noise mitigation, where applied, must be administratively, economically, and technically feasible, and must provide at least 6 dBA of reduction averaged over the first row of noise-sensitive receptors. Mitigation measures are restricted to within the roadway right-of-way. Off right-of-way noise mitigation, such as window upgrades and air conditioning, are not considered.

The evaluation of noise impacts is determined by the change in cumulative sound levels from the 2041 “no-build” scenario to the future “build” scenario. Assessments are based on a mature state of development or at the start of construction. Accordingly, a design year of 2041 applies to this project, corresponding to the traffic forecasts provided by Morrison Hershfield Limited. The York Region Policy requires that the higher of the posted speed limit and actual driving speed (based on the 85th percentile) shall be used in the calculation of the sound levels.

2.2 Location of Noise-Sensitive Areas Within the Study Area

2.2.1 Definition of Outdoor Living Area and Noise Sensitive Areas

Noise impacts from transportation projects are evaluated at noise sensitive receptors commonly referred to as Noise Sensitive Areas (NSAs). The Outdoor Living Area (OLA) is the part of an outdoor amenity area provided for the quiet enjoyment of the outdoor environment. The OLA is typically an area at ground level accommodating outdoor living activities. For sound level calculation purposes, the usual distance from the dwelling unit wall is 3 metres (m) where the actual OLA is not known. The vertical height is 1.5 m (approximate head-height) above ground level. Where unknown, the side closest to the source of noise is assumed. Paved areas for multiple dwelling residential units are not defined as OLAs. The OLA may include private areas used by individual dwelling occupants or “common” areas used by multi-tenant dwelling occupants.

Under the MTO Joint Protocol, NSAs include the following land-uses, provided they have an OLA associated with them:

- Private homes (single family units and townhouses);
- Multiple unit buildings such as apartments, provided they have a communal OLA associated with them;



- Hospitals and nursing homes for the aged, provided they have an OLA for use by patients;
- Schools, educational facilities, and daycare centres where there are OLAs for students;
- Campgrounds that provide overnight accommodation;
- Hotels and motels with outdoor communal OLAs for visitors; and
- Churches and places of worship.

The following land uses are generally not considered to qualify for NSAs:

- Apartment balconies;
- Cemeteries;
- Parks and picnic areas not part of a defined OLA;
- All commercial; and
- All industrial.

2.2.2 Representative NSAs for Analysis

Thirty-nine NSAs have been used in the analysis to represent worst-case potential noise impacts at all nearby noise-sensitive land uses within the study area. NSAs were chosen to assess areas with similar overall noise levels and similar changes in noise (“build” versus “sound level at anticipated date of construction”). These NSAs and modelled receptor locations are described in Table 2. The locations of the representative noise receptors used in the analysis are shown in Figure 2 to Figure 6 (attached).

Table 2: Representative NSAs Considered in Analysis

Receptor Location	Description	Distance to Teston Road (m) ^[1]	Location of Property in Relation to Teston Road
Receptor 1	House, 40 D’Amato Cr.	22	South
Receptor 2	House, 370 Isaac Murray Ave.	30	South
Receptor 3	House, 371 Isaac Murray Ave.	31	South
Receptor 4	Apartment, 10,500 Dufferin St.	51	South
Receptor 5	Apartment, 10,500 Dufferin St.	88	South
Receptor 6	House, 1,500 Teston Road	39	North
Receptor 7	House (not built yet)	34	North
Receptor 8	House (not built yet)	47	North
Receptor 9	House (not built yet)	59	North
Receptor 10	House (not built yet)	71	North
Receptor 11	House (not built yet)	84	North
Receptor 12	House (not built yet)	95	North
Receptor 13	House (not built yet)	106	North
Receptor 14	House (not built yet)	119	North



Receptor Location	Description	Distance to Teston Road (m)^[1]	Location of Property in Relation to Teston Road
Receptor 15	House (not built yet)	130	North
Receptor 16	House (not built yet)	143	North
Receptor 17	House (not built yet)	143	North
Receptor 18	House (not built yet)	146	North
Receptor 19	House (not built yet)	156	North
Receptor 20	House (not built yet)	186	North
Receptor 21	House, 68 Germana Pl.	265	North
Receptor 22	House, 83 Germana Pl.	227	North
Receptor 23	House, 89 Germana Pl.	208	North
Receptor 24	House, 93 Germana Pl.	189	North
Receptor 25	House, 97 Germana Pl.	167	North
Receptor 26	House, 10,790 Dufferin St.	44	North
Receptor 27	House, 12 Sweet Valerie Ct.	41	South
Receptor 28	House, 12 Little Marco Ct.	46	South
Receptor 29	House, 102 Goldenview Ct.	39	South
Receptor 30	House, 28 Countrywide Ct.	44	South
Receptor 31	House, 28 Countrywide Ct.	50	South
Receptor 32	House, 753 Via Romano Blvd.	47	South
Receptor 33	House, 1138 Teston Rd.	77	North
Receptor 34	House, 29 Saul Ct.	69	North
Receptor 35	House, 69 Lady Angela Ln.	47	North
Receptor 36	House, 348 Lady Nadia Dr.	65	South
Receptor 37	House, 376 Lady Nadia Dr.	66	South
Receptor 38	House, 6 Quail Run Blvd.	60	North
Receptor 39	House, 389 Lady Nadia Dr.	31	South
Notes:			
[1] Distance to centerline of Teston Road., "Build".			

2.3 Study Horizons

The evaluation of noise impacts is determined by the change in cumulative sound levels from the 2041 “no-build” scenario to the future “build” scenario. Assessments are based on a mature state of development or at the start of construction. Accordingly, a design year of 2041 applies to this project, corresponding to the traffic forecasts.



2.4 Study Scenarios

As mentioned above, the “noise impact” for the study area is defined as the difference in projected noise levels between the “no build” and “build” scenarios.

2.5 Road Traffic Data

Traffic information for the 2041 “no build” and “build” scenarios for multiple roadways were provided by Morrison Hershfield Limited, and are found in Appendix C. The data is further summarized in Table 3 and Table 4. Traffic data was provided as Average Annual Daily Traffic (AADT), with the percentage of commercial vehicles, day/night traffic split and posted speeds.

Table 3: 2041 “No-Build” Traffic Information at Anticipated Date of Construction

Roadway	Section	Traffic Volumes (AADT)	Day % ^[1]	% Medium Trucks	% Heavy Trucks	Posted Speed (km/h)	85 th Percentile Speed (km/h)
Keele St.	N. of Teston Rd.	23,840	95.4	1.9	4.0	70	78
	S. of Teston Rd.	25,640	94.8	2.9	4.1	50	76
Dufferin St.	N. of Teston Rd.	30,730	65.6	0.6	2.0	60	84
	S. of Teston Rd.	29,580	93.3	0.6	2.0	60	79
Bathurst St.	N. of Teston Rd.	45,140	94.2	1.7	3.7	60	74
	S. of Teston Rd.	38,630	94.3	1.5	3.4	60	74
Teston Rd.	Jane St. to Keele St.	22,500	95.0	1.5	2.4	60	75
	Keele St. to Rodinea Rd.	2,222	96.3	2.6	5.5	60	72
	Dufferin St. to Bathurst St.	19,480	94.4	0.8	1.7	60	74

Notes:
[1] Percentage of vehicle traffic in the 16-hour daytime period.

Table 4: 2041 “Build” Traffic Information

Roadway	Section	Traffic Volumes (AADT)	Day % ^[1]	% Medium Trucks ^[2]	% Heavy Trucks ^[2]	Posted Speed (km/h) ^[2]	85 th Percentile Speed (km/h) ^[2]
Keele St.	N. of Teston Rd.	26,690	95.4%	1.9%	4.0%	70	78
	S. of Teston Rd.	20,660	94.8%	2.9%	4.1%	50	76
Dufferin St.	N. of Teston Rd.	21,160	95.6%	0.6%	2.0%	60	84
	S. of Teston Rd.	29,120	93.3%	0.6%	2.0%	60	79
Bathurst St.	N. of Teston Rd.	47,320	94.2%	1.7%	3.7%	60	74
	S. of Teston Rd.	40,950	94.3%	1.5%	3.4%	60	74



Roadway	Section	Traffic Volumes (AADT)	Day % ^[1]	% Medium Trucks ^[2]	% Heavy Trucks ^[2]	Posted Speed (km/h) ^[2]	85 th Percentile Speed (km/h) ^[2]
Teston Rd.	Jane St. to Keele St.	25,760	95.0%	1.5%	2.4%	60	75
	Keele St. to Rodinea Rd.	27,790	96.3%	2.6%	5.5%	60	72
	Dufferin St. to Bathurst St.	23,350	94.4%	0.8%	1.7%	60	74

Notes:
 [1] Percentage of vehicle traffic in the 16-hour daytime period.
 [2] Information assumed to be the same as the 2041 “no build” option.

2.6 Noise Model Used

The roadway noise prediction model used is the ORNAMENT road noise prediction algorithm produced by the MECP. The MECP “STAMSON” highway noise prediction model is a computerized version of this method. Both methods are simplified versions of the United States Federal Highway Administration Method. A Cadna/A implementation of the STAMSON/ORNAMENT model was used for the noise analysis because of its ability of handle complex ground elevations, multiple barriers, and receptors. The Cadna/A software also considers screening from buildings that are located between the roadways and the NSAs. The sound power levels, and noise source heights used in Cadna/A are found in Appendix D.

The noise prediction model relies on the use of vehicle noise emission levels to generate a noise source that can then be assessed at the receptors based on the following factors:

- Speeds for the roadways in the area used in the noise analysis;
- Pavement surface used for construction of the roadway (hot mix asphaltic pavement for all roadways);
- Elevations, contours, and locations of all the NSAs near the right-of-way;
- Roadway grades;
- Intervening rows of homes and barriers;
- Type of ground cover, soft or hard ground;
- Percentage of commercial traffic; and
- Distance from the roadway.

The model uses the following vehicle classifications:

- **Automobiles:** Two axles and four wheels designed primarily for the transportation of nine or fewer passengers, or transportation of cargo (light trucks). This classification includes motorcycles. Generally, the gross vehicle weight is less than 4,500 kilograms (kg).
- **Medium trucks:** Two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 4,500 kg but less than 12,000 kg.



- **Heavy trucks:** Three or more axles and designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 12,000 kg.

Distances, roadway heights, and receptor locations were obtained from plan drawings supplied by Morrison Hershfield Limited, in addition to aerial photography.

2.7 Detailed Modelling

Table 5 presents a comparison of predicted “no build” versus future “build” sound levels at receptors in the study area during the 16-hour daytime period. Table 6 presents a comparison of predicted “no build”, “build” and “build with grade raise” sound levels.

Table 5: 2041 "No-Build" and 2041 "Build" Noise Levels, Technically Preferred Option

Receptor No.	Approx. No. of NSAs Represented	“No Build” L _{eq} (16h) ^[1]	“Build” L _{eq} (16h) ^[1]	Change (“Build” minus “No Build”)	Mitigation Investigation Needed (Yes/No)
Receptor 1	2	57.7	58.9	1.2	No
Receptor 2	4	55.1	56.3	1.2	No
Receptor 3	2	55.8	56.7	0.9	No
Receptor 4	N/A	50	55.9	5.9	Yes [2]
Receptor 5	N/A	50	54.9	4.9	No
Receptor 6	1	50	63.3	13.3	Yes [2]
Receptor 7	1	50	58.9	8.9	Yes [3]
Receptor 8	1	50	56.9	6.9	Yes [3]
Receptor 9	1	50	55.9	5.9	Yes [3]
Receptor 10	1	50	53.8	3.8	No
Receptor 11	1	50	52.1	2.1	No
Receptor 12	1	50	51.5	1.5	No
Receptor 13	1	50	51.9	1.9	No
Receptor 14	1	50	52.1	2.1	No
Receptor 15	1	50	51.7	1.7	No
Receptor 16	4	50	51.3	1.3	No
Receptor 17	3	50	53.7	3.7	No
Receptor 18	2	50	56.7	6.7	Yes [3]
Receptor 19	1	50	56.4	6.4	Yes [3]
Receptor 20	3	50	53.5	3.5	No
Receptor 21	3	57.8	55.7	-1.8	No
Receptor 22	1	58.1	56.5	-1.6	No
Receptor 23	1	62.1	60.6	-1.5	Yes [4]
Receptor 24	1	59.3	58.0	-1.3	No



Receptor No.	Approx. No. of NSAs Represented	“No Build” L_{eq} (16h) ^[1]	“Build” L_{eq} (16h) ^[1]	Change (“Build” minus “No Build”)	Mitigation Investigation Needed (Yes/No)
Receptor 25	2	58.4	57.1	-1.3	No
Receptor 26	1	60.2	64.3	4.1	Yes [2]
Receptor 27	4	52.1	53.4	1.3	No
Receptor 28	4	52.0	53.3	1.3	No
Receptor 29	3	53.5	54.7	1.2	No
Receptor 30	4	53.2	54.4	1.2	No
Receptor 31	4	52.7	53.8	1.1	No
Receptor 32	4	50.8	51.8	1.0	No
Receptor 33	1	50.3	50.9	0.6	No
Receptor 34	2	50	50.0	0.0	No
Receptor 35	2	51.5	52.2	0.7	No
Receptor 36	5	50	50.0	0.0	No
Receptor 37	5	50	50.0	0.0	No
Receptor 38	1	55.0	55.9	0.9	No
Receptor 39	3	53.1	53.9	0.8	No

Notes:
 [1] Where predicted sound levels are less than 50 dBA a sound level of 50 dBA is assumed.
 [2] The feasibility of mitigation should be reviewed at detail design due to the need to maintain driveway entrances.
 [3] Below 60 dBA, defer decision until detail design in the future, prior to construction.
 [4] Barrier already installed to the east of the dwelling. Sound levels are reduced with the build condition.

Table 6: 2041 "Build" and 2041 "Build with Grade Raise" Noise Levels, Technically Preferred Option

Receptor No.	Approx. No. of NSAs Represented	“No Build” L_{eq} (16h) ^[1]	“Build” L_{eq} (16h) ^[1]	“Build with Grade Raise” L_{eq} (16h)	Change (“Build with Grade Raise” minus “No Build”)	Mitigation Investigation Needed (Yes/No)
Receptor 1	2	57.7	58.9	58.4	0.7	No
Receptor 2	4	55.1	56.3	58.3	3.2	Yes [1]
Receptor 3	2	55.8	56.7	60.0	4.2	Yes [1]

Notes:
 [1] Below 60 dBA, defer decision until detail design in the future prior to construction.



2.8 Discussion of Noise Impacts

The location of the noise receptors is shown in Figure 2 to Figure 6. The results show that changes in sound levels resulting from the proposed project are expected to be very minor for the homes west of Keele Street and for the homes located between Dufferin Street and Bathurst Street. It takes approximately a 3 decibels (dB) change in sound levels before most persons perceive a change, therefore slight increases or decreases in sound levels are expected to be imperceptible.

The changes in the vicinity of Teston Road and Dufferin Street are somewhat complicated. The noise sensitive areas shown as Receptors 4, 6 to 9, 18 and 19 will experience significant increases in sound levels. The feasibility of noise mitigation should be further reviewed during detail design for Receptor 4, 6 and 26 due to the presence of driveways.

Receptors 7 to 9, 18 and 19 will experience a significant change in noise levels once the new Teston Road Bridge is constructed and in operation. There are anticipated noise impacts for this project that are above some of the noise impact criteria in the York Region Policy for analyzing mitigation. However, sound levels are still predicted to be below 60 dBA and therefore the need for noise mitigation should be reassessed during detail design due to potential changes to traffic volumes.

With the inclusion of the grade raise at Keele Street, the existing noise barriers for Receptors 2 and 3 become less effective. Sound levels are still below 60 dBA and therefore, mitigation should be deferred until levels are above 60 dBA.

2.9 Discussion and Investigation of Noise Mitigation

There are anticipated noise impacts for this project that are above some the noise impact criteria in the York Region Policy. Noise barriers for receptors with over 5 dB of increase from “no-build” to “build” conditions were quantitatively assessed and deemed infeasible due to location, cost, and providing less than 6 dB of attenuation. These locations may be candidates for a potential noise barrier and will be reviewed/confirmed using the current policies and site conditions at the time of detail design in the future.

As a result, it is highly recommended that an additional noise impact study be undertaken prior to construction as the anticipated date of construction is not expected until at least 2041. Mitigation should be deferred until sound levels are above 60 dBA per York Region Policy. It is very difficult to make any recommendations at this point as site conditions, the road design and traffic volumes will likely be different than those assumed in this study.



3.0 Construction Noise Impacts

Construction noise impacts are temporary in nature, and largely unavoidable. Although for some periods and types of work, construction noise may be noticeable, with adequate controls, impacts can be minimized. This section of the report provides an overview of the by-law and recommends a Code of Practice to minimize impacts.

3.1 Construction Noise and Vibration Assessment Guidelines

3.1.1 MECP Model Municipal Noise Control By-Law

The MECP stipulates limits on noise emissions 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 within MECP Publication NPC-115 – “Construction Equipment”. These limits are provided in Table 7.

Table 7: NPC-115 Maximum Noise Emission Levels for Typical Construction Equipment

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

Notes:
 [1] Maximum permissible sound levels presented here are for equipment manufactured after January 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.

3.1.2 Construction Vibration Guidelines

Blasting is not expected to occur as part of this project’s construction processes. Regardless, vibration from construction activities can affect surrounding structures. The vibration limits recommended under Ontario Provincial Standard Specification (OPSS) OPSS MUNI-120 General Specification for the Use of Explosives should be adopted (OPSS 2014). These vibration limits are summarized in Table 8.

Table 8: Construction Vibration Limits - OPSS MUNI-120

Element	Frequency	Limit – Peak Particle Velocity (PPV), mm/s
Structures and Pipelines	< 40 Hz	20
	> 40 Hz	50
Concrete and Grout < 72 hours from placement	All	10



These limits would apply to vibration from construction activities such as hoe ramming, pile driving, dumping and excavation. The contractor should assess the potential for vibration impacts from their planned activities prior to the start of construction and mitigate accordingly.

In addition, the contractor should abide by the following MECP vibration document requirements when constructing this undertaking:

- Noise Pollution Control Publication 207 (NPC-207), Impulse Vibration in Residential Buildings, (November 1983); and
- Vibration limits within MECP publication NPC-207 can be supplemented by more detailed construction vibration limits regarding building damage from Chapter 12 of United States Federal Transit Administration - Transit Noise and Vibration Impact Assessment (document FTA-VA-90-1003-06, May 2006).

Where there are overlapping criteria, the more stringent criteria apply. Excerpts from NPC-207 are presented in Table 9 and Table 10. Full details of the construction vibration limits are provided in their respective documents.

The scope of NPC-207 is defined as follows:

The purpose of this Publication is to provide a method for assessment of impulse vibration measured inside occupied residential buildings, caused by the operation of stationary sources of vibration including, but not limited to, stamping presses and forging hammers.

NPC-207 was drafted to address permanent, rather than temporary, vibration impacts and address perceived vibrations rather than the building damage criteria that are set out in OPSS MUNI-120.

Table 9: Table 207-2: Vibration Limits for Frequent Impulses (20 or More Impulses in Reported Observation Period)

Observation Period in Minutes	Limit on the Average Peak Vibration Velocity in mm/s	
	Daytime 07:00-23:00	Nighttime 23:00-07:00
20 minutes or less	0.30	0.30
Less or equal to 60 minutes but more than 20 minutes	0.60	0.30
Less or equal to 120 minutes but more than 60 minutes	1.00	0.30
Notes: Source: NPC-207 – Full details for vibration limits provided in NPC-207		

Table 10: Table 207-3: Vibration Limits for Infrequent Impulses (Less than 20 Impulses in Reported Observation Period)

Observation Period in Minutes	Limit on the Average Peak Vibration Velocity of Individual Impulses in mm/s	
	Daytime 07:00-23:00	Nighttime 23:00-07:00
120 minutes	10.00	0.30
Source: NPC-207 – Full details for vibration limits provided in NPC-207		



3.1.3 Local Noise Control By-Law

The proposed project lies entirely within the City of Vaughan which has a bylaw restricting noise from construction activities. Table 11 clearly exempts the City from the need for an exemption to the bylaw for the construction phase of this undertaking. A consolidated copy of the bylaw can be found in Appendix E.

Table 11: City of Vaughan Noise Control By-Law

Jurisdiction	Bylaw Number	Bylaw Provision
City of Vaughan	062-2018	<p>“Necessary Municipal Work’ means work being undertaken by the City, the Region, Transit Authority, or any other level of government, and its agents, and includes but is not limited to any rehabilitation or require maintenance processes and activities within the Public Right of Way or any Highway as defined by the Highway Traffic Act (HTA) of Ontario, using of Construction Equipment that requires work must be performed at times that minimizes traffic disruption, including minimizing lane closures or lane restrictions, or both, and includes any works undertaken on Property owned or under the control of the City, Region or any other level of government. Without forgoing the generality rehabilitation or maintenance processes and activities include but are not limited to:</p> <ul style="list-style-type: none"> • Deck Removal of any Highway; • Intersection rehabilitation and all related work; • All Transit Authority work, including any ancillary Property or facilities and infrastructure; • All other work as determined necessary by the Director of Enforcement, or delegate; <p>10.0 CONSTRUCTION</p> <p>(1) No person shall, between 1900 hours of one day and 0700 hours of the next day operate or cause to be operated, any Construction Vehicle or Construction Equipment in connection with the Construction of any building or structure, Highway, motor car, steam boiler or other engine machine;</p> <p>(2) Despite Subsection (1), no person shall operate or cause to be operated any Construction Vehicle or Construction Equipment before 0700 hours and no later than 1900 hours on any Saturday and not at all on Sunday or statutory holidays;</p> <p>Subsection 10. (1) and (2) does not apply to Necessary Municipal Work and Emergency Work as defined by this By-Law.”</p>

3.2 Anticipated Construction Activities

The following construction activities are anticipated as part of this project:

- Removing some existing surface pavements;
- Construction of the roadway widening, including removal of overburden;
- Paving of new roadway surfaces; and
- Repaving of some of the existing roadways.



3.3 Construction Code of Practice Requirements (Mitigation)

To minimize the potential for construction noise impacts, it is recommended that provisions be written into the contract documentation for the contractor, as outlined below:

- Where possible construction should be carried out during the normally allowed hours specified in the by-law found in Appendix E. If construction activities are required outside of these hours, the Contractor should minimize the amount of noise being generated to not be clearly audible in any noise sensitive areas.
- There should be an explicit indication that the Contractor is expected to comply with all applicable requirements of the contract.

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. This is also a requirement of the Vaughan noise control by-law.

4.0 Conclusions and Recommendations

The potential environmental noise impacts of the proposed undertaking have been assessed. Both operational and construction noise impacts have been considered. The conclusions and recommendations are as follows:

- The results show that changes in sound levels resulting from the proposed project (without the grade raise) are expected to be very minor for the homes west of Keele Street and for the homes located between Dufferin Street and Bathurst Street.
- Noise impacts of the proposed future conditions with and without the proposed grade raise west of Keele Street were quantitatively assessed. Receptors on the south side were the focus of our assessment. It is very likely that remediation/mitigation is required and located within the ROW in the vicinity of the elevated portion if the grade raise is included in the road design.
- The noise sensitive areas shown as Receptors 4, 6 to 9, 18 and 19 will experience significant increases in sound levels.
- The feasibility of mitigation should be assessed at detail design for Receptor 4, 6, and 26 due to the presence of driveways that need to be maintained.
- Receptors 7 to 9, 18 and 19 will experience a significant change in noise levels once the new Teston Road Bridge is constructed and in operation. There are anticipated noise impacts for this project that are above some of the noise impact criteria in the York Region Policy for analyzing mitigation. However, sound levels are still predicted to be below 60 dBA and the need for noise mitigation should be reassessed during detail design due to potential changes to traffic volumes.
- Proposed developer-constructed noise barriers for the development at Receptors 7-20 were included in the assessment based on plans provided in the Detailed Environmental Noise Report conducted by Jade Acoustics Inc., for the 1600 Teston Road development. The proposed barriers reduce the future noise levels to below 60 dBA which falls within the guideline limits of MECP Guideline NPC-300 for outdoor living areas with the inclusion of appropriate warning clauses and York Region's Policy.



- These locations may be candidates for a potential noise barrier and will be reviewed/confirmed using the current policies and site conditions at the time of detail design in the future. It is highly recommended that an additional noise impact study be undertaken closer to the anticipated date of construction as emission levels from vehicles may change.
- It is very difficult to make any recommendations at this point as site conditions, the road design and traffic volumes will likely be different than those assumed in this study.
- Construction noise impacts are temporary in nature but may be noticeable at times in nearby residential NSAs. Methods to minimize construction noise impacts should be included in the Construction Code of Practice, as outlined in Sections 3.1.3 and Section 3.3.

5.0 Closure

Should you have questions on the above report, please contact the undersigned.

Regards,

SLR Consulting (Canada) Ltd.



Jason Dorssers, P.Eng.
Acoustics Engineer



Chris Blaney, B.A.
Senior Acoustics Consultant



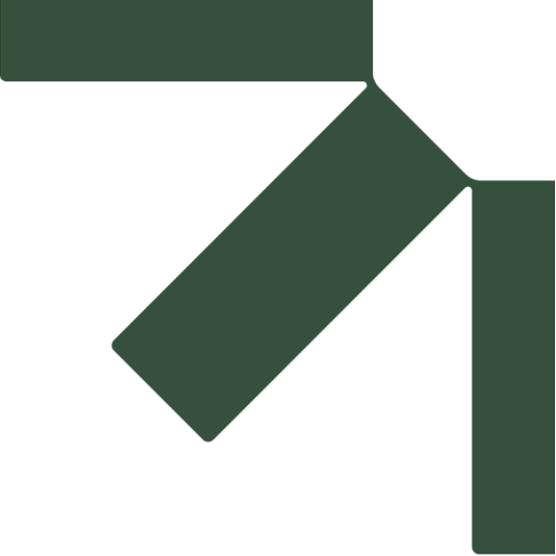
Scott Penton, P.Eng.
Principal Acoustics Engineer



6.0 References

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- Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06. May 2006
- MECP. 1977b. Model Municipal Noise Control Bylaw, which includes Publication NPC-115 – Construction Equipment. Ontario Ministry of the Environment, Conservation and Parks.
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- MTO. 1992a. Quality and Standards Directive QST-A1, Noise Policy and Acoustic Standards for Provincial Highways. Ontario Ministry of Transportation.
- MTO. 2006. Environmental Guide for Noise (2006), Revised 2008. Ontario Ministry of Transportation.
- Ontario Provincial Standard Specification OPSS MUNI 120: General Specification for the Use of Explosives.
- Regional Municipality of York. 2006. York Region Traffic Noise Mitigation Policy for Regional Roads. March 23, 2006.
- Regional Municipality of York. 2010. Standard Operating Procedures (SOPs) for Traffic Noise Mitigation on Regional Roads. July 2010.
- The City of Vaughan. 2018. Noise By-Law Number 06-2018.





Figures

Environmental Noise Assessment

Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

SLR Project No.: 241.30212.00000

November 21, 2025



Legend	
	Study Area

Background Aerial Imagery from ESRI – QGIS Version 3.34

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

SITE AND CONTEXT PLAN

True North



Scale: 1:25,000 METRES

Date: Feb 2025 Rev 1.0 Figure No.

Project No. 241.30212.00000

1





Legend	
	Noise Sensitive Receptor
	Developer Noise Barrier

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

NOISE SENSITIVE RECEPTORS 1 TO 3

True North



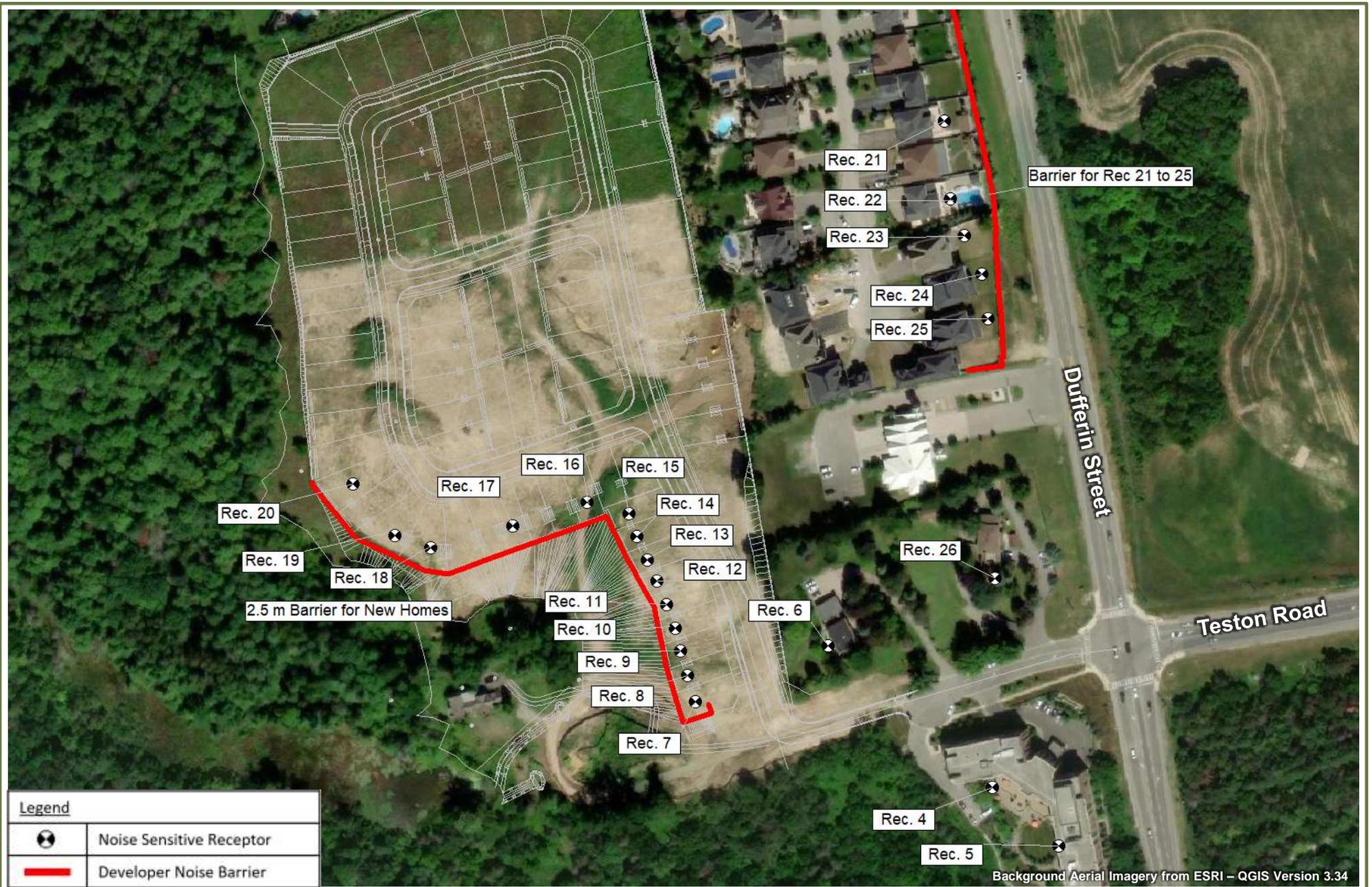
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Date: Feb 2025 Rev 1.0 Figure No.

Project No. 241.30212.00000

2





Legend	
	Noise Sensitive Receptor
	Developer Noise Barrier

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

NOISE SENSITIVE RECEPTORS 4 TO 26

True North



Scale: 1:2,500 METRES

Date: Feb 2025 Rev 1.0 Figure No.

Project No. 241.30212.00000

3





Legend	
	Noise Sensitive Receptor
	Developer Noise Barrier

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

NOISE SENSITIVE RECEPTORS 27 TO 31 AND RECEPTOR 33

True North



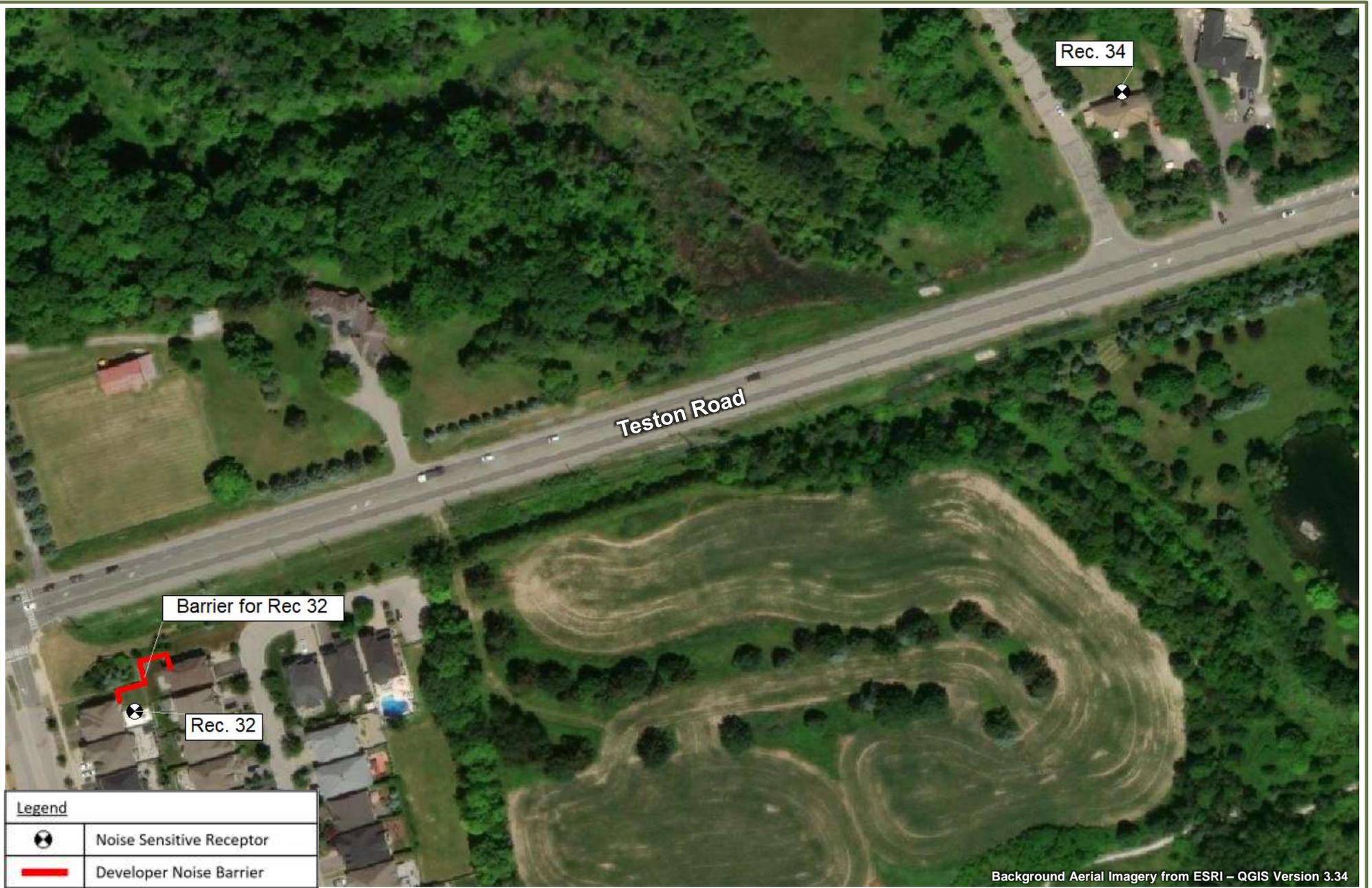
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Date: Feb 2025 Rev 1.0 Figure No.

Project No. 241.30212.00000

4





Legend	
	Noise Sensitive Receptor
	Developer Noise Barrier

Background Aerial Imagery from ESRI – QGIS Version 3.34

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

NOISE SENSITIVE RECEPTORS 32 AND 34

True North



Scale: 1:2,000 METRES

Date: Feb 2025 Rev 1.0 Figure No.

Project No. 241.30212.00000

5





Legend	
	Noise Sensitive Receptor
	Developer Noise Barrier

CITY OF VAUGHAN

TESTON ROAD ENVIRONMENTAL ASSESSMENT

NOISE SENSITIVE RECEPTORS 35 TO 39

True North



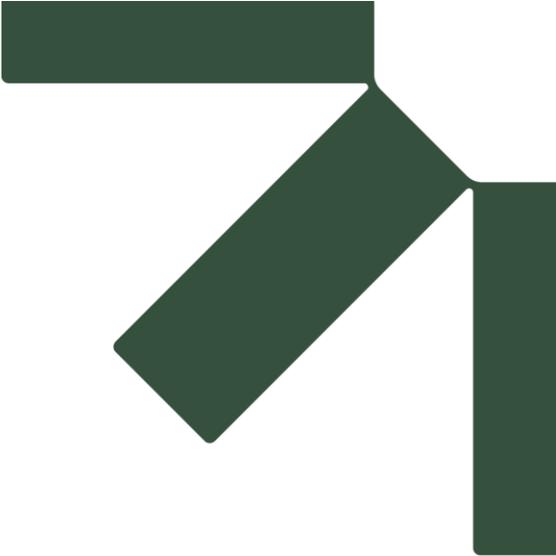
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Project No. 241.30212.00000

6





Appendix A Transportation Sound Basics

Environmental Noise Assessment

Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

SLR Project No.: 241.30212.00000

November 21, 2025

Appendix A Transportation Sound Basics

A.1 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.

A.2 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, 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).¹ For completeness, decibels should always be stated with their reference level (e.g., 20 dB re: 20 µPa). However, in practice the reference level is often left out.

A.3 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:

$$\text{Sound Pressure Level, dB} = 10 \log (p^2/p_0^2)$$

Where: p = root mean square (r.m.s.) sound pressure, in Pa

p_0 = reference sound pressure, 20 µPa

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.

¹ Equivalent to Sound Power Levels ranging from 70 to 140 dB and Sound Pressure Levels ranging from 20 dB to 140 dB



A.4 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.

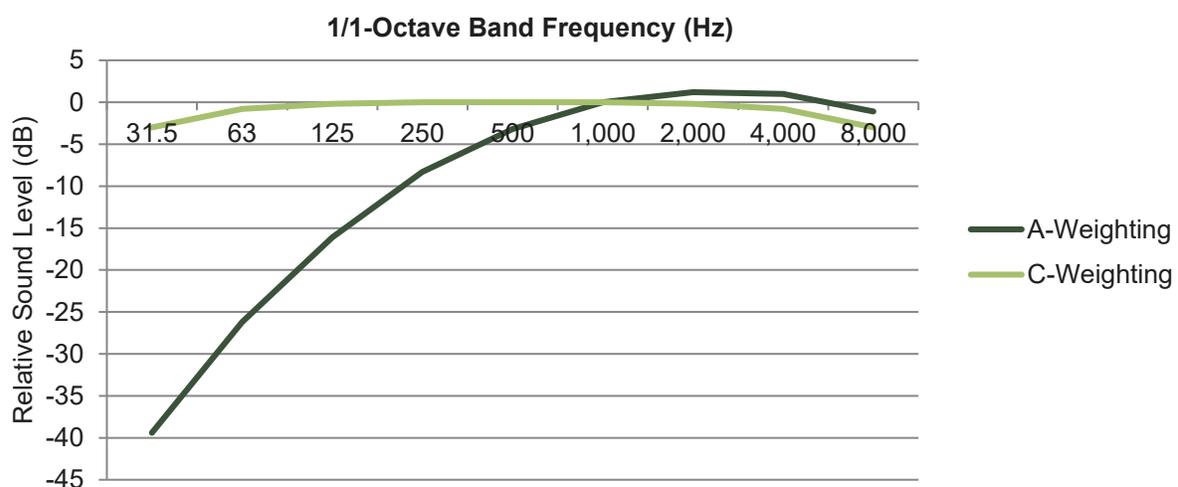
Sound is typically analysed in octave bands or 1/3-octave bands. An octave band is defined as a band or range of sound frequencies where the frequency range doubles for succeeding octave (alternately, the highest frequency in the range is twice the value of the lowest frequency).

A.5 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, such as those typically generated by road traffic. 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 figure.

Figure A-1: Weighting and C-Weighting Networks



A.6 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. 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 dBA are perceived as loud. This area includes very noisy commercial and industrial spaces. Sound levels greater than 85 dBA are very loud to deafening and may result in hearing damage.

Table A-1: 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 away
	100	Dance club/maximum human vocal output at 1 m distance
	95	Jack hammer at 15 m distance
	90	Indoors in a noisy factory
Loud	85	Heavy truck pass-by at 15 m distance
	80	School cafeteria/noisy bar; Vacuum cleaner at 1.5 m
	75	Near edge of major highway
	70	Inside automobile at 60 km/h
	65	Normal human speech (unraised voice) at 1 m distance
Moderate	60	Typical background noise levels in a large department store
	55	General objective for outdoor sound levels; typical urban sound level (24h)
	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

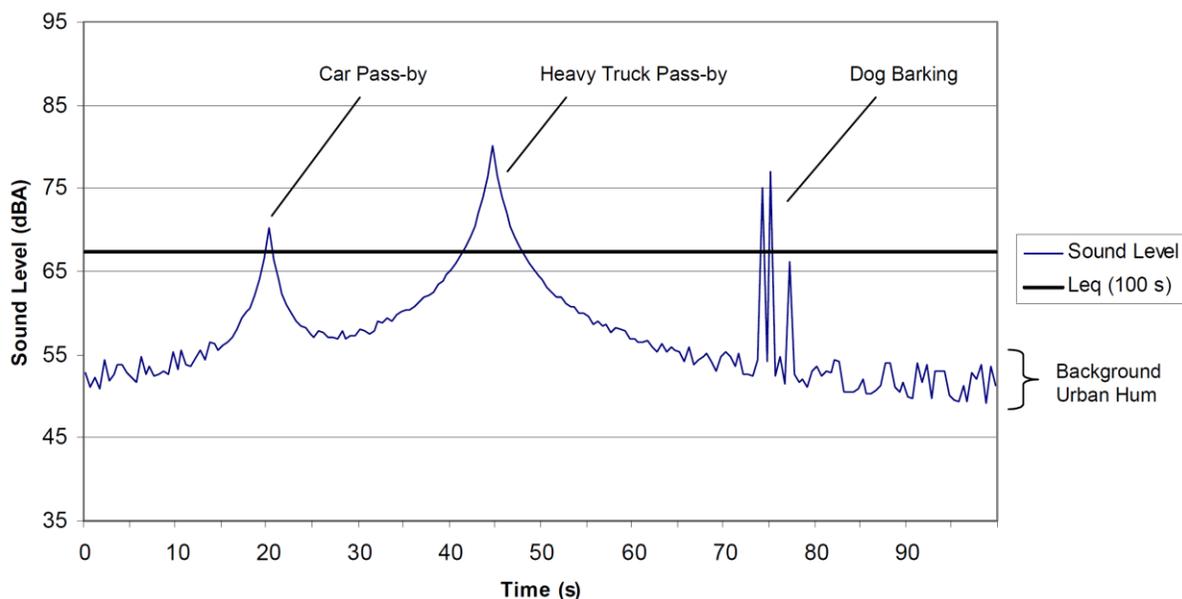


A.7 Noise Descriptors – L_{eq} Values

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)^{2 3}, 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 the following figure, showing noise levels beside a small roadway, over a 100 second time period, with two vehicle pass-bys:

Figure A-2: 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.

² Berglund and Lindvall, Community Noise, 1995.

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



The L_{eq} (100s) for the 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 be 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.

A.8 Typical Durations for L_{eq} Analyses

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

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

L_{eq} (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 L_{eq} (24h) values and the corresponding L_{eq} Day and L_{eq} Night values.

L_{eq} 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. 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 L_{dn} metric (also known as DNL). It is a special form of the L_{eq} (24h) with a +10 dB night-time penalty. L_{dn} values and a related metric, the day-evening-night level (L_{den}) are also used in some European guidelines. L_{dn} values are not used in Provincial jurisdictions in evaluating transportation noise. Instead, guideline limits for separate L_{eq} Day and L_{eq} Night periods are generally used.

L_{eq} (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. L_{eq} (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.



Some transportation noise sources may have significant traffic levels occurring overnight. 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.

A.9 Typical Background Sound Levels

Typical ambient background sound levels removed from direct influence of roads, railways and air traffic are:

- **Urban areas:** 55 dBA during the day, 45 dBA at night;
- **Sub-urban/semi-rural areas:** 50 dBA during the day, 45 dBA at night; and
- **Rural area:** 45 dBA during the day, 40 dBA at night.

A.10 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 A-2: Subjective Human Perception of Changes in Sound Levels

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.

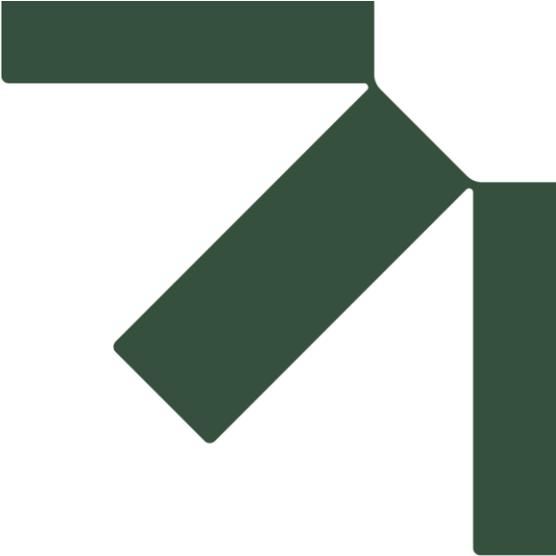


A.11 Decay of Noise with Distance

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





Appendix B Technically Preferred Alternative

Environmental Noise Assessment

Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

SLR Project No.: 241.30212.00000

November 21, 2025

This Appendix is found in a separate volume.

Appendix C Traffic Data

Environmental Noise Assessment

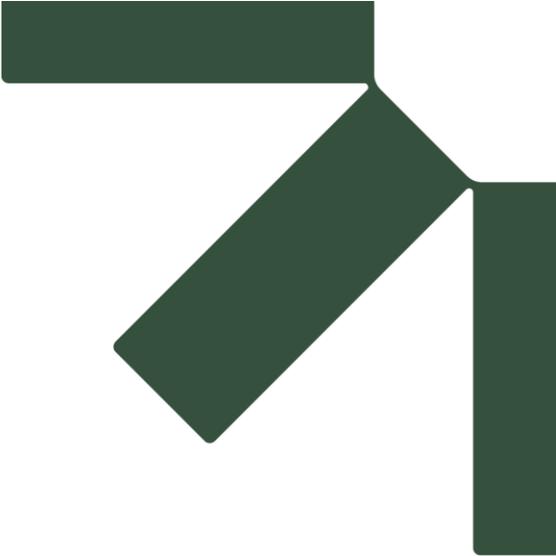
Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

SLR Project No.: 241.30212.00000

November 21, 2025

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Appendix D Cadna/A Sound Power Levels

Environmental Noise Assessment

Teston Road from Hwy 400 to Bathurst Street

Morrison Hershfield Limited

SLR Project No.: 241.30212.00000

November 21, 2025

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Appendix E Noise Bylaw

Environmental Noise Assessment

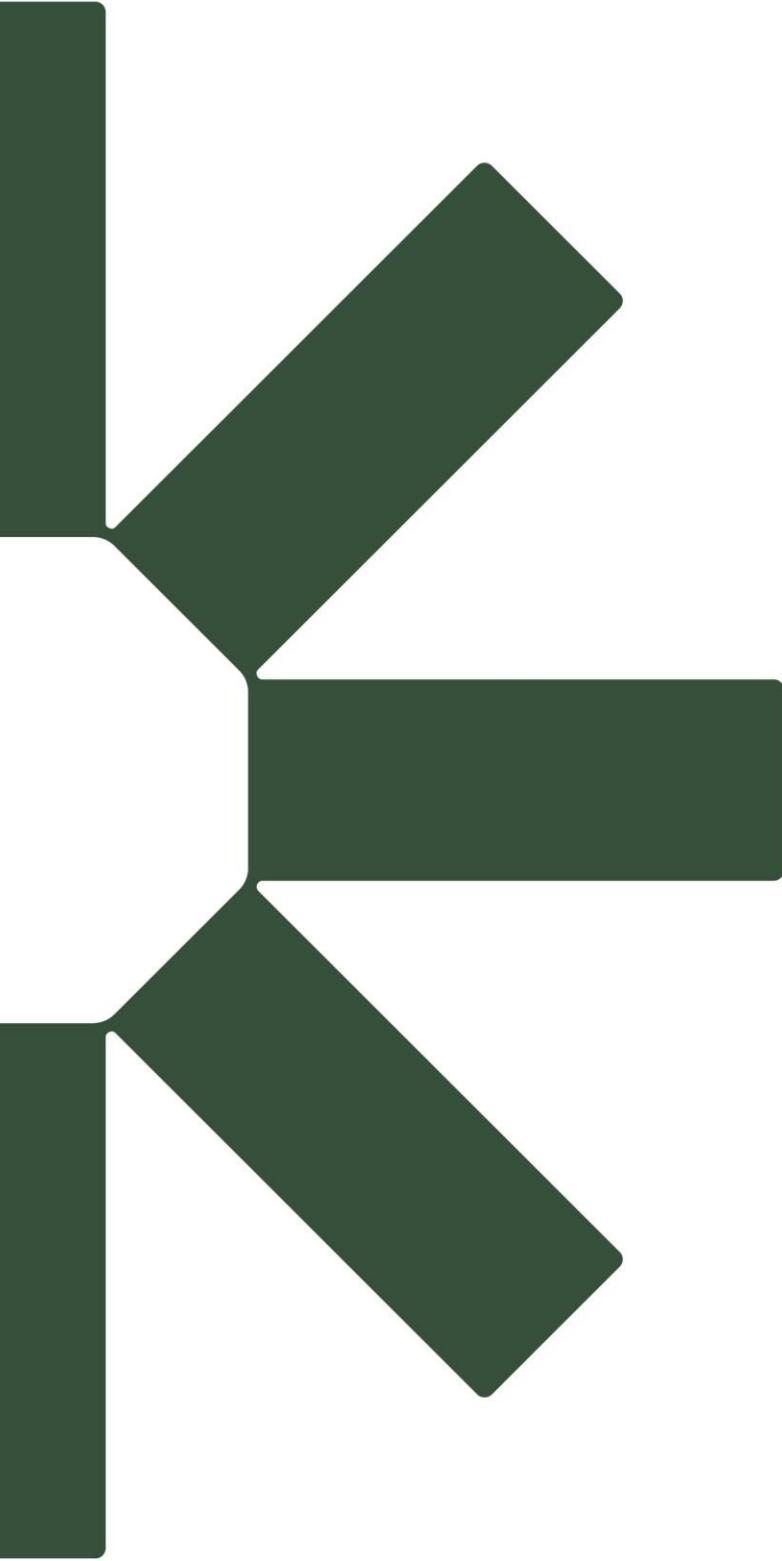
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