APPENDIX C4 – NOISE & VIBRATION AND AIR QUALITY REPORTS

SENES Consultants Limited

Specialists in Energy, Nuclear and Environmental Sciences

NOISE AND VIBRATION IMPACT ASSESSMENT

SCARBOROUGH-MALVERN LIGHT RAIL TRANSIT

Prepared for:

IBI Group
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Toronto, Ontario
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September 2009
(34711-1)

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September 2009

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1.0 INTRODUCTION

1.1 BACKGROUND

The Toronto Transit Commission (TTC) and the City of Toronto have conducted a Transit Assessment Project to study ways to provide high-quality and reliable transit services between the TTC Kennedy Subway Station and the Scarborough-Malvern community. The Scarborough-Malvern Light Rail Transit (SMLRT) Assessment Study recommended that bus service along Eglinton Avenue from Kennedy Station to Kingston Road and Morningside Road be replaced by Light Rail Transit - an electrically powered "light rail" vehicle operating in a designated centre lane.

The SMLRT corridor is approximately 13 km long and links the Kennedy Subway Station, the Scarborough Rail Transit and the proposed Eglinton Crosstown SMLRT, with northern Scarborough communities. The proposed SMLRT route will run east from Kennedy Station on Eglinton Avenue, northeast on Kingston Road, north on Morningside Avenue to Military Trail and continue to northern Scarborough communities. Benefits of this line include providing a new high quality light rail service along several busy transit routes and a direct high quality transit service to the University of Toronto at Scarborough Campus (UTSC) and to Centennial College's Ellesmere Road Campus.

The SMLRT project will introduce an at-grade two-track SMLRT alignment in the centre of the roadway that is grade-separated from vehicular traffic except at signalized intersections, while providing for two basic through lanes in each direction. This cross-section arrangement will involve the removal of a lane in each direction for the Eglinton and Kingston corridors. However, for the Morningside corridor, the two basic through lanes will remain (except in the vicinity of the Highway 401 interchange) in each direction along its entire length with left-turn lanes at all signalized intersections.

As part of the EA process, SENES Consultants Limited (SENES) was retained by IBI Group to assess the potential for noise and vibration impacts from the SMLRT on selected points of reception along the Scarborough-Malvern corridor.

1.2 OVERVIEW OF NOISE AND VIBRATION IMPACT ASSESSMENT APPROACH

Noise and vibration from the SMLRT is assessed using protocols developed by the TTC and the Ontario Ministry of the Environment (MOE). The general approach to the noise impact assessment is as follows:

- **Existing Conditions Scenario** – Predicting existing sound levels from road traffic;

- **Future No Build Scenario** – Predicting future sound levels at a 20 year horizon assuming that the SMLRT project does not proceed;

- **Future Build Scenario** – Predicting sound levels at a 20 year horizon assuming that the project ***does*** proceed.

The difference in sound levels between the "future build" scenario and the "future no-build" scenario is an indicator of the noise impact of the project. The protocols, described in Chapter 3, outline criteria values and thresholds that define the degree of impact and the point at which mitigations must be considered.

The approach to the vibration impact assessment involved the review of vibration studies completed for the TTC, and assessing the likelihood for vibration impacts on the selected points of reception from these reports.

1.3 REPORT FORMAT

In addition to this introductory chapter, the noise and vibration impact assessment includes the following six (6) chapters, as outlined in Table 1.

Table 1 - Report Overview

Chapter	Description
2.0	STUDY AREA DESCRIPTION
3.0	REGULATORY REQUIREMENTS
4.0	ASSESSMENT METHODOLOGY
5.0	NOISE IMPACT ANALYSIS
6.0	VIBRATION IMPACT ANALYSIS
7.0	CONCLUSIONS

2.0 STUDY AREA DESCRIPTION

2.1 SCARBOROUGH MALVERN CORRIDOR

The preferred routing for the SMLRT, as shown in Figure 1, includes:

- Eglinton Avenue, between Kennedy Station and Kingston Road;
- Kingston Road, between Eglinton Avenue; and
- Morningside Avenue; Morningside Avenue, between Kingston Road and north of Beath Street.

The SMLRT remains within the municipality of Toronto for the entire route. For the most part, the Scarborough Malvern study area consists of primarily 20th century urban development with commercial, industrial and some residential areas, and linear transportation corridors such as roads and railway lines. The corridor serves traffic and pedestrian movements associated with neighbourhood access, retail/commercial development demands, higher education demands, and commuter traffic demands.

2.2 PREDOMINANT LAND USES

The land uses within the study area are a mix of residential, commercial, industrial, institutional and park/open spaces. Eglinton Avenue between Kennedy Station and Kingston Road predominantly consists of small scale commercial developments and low-rise residential area (i.e., mixed use) with some high-rise residential dwellings. Kingston Road between Eglinton Avenue and Morningside Avenue predominantly consists of low-rise residential with a few mid to high-rise residential sites and mixed use areas. Morningside Avenue between Kingston Road and north of Beath Street mainly consists of low-density residential developments and natural areas.

There are a number of schools, open space areas and community centres located within the SMLRT study corridor. In addition, the 300 acre UTSC site is located on the north side of Ellesmere. Out of the three UTSC campus sites, Scarborough has the most land available to meet future needs and is presently below the standard building per student ratio. Currently, there are about 10,000 UTSC students, which is expected to double in the in the next 10 years. Centennial College supports the enrolment of full-time students and is located on Morningside Avenue. There are a total of about 15,000 people accessing the UTSC/Centennial College area: 10,000 UTSC students, 4,000 Centennial College students and 1,000 employees. This number is expected to grow to 20,000 in 10 years, and to double in the longer term.

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

Figure 1 – SMLRT Route and Receptor Locations

Image Source:	Google Earth v.5.0.11337.1968 (beta)

Legend:

Receptor Location — SMLRT Route

R1 Receptor ID

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2.3 PROPOSED ROAD REALIGNMENTS

Several sections of the existing traffic routes within the Study Area will require realignment in order to accommodate the SMLRT. The affected roads are:

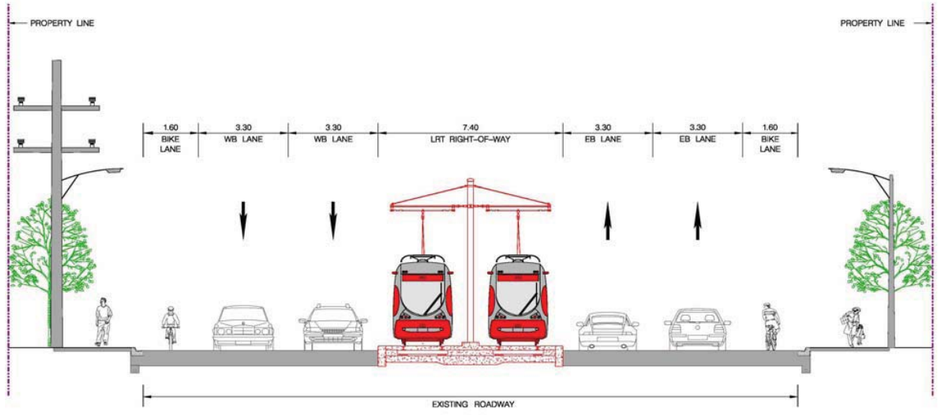
- Eglinton Avenue East, between Kennedy Road and Kingston Road;
- Kingston Road, between Eglinton Avenue East and Morningside Avenue;
- Morningside Avenue, between Kingston Road and Sheppard Avenue East;
- Ellesmere Road, between Morningside Avenue and Military Trail; and
- Military Trail, between Ellesmere Road and Morningside Avenue.

Details of the proposed changes to the alignment of the above roads within the Scarborough Malvern Corridor are summarized below:

Eglinton Avenue East

Eglinton Avenue East currently consists of a 7-lane cross-section (4 general purpose lanes, 2 HOV lanes and a median two-way-left-turn lane). With the proposed new SMLRT implementation, the HOV lanes and the median lane would be replaced by the SMLRT right-of-way as shown in Figure 2.

Figure 2 - Typical Cross Section: Eglinton Avenue And Kingston Road



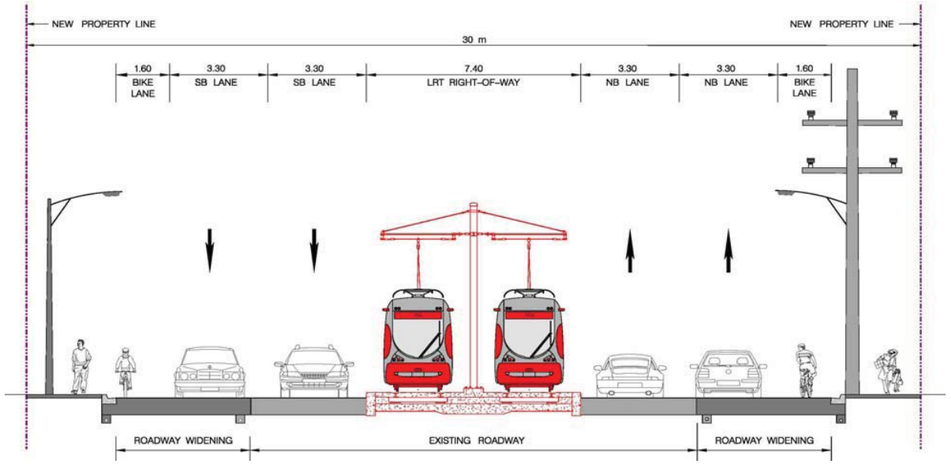
Kingston Road

The section of Kingston Road between Eglinton Avenue East and Morningside Avenue is currently a 6-lane cross-section with a raised median. The proposed new SMLRT will consist of the existing raised median lane with two inner travel lanes being replaced by the SMLRT right-of-way and bike lanes as shown in Figure 2.

Morningside Avenue

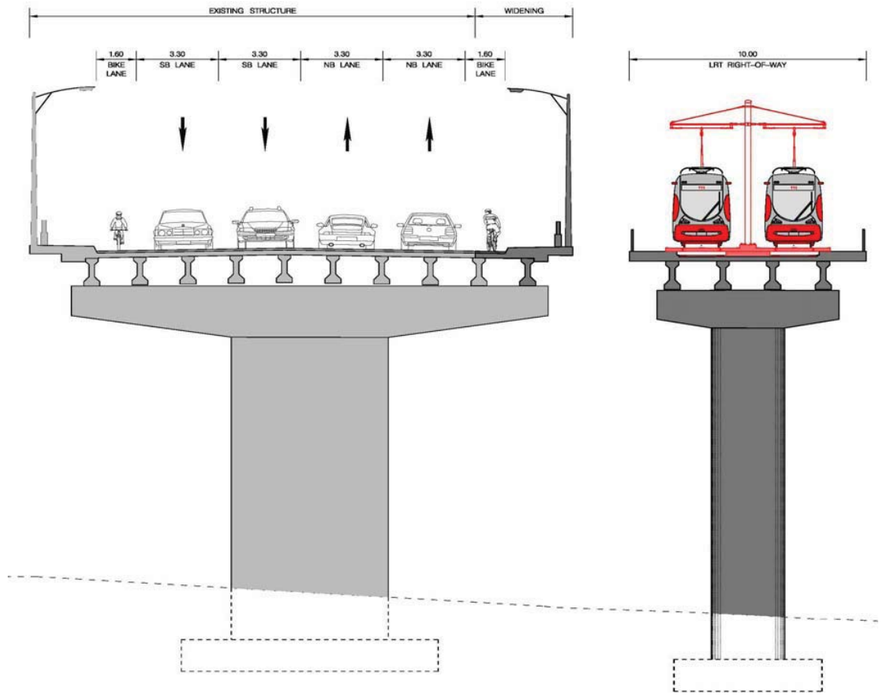
The section of Morningside Avenue between Kingston Road and Warmsworth is currently a 4-lane cross-section with a 26 m right-of-way. With the proposed new SMLRT implementation, the existing right-of-way would need to be widened to 30 m to accommodate the SMLRT right-of-way and the bike lanes, as shown in Figure 3.

Figure 3 - Typical Cross Section: Morningside Avenue



The structure over Highland Creek would require widening by 1.7 m on the west side to accommodate the new bike lanes. A new 9 m wide structure is being proposed on the east side of the existing Morningside Avenue to accommodate the SMLRT as shown in Figure 4.

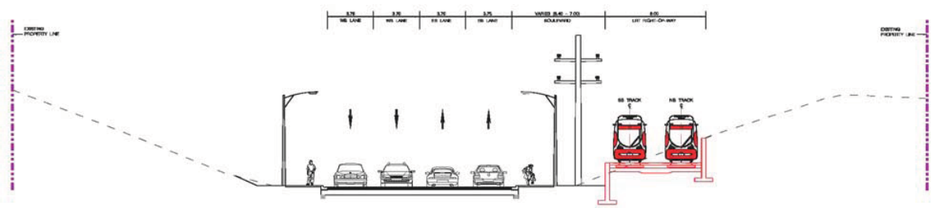
Figure 4 - Typical Cross Section: Morningside Avenue Over Highland Creek



Ellesmere Road

Ellesmere Road is currently a 4-lane cross section with no median and a sidewalk on the south side. With the SMLRT implementation, the existing roadway cross-section would be maintained with the SMLRT located on the south side of Ellesmere Road as shown in Figure 5.

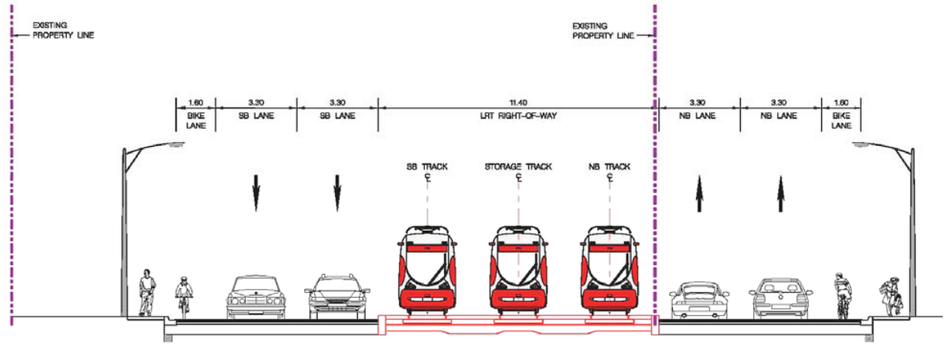
Figure 5 - Typical Cross Section: Ellesmere Road



Military Trail

Military Trail is currently a 3-lane cross section, consisting of one lane in each direction with a median two-way left-turn lane. With the new SMLRT implementation, the existing Military Trail would become a four lane road as shown in Figure 6. The SMLRT right-of-way along Military Trail is generally wider than the other locations due to the special track works located in the area.

Figure 6 - Typical Cross Section: Military Trail



3.0 REGULATORY REQUIREMENTS

3.1 MOE/TTC PROTOCOLS

In light of the potential for noise and vibration impacts from projects proposed by the Toronto Transit Commission (TTC), protocols for assessing these impacts have been developed by the TTC in cooperation with the Ontario Ministry of the Environment (MOE). The following protocols were developed for Light Rail and Rapid Transit Line assessments:

- MOEE/TTC Draft Protocol for Noise and Vibration Assessment for the Proposed Scarborough Rapid Transit Extension, May 11, 1993 (MOEE/TTC, 1993a)

- MOEE/TTC Protocol for Noise and Vibration Assessment for the Proposed Waterfront West Light Rail Transit Line, November 11, 1993 (MOEE/TTC, 1993b).

The above protocols have not been updated since their initial publication but have been used in connection with a number of recent TTC projects.

The MOE/TTC protocols apply to existing and proposed residential developments (having municipal approval as of the date of the protocol), nursing homes, group homes, hospitals and other such institutional land uses where people reside. It does not apply to commercial and industrial land uses. The MOE/TTC protocol requires that noise impacts resulting from the SMLRT are assessed in terms of the following criteria:

Table 2 – MOE/TTC Noise Criteria

Criteria	L_{eq} dBA
16-hr (daytime)	55 or ambient
8-hr (night-time)	50 or ambient
Passby Sound Level	80

The day-time and night-time equivalent sound level limits are measured at a point of reception with rail transit operating alone (excluding ambient contributions). The Passby Sound Level limit is assessed at a point of reception for a single train operating alone and excludes contributions from other sources. This limit is based on vehicles operating on tangent track and does not apply within 100 meters of special track works and excludes wheel rail squeal.

The MOE/TTC protocol requires that mitigation measures are incorporated in the design of the SMLRT when predictions show that any of the above limits are exceeded by more than 5 dBA. Mitigation measures applied to a project must ensure that the predicted sound levels are as close to, or lower than the respective limits as is technologically, economically, and administratively feasible.

General features of these protocol documents include requirements that ancillary facilities (i.e., subway stations) are to be treated as stationary sources and that construction noise be considered within the context of the assessment. In both cases, the criteria presented in the relevant MOE NPC publications would apply.

The MOE/TTC protocol also outlines criteria for ground borne vibration impact assessment. The assessment of ground borne vibration impact is confined to the vibration that is produced by the operation of the SMLRT and excludes vibration due to maintenance activities. If the predicted vertical vibration velocity from the SMLRT (at any outdoor point on a residential property greater than 15 m from the centreline of the track) exceeds 0.1 mm/sec appropriate mitigation methods shall be applied during the detailed design to meet this criterion to the extent that is technologically, economically, and administratively feasible.

A copy of the MOEE/TTC protocols is provided in Appendix C.

3.2 ONTARIO MINISTRY OF THE ENVIRONMENT NPC-115

Noise Pollution Control Publication 115 (MOE, 1978a) of the Ontario Model Municipal Noise Control By-Law stipulates specific sound emission standards for various pieces of construction equipment. This publication does not set receptor based sound level limits due to construction activities but sets limits for noise generated by each individual piece of equipment.

Table 3 lists Residential Area sound emission standards and Quiet Zone sound emission standards for specific items of new construction equipment based on the date of manufacture. Quiet zone and residential area sound emission standards for excavation equipment, dozers, loaders, backhoes or other related equipment are provided below:

Table 3 – Sound Emission Standards Construction Equipment

Date of Manufacture	Power Rating Less than 75 kW (dBA)	Power Rating 75 kW and Larger (dBA)
January 1, 1979 to December 31, 1980	85	88
January 1, 1981 and after	83	85

3.3 ONTARIO MINISTRY OF THE ENVIRONMENT NPC-118

Noise Pollution Control Publication 118 (MOE, 1978b) of the Ontario Model Municipal Noise Control By-Law sets sound emission standards for motorized conveyances of various types. This publication does not set receptor based sound level limits due to heavy vehicle operation but sets limits for noise generated by each individual piece of equipment.

Table 4 lists for various years of manufacture, the sound emission standard for a heavy vehicle powered by a diesel engine. Heavy vehicle refers to a motorized conveyance having a registered gross weight of more than 4,500 kg.

Table 4 – Sound Emission Standards for Heavy Vehicles

Date of Manufacture	Maximum Sound Level (dBA)
Prior to January 1, 1979	100
January 1, 1979 and after	95

[1] as measured in accordance with NPC - 103, Section 9

3.4 ONTARIO MINISTRY OF THE ENVIRONMENT NPC-205

Noise Pollution Control Publication 205 (MOE, 1995) establishes sound level limits for stationary sources such as industrial and commercial establishments or ancillary transportation facilities, affecting points of reception in Class 1 and 2 Areas (Urban). NPC-205 states that the sound level limit must be established based on the principle of "predictable worst case" noise impact. Generally, the limit is based on the background sound level at the receptors and must represent the minimum background sound level that occurs or is likely to occur during the operation of the stationary source under assessment.

Sound levels from steady stationary noise sources are quantified using the energy equivalent sound level, L_{eq}, in dBA. For urban areas, the daytime limit at a critical receptor for steady noise

from a stationary source is the higher of either the one-hour L_{eq} resulting from existing volumes of road traffic and any industry that is not under investigation for noise excess, or 50 dBA. The night-time limit is the higher of either the ambient (road traffic plus industry) one-hour L_{eq} noise level, or 45 dBA. If the stationary source contains any noticeable features such as tonal components or buzzing, a 5 dB tonal penalty must be added to the noise level of the source as per NPC-104 (MOE, 1978c).

No restrictions apply to a stationary source resulting in a one hour L_{eq} lower than the minimum values for the time periods specified in Table 5.

Table 5 - Minimum Values of One-Hour L_{eq} by Time of Day

Time of Day	One Hour L_{eq} (dBA)	
	Class 1 Area	Class 2 Area
07:00 - 19:00	50	50
19:00 - 23:00	47	45
23:00 - 07:00	45	45

The background sound level in the area of the Facility is dominated by road traffic that is indicative of a Class 1 Area.

3.5 CITY OF TORONTO – MUNICIPAL CODE NOISE

The Toronto Municipal Code Noise (City of Toronto, 2007) document applies to transportation projects mainly during construction. The Code requires that the operation of construction equipment take place only during designated hours, which are generally between 07:00 and 19:00 on Monday to Friday, and 09:00 to 19:00 on weekends and holidays. Should construction activities occur outside of these hours, a permit for an exemption to the Code requirements is required. If granted, the permits are generally subject to the following terms and conditions:

- The sound emitted from any equipment shall not exceed an equivalent sound level (L_{eq}) of 85 dBA when measured 20 metres from the source over a five minute period;
- Where the sound level exceeds 85 dBA, the applicant shall comply with any request made by an officer of the Toronto Police Service or a municipal standards officer of the Municipal Licensing and Standards Division with respect to the volume of sound from the equipment to ensure compliance with Subsection D(1) [the first point above];

- No sound or construction equipment other than the equipment approved under the permit shall be used by the applicant;
- The event or activity shall be restricted to the approved location; and
- The permission granted is for the date and times for the event or activity as set out in the permit.

If noise from a piece of construction equipment is clearly audible at a point of reception, the use of an effective exhaust or intake muffling device, or other sound attenuating device of a type specified by the manufacturer is required. The attenuation device must be in good working order, and in constant operation.

3.6 SUMMARY OF ASSESSMENT CRITERIA

Based on the information presented in the preceding Sections, the project noise assessment criteria are presented Table 6.

Table 6 - Summary of Noise and Vibration Criteria

Component	Protocol	Criteria	Mitigation
Existing/ Future Noise	MOEE/TTC	55 dBA or ambient noise levels for daytime; 50 dBA or ambient noise levels for nighttime; 80 dBA for single train passby	Incorporated when limits are exceeded by more than 5 dBA
	NPC-205 (Stationary Sources Only)	50 dBA day-time; 47 dBA evening; 45 dBA night-time OR Background 1-hr Leq, typically caused by road traffic, established through measurement or prediction	Mitigation required to meet criteria
Construction Noise	NPC-115	See Table 3	Not addressed
	NPC-118	See Table 4	Not addressed
	City of Toronto - Municipal Code Noise	07:00 and 19:00 Monday to Friday; 09:00 to 19:00 on weekends and holidays	Not addressed
Ground Vibration	MOEE/TTC	Vertical vibration velocity of 0.1 mm/sec on a residential property greater than 15 m from centre line of track	Vertical vibrations >0.1 mm/sec, mitigation required to meet criteria

4.0 ASSESSMENT METHODOLOGY

4.1 DOCUMENTATION REVIEW AND RECEPTOR SELECTION

The assessment began with a thorough review of the study area, including the proposed SMLRT layout and the land uses along the corridor. Potential receptor locations were identified for possible inclusion in the assessment during this initial review stage, and members of the project team visited the study area to confirm receptor locations and make observations. While the MOE/TTC Protocol provides a definition of a point of reception as being specific to residential properties, the broader definition of a point of reception from the MOE Model Municipal Noise Control By-Law was considered in the assessment. In this publication, a point of reception may include any of the following existing, or zoned for future use, premises:

- permanent or seasonal residences;
- hotels/motels;
- nursing/retirement homes;
- rental residence;
- hospitals;
- camp grounds; and
- noise sensitive buildings such as schools and places of worship.

It should be noted that while all of the above receptor types were considered in the selection of receptor locations for the assessment, all of the receptors chosen were existing residential dwellings (i.e., houses, apartments, townhouses). These receptor types were generally closest in proximity to the proposed SMLRT line compared to the other land uses listed above.

A total of sixteen (16) receptors were initially selected for assessment (R1 – R16). Upon review by the MOE, it was requested that additional receptors be considered from a list provided by the MOE reviewer. Three additional receptors were selected for inclusion (AR1 – AR3). The receptor locations are listed in Table 7. Aerial photographs showing the receptor locations are provided in Figure 1 and in Appendix A. The full list of receptor points put forth for consideration by the MOE are provided in Appendix B, including the rationale for selecting the additional points.

Table 7 - Receptor Location Summary

Receptor ID	Receptor Type	Receptor Location
R1	Townhouse	Eglinton and Danforth
R2	Apartment	340 McCowan Rd
R3	Apartment	3181 Eglinton Ave
R4	Apartment	3400 Eglinton Ave
R5	Apartment	3434 Eglinton Ave
R6	Townhouse	Kingston Rd, South of Guildpark Pathway
R7	Townhouse	3 Celeste Drive
R8	Townhouse	Kingston Rd, South of Poplar Road
R9	Residential	302 Morningside Ave
R10	Residential	331 Morningside Ave
R11	Residential	339 Morningside Ave
R12	Residential	357 Morningside Ave
R13	Residential	UofT Scarborough Campus - North Residence
R14	Townhouse	100 Morningside Ave
R15	Townhouse	Bonaspiel Drive
R16	Residential	920 Morningside Ave
AR1	Apartment	North-east corner of Town Haven Place
AR2	Townhouse	Between Muir Drive and Scarborough Golf Club Road
AR3	Townhouse	Between Payzac Ave and Galloway Rd

4.2 TRAFFIC DATA AND ASSUMPTIONS

Traffic data for existing conditions and future conditions (with and without the project) were provided by IBI Group for all traffic routes that will be affected by the SMLRT line. The traffic volumes were provided as 24-hour Annual Average Daily Traffic (AADT) volumes, and were split between automobiles, medium trucks, heavy trucks, buses (for existing and future no-build scenario only) and SMLRT (for future build scenario). Since the MOE/TTC Protocol requires assessments to be performed separately for daytime hours and night-time hours, it was assumed that 85% of the 24-hr AADT is representative of daytime traffic, with the remainder occurring

during night-time hours. The 24-hr AADT volumes for the existing scenario, future no-build scenario and the future build scenario are provided in Appendix D.

4.3 TRAFFIC NOISE MODELLING

The traffic sound levels were estimated using the MOE STAMSON noise model, which is based on Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT). STAMSON calculates receptor sound levels for a variety of source types such as roads, rail, and several TTC vehicles. Sound levels due to road noise include the contribution from three vehicle categories:

Automobiles

- All vehicles having two axles and four wheels designed primarily for the transportation of nine or fewer passengers or the transportation of cargo (e.g., vans and light trucks). Generally, the gross vehicle weight is less than 4,500 kg.

Medium Trucks

- All vehicles having two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 4,500 but less than 12,000 kg. City buses are also included in this category.

Heavy Trucks

- All vehicles having three or more axles designed for the transportation of cargo. Generally, the gross vehicle weight is greater than 12,000 kg. Inter-city buses are included in this category.

Key parameters utilized by STAMSON in the calculation of road noise include vehicle speed, road surface, topography gradient, ground surface conditions (absorptive or reflective), angle of exposure, and the presence or absence of sound barriers. In order to predict sound levels for road traffic, the STAMSON model requires an hourly traffic flow of at least 40 vehicles/hour; travelling at least 40 km/h; and receptors must be located between 15 m and 500 m from the traffic source.

The sound levels at the receptor locations resulting from the operation of the SMLRT were estimated in STAMSON using the ALRV source (the light rail transit vehicles widely used by the TTC). The parameters used in calculating the sound level impact from these vehicles are similar to those listed above; however, there is a limitation on the travel speed at which the ALRV may be modelled (must be between 30 km/hr and 50 km/hr).

Due to the limitations of the STAMSON software, there was a need to make adjustments to a portion of the modelled results in order to arrive at representative sound levels for the future-build scenario under consideration. The limitations that resulted in further refinement of sound level predictions included:

- The restriction that a receptor must be located within 15 m of the centreline of the road segment. This was an issue as several receptors were located within this distance. *Note that this applies to the road sources only – all ALRV sources were greater than or equal to 15 m from the receptor locations; and*

- The restriction that an ALRV source may not be modelled at a speed greater than 50 km/hr. It is expected that the SMLRT will travel at a speed of 60 km/hr.

As several receptors were located within 15 m of the centreline of the nearest road segment, an approximation of distance attenuation between 15 m and the actual separation distance was applied to the modelled result. In order to estimate the sound level impact of the ALRV when travelling at a speed of 60 km/hr, model runs were completed for each receptor with the ALRV travelling at speeds of 30 km/hr, 40 km/hr and 50 km/hr and the results were fit to a logarithmic curve, which related the receptor sound level to the travel speed. The curve equation was then used to project the receptor sound levels with the ALRV operating at its actual speed of 60 km/hr. Examples of this projection are included in the samples calculations in Appendix E. The STAMSON outputs for all sample calculations are provided in Appendix F.

Within the context of the modelling, the receptors were assumed to be in the Outdoor Living Area (OLA) during daytime hours (i.e., 3 m from the façade of the building), and at an upper level bedroom window for night-time hours. All receptor locations were assumed to be on the same side of the building as the road and ALRV sources.

5.0 NOISE IMPACT ANALYSIS

The following section summarizes the results of the traffic noise modelling completed for the existing/future no-build scenario and the future-build scenario. The data generated in the modelling phase of the project has been summarized in two ways:

- Impacts associated with SMLRT only; and
- Impacts associated with SMLRT and road realignments

According to the MOE/TTC Protocol, the assessment criteria apply to impacts solely from the SMLRT at the receptor locations. Section 5.1 provides a summary of the SMLRT noise levels (i.e., not including the impact from the roads on either side) compared against the criteria values from the MOE/TTC Protocol. An assessment of the requirement for mitigation accompanies this summary. As discussed in Section 2.0, the implementation of the SMLRT will cause the existing traffic routes to be realigned. This realignment will affect receptor sound levels by changing the distance between the receptor and the road segments, affecting traffic volumes, eliminating bus traffic and introducing the SMLRT. As such, the effects of the realignment have been considered as being a project-related impact. A summary that compares the future no-build traffic volumes to the total effect of the project has been included in Section 5.2 (i.e., the combined effect of the SMLRT and the road realignment). An assessment of the requirement for mitigation is provided.

It should be noted that there is a possibility of wheel squeal resulting from the LRT travelling on curved sections of track. While the curves are gradual, and the latest TTC track design is expected to minimize the squeal effect, a tonal penalty of 5 dB has been added to the LRT sound level contribution at receptors located near curved sections, as per NPC-104 (MOE, 1978c). These receptors included R4, R5 and AR2.

5.1 IMPACT OF SMLRT NOISE ONLY

As discussed in Chapter 3, the sound level criteria presented in the MOE/TTC Protocol are the higher of the ambient sound level at the receptor location, or the presented minimum criteria values. Table 8 illustrates that the predicted impact solely from the SMLRT is below the established criteria at all receptor locations.

Table 8 - Summary of Predicted Sound Levels Due to SMLRT Only

Receptor ID	Future No-Build Ambient Sound Level (dBA)		MOE/TTC Protocol Minimum Sound Level Criteria (dBA)		Applicable Criteria[1] (dBA)		SMLRT-Only Sound Level (dBA)		Comparison with Criteria Values (dB)		Increment Requiring Mitigation (dB)	Mitigation Required? (Yes/No)
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
R1	71.2	66.0	55	50	71.2	66.0	65.1	60	-6.1	-6	5	No
R2	72.8	66.5	55	50	72.8	66.5	64.8	59.8	-8	-6.7	5	No
R3	68.5	63.5	55	50	68.5	63.5	62.7	57.9	-5.8	-5.6	5	No
R4	60.5	56.0	55	50	60.5	56.0	61.9	57.9	1.4	1.9	5	No
R5	58.8	54.7	55	50	58.8	54.7	58.5	54.5	-0.3	-0.2	5	No
R6	70.6	65.3	55	50	70.6	65.3	64.8	59.8	-5.8	-5.5	5	No
R7	67.9	62.9	55	50	67.9	62.9	62.5	57.6	-5.4	-5.3	5	No
R8	68.4	63.4	55	50	68.4	63.4	62.2	57.4	-6.2	-6	5	No
R9	63.2	58.1	55	50	63.2	58.1	60.7	55.8	-2.5	-2.3	5	No
R10	70.6	65.1	55	50	70.6	65.1	64.8	59.8	-5.8	-5.3	5	No
R11	69.0	63.8	55	50	69.0	63.8	63.3	58.4	-5.7	-5.4	5	No
R12	69.1	63.9	55	50	69.1	63.9	64	59.1	-5.1	-4.8	5	No
R13	53.6	50.0	55	50	55.0	50.0	50.2	46.3	-4.8	-3.7	5	No
R14	68.1	63.0	55	50	68.1	63.0	55.6	51.1	-12.5	-11.9	5	No
R15	65.5	60.4	55	50	65.5	60.4	60.7	55.8	-4.8	-4.6	5	No
R16	70.9	65.4	55	50	70.9	65.4	65.9	60.7	-5	-4.7	5	No
AR1	71.2	66.0	55	50	71.2	66.0	64.6	59.6	-6.6	-6.4	5	No
AR2	69.5	64.6	55	50	69.5	64.6	65.8	61.4	-3.7	-3.2	5	No
AR3	70.9	65.6	55	50	70.9	65.6	65.3	60.2	-5.6	-5.4	5	No

[1] Applicable Criteria is the higher of the Future No-Build sound level and the minimum criteria values from the MOE/TTC Protocol

5.2 COMBINED IMPACT OF SMLRT AND ROAD REALIGNMENT

The realignment of the existing traffic routes is expected to cause a change in sound levels at the receptor locations, in addition to the sound caused by the presence of the SMLRT. A summary of the combined impact of the road realignment and the SMLRT is therefore provided in Table 9. While the MOE/TTC Protocol states that the criteria values apply to the rail source alone, the criteria are included in this summary for comparative purposes and to identify the potential for mitigation.

The results in Table 9 indicate that the sound level criteria are not exceeded by greater than 5 dB at any receptor point. The greatest impacts are at R4, consisting of increases of 4.3 dB during the day, and 4.7 dB during the night. These increases are in part influenced by the tonal penalty applied to the LRT contribution to reflect the potential tonal qualities of any "wheel squeal" associated with curved sections of the track. The next highest impact is an increase of 4.0 dBA during the night-time hours at receptor R13. Receptor R13 is a student housing building located on the University of Toronto Scarborough Campus. At this location, the SMLRT runs adjacent to the existing alignment of Ellesmere Ave. on the south side (i.e., nearest to the residence). The alignment of Ellesmere Ave. does not change as a function of the project and it was expected that the addition of the SMLRT to the south side of Ellesmere Avenue would cause the sound levels at this receptor location to increase. The modelling indicates that the sound level increase will be barely perceptible, and not significant enough to warrant mitigation. The daytime increase at this location is predicted to be 2.2 dB.

Other receptor locations are predicted to experience slight increases in sound levels of up to 3.6 dB over the project future no-build levels. Generally, an increase in sound level of up to 3 dB is not considered to be perceptible to human hearing (Cowan, 1994).

Table 9 - Summary of Predicted Sound Levels Due to SMLRT and Road Realignment

Receptor ID	Future No-Build Ambient Sound Level (dBA)		MOE/TTC Protocol Minimum Sound Level Criteria (dBA)		Applicable Criteria (dBA)		Future Build Sound Level (dBA)		Project-related Increment (dBA)		Increment Requiring Mitigation (dB)	Mitigation Required? (Yes/No)
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night		
R1	71.2	66	55	50	71.2	66.0	72.1	66.8	0.9	0.8	5	No
R2	72.8	66.5	55	50	72.8	66.5	73.3	67.8	0.5	1.3	5	No
R3	68.5	63.5	55	50	68.5	63.5	69.1	64.1	0.6	0.6	5	No
R4	60.5	56	55	50	60.5	56.0	64.8	60.7	4.3	4.7	5	No
R5	58.8	54.7	55	50	58.8	54.7	62.3	58.3	3.5	3.6	5	No
R6	70.6	65.3	55	50	70.6	65.3	71.9	66.5	1.3	1.2	5	No
R7	67.9	62.9	55	50	67.9	62.9	68.8	63.8	0.9	0.9	5	No
R8	68.4	63.4	55	50	68.4	63.4	69	64.1	0.6	0.7	5	No
R9	63.2	58.1	55	50	63.2	58.1	65.4	60.2	2.2	2.1	5	No
R10	70.6	65.1	55	50	70.6	65.1	70.7	65.4	0.1	0.3	5	No
R11	69	63.8	55	50	69.0	63.8	68.9	63.8	-0.1	0.0	5	No
R12	69.1	63.9	55	50	69.1	63.9	69.8	64.6	0.7	0.7	5	No
R13	53.6	50	55	50	55.0	50.0	57.2	54	2.2	4.0	5	No
R14	68.1	63	55	50	68.1	63.0	67.7	62.7	-0.4	-0.3	5	No
R15	65.5	60.4	55	50	65.5	60.4	66.5	61.4	1.0	1.0	5	No
R16	70.9	65.4	55	50	70.9	65.4	71.6	66.2	0.7	0.8	5	No
AR1	71.2	66.0	55	50	71.2	66.0	71.1	65.8	-0.1	-0.1	5	No
AR2	69.5	64.6	55	50	69.5	64.6	71.1	66.4	1.6	1.8	5	No
AR3	70.9	65.6	55	50	70.9	65.6	73.3	67.8	2.4	2.1	5	No

[1] Applicable Criteria is the higher of the Future No-Build sound level and the minimum criteria values from the MOE/TTC Protocol

5.3 STATIONARY NOISE IMPACT

Under the MOE/TTC Protocol there is a requirement to assess noise from stationary sources in accordance with the MOE guidance provided in their publication NPC-205. There will be nine (9) electrical substations installed to support the SMLRT line. The location and design of these stations has not yet been determined. As similar stations will be installed throughout the City in support of the various Transit City lines, TTC will be developing a standard approach to their installation/design. This approach will consider appropriate minimum setback distances to nearest residences and, if necessary, mitigation such as masonry block walls or similar enclosures.

5.4 CONSTRUCTION NOISE IMPACT

It is likely that construction activities relating to the installation of the SMLRT line will cause nearby receptor sound levels to increase above ambient conditions. Construction activities are temporary in nature, but would be considered a source of annoyance if construction occurs outside of normal weekday construction periods when ambient sound levels are the lowest.

Time and place restrictions as described in the Toronto Municipal Code have been outlined in Section 3.0. Construction must either occur within these limitations, or an exemption must be sought prior to commencement. Furthermore, all construction equipment is required to be properly maintained to limit noise emissions. The noise limits for construction equipment are stipulated in the MOE NPC-115 and NPC-118 guidelines, as described in Section 3.0. Consideration should be given in advance to developing a procedure to respond to noise complaints during the construction phase.

6.0 VIBRATION IMPACT ANALYSIS

The vibration impact analysis for the proposed SMLRT was based on the results of vibration study reports that have been completed for previous projects. A study completed for the TTC Eastern Waterfront Project (RWDI, 2007) outlines the range of root-mean-squared vibration levels expected at increasing distances from a TTC streetcar travelling on a track (representing the latest TTC track design).

The vibration levels outlined in the TTC Eastern Waterfront Project report are regarded as being applicable to this project, provided the TTC implements this new track design. A summary of the vibration levels to be expected from a TTC vehicle travelling on the new TTC track design is provided in Table 10. The relevant excerpts from the source report are provided in Appendix G.

Table 10 - Summary of Vibration Levels from TTC Vehicle

Distance (m)	Range of RMS Vibration Levels (mm/s)
1	0.07 – 0.14
2	0.06 – 0.13
3	0.05 – 0.12
4	0.04 – 0.11
5	0.02 – 0.10
6	0.01 – 0.08
7	0.00 – 0.07
8	0.00 – 0.06
9	0.00 – 0.05
10	0.00 – 0.04
11	0.00 – 0.02
12	0.00 – 0.01

According to the measurement data in Table 10, vibration levels resulting from TTC vehicles are well below the limit of 0.1 mm/s at very close range. At distances beyond 12 m from the track it is projected that vibration levels should approach levels that are not detectable. The shortest distance between the centreline of a proposed SMLRT track and receptor included in this assessment is 15 m. Therefore it is expected that receptor vibration levels will be well within the MOE/TTC Protocol criteria value of 0.1 mm/s.

7.0 CONCLUSIONS

The following key conclusions are drawn from the preceding information:

- The noise impact from the operation of SMLRT alone (i.e., not including other sources of noise such as adjacent roadways) is below the established sound level criteria at all receptor locations;

- The noise impact from the combined operation of the SMLRT and the proposed realignment of the roads within the Study Area does not exceed the established criteria by more than 5 dB at any receptor location;

- Noise mitigation measures do not need to be considered as the projected increases in sound levels from both the SMLRT and road alignment are less than 5 dB. The MOE/TTC Protocol requires mitigation to be considered if the project related increase from the SMLRT alone is 5 dB;

- Construction must occur within time and place restrictions outlined in the Toronto Municipal Code, or an exemption must be sought prior to commencement of construction. Furthermore, all construction equipment should be properly maintained to limit noise emissions and comply with the noise limits outlined in NPC-115 and NPC-118 guidelines.

- Based on measurements performed for the TTC Eastern Waterfront Project (RWDI, 2007), vibration levels are expected to be within the MOE/TTC Protocol criteria at very close range (i.e., 2 m), and should approach levels that are non-detectable beyond 12 m. There are no expected vibration impacts resulting from the SMLRT provided the TTC employs its latest technology in track design (i.e., continuously welded tracks on tangential sections, rubber boot vibration isolation and other concrete bedding details).

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Ontario Ministry of the Environment and Toronto Transit Commission, 1993b. MOEE/TTC Protocol for Noise and Vibration Assessment for the Proposed Waterfront West Light Rail Transit Line, November 11, 1993.

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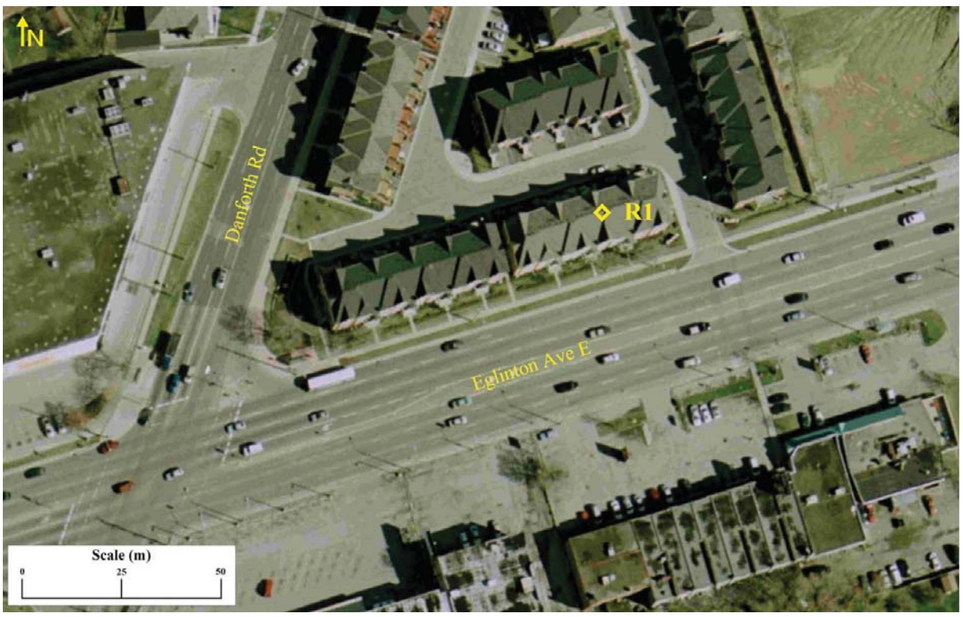
APPENDIX A
RECEPTOR LOCATIONS

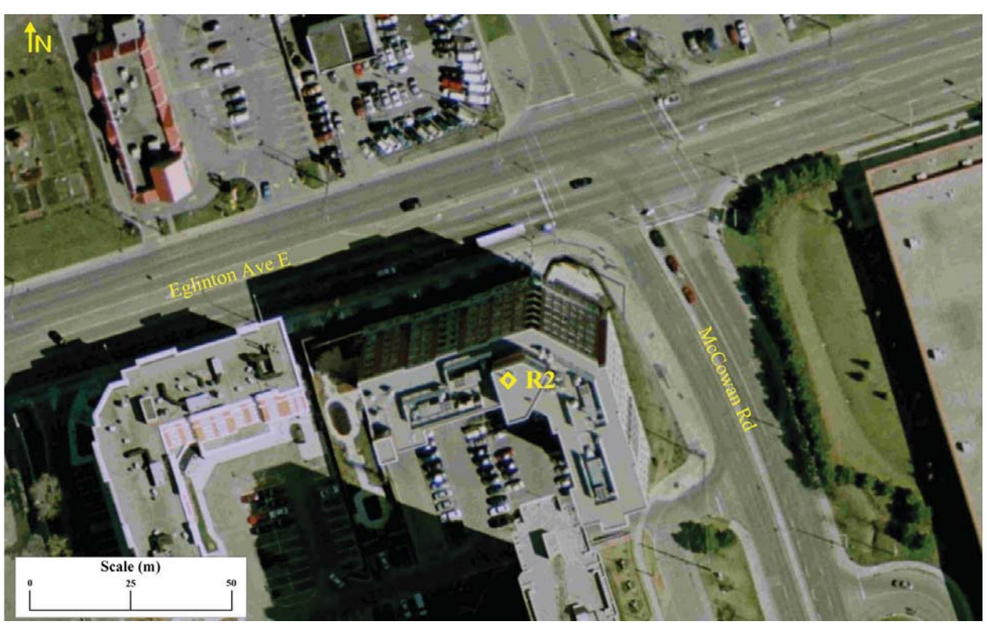
34711-1 RPT 24Sep09 TTC NoiseVibration Final.doc SENES Consultants Limited

Receptor ID: R1	**Receptor Description:** Townhouse – Eglinton Ave and Danforth Rd	



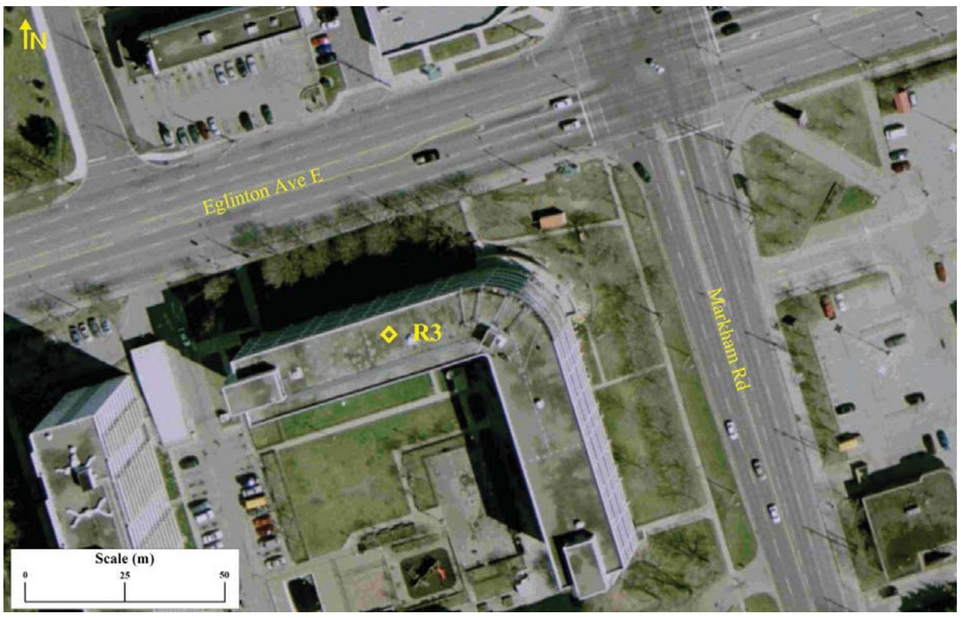
UTM Coordinates:	**Easting (m):** 641343	**Northing (m):** 4844236
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-1	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R2	**Receptor Description:** Apartment – 340 McCowan Road	



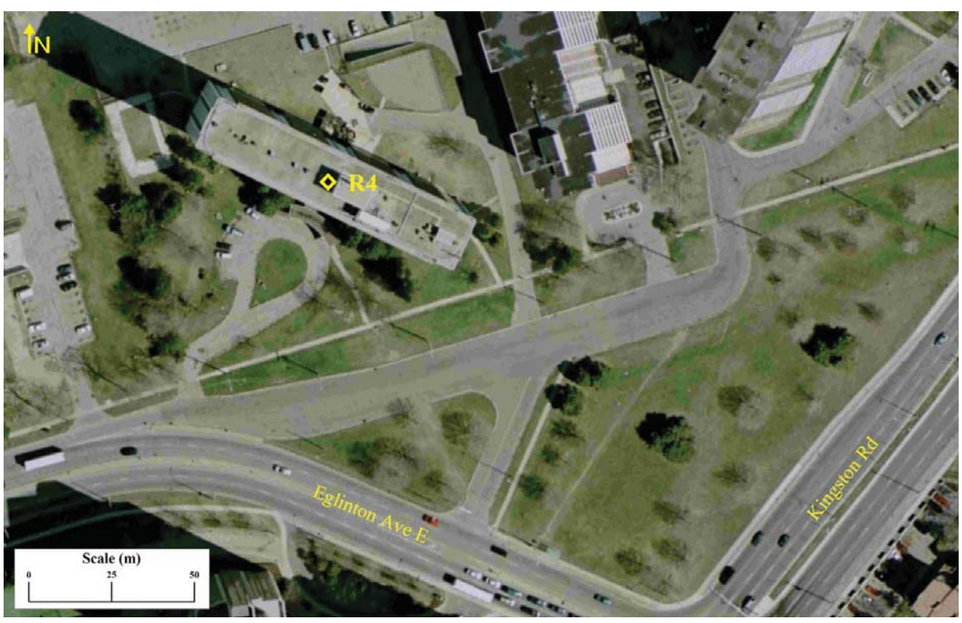
UTM Coordinates:	**Easting (m):** 641815	**Northing (m):** 4844328
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-2	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R3	**Receptor Description:** Apartment – 3181 Eglinton Ave E	



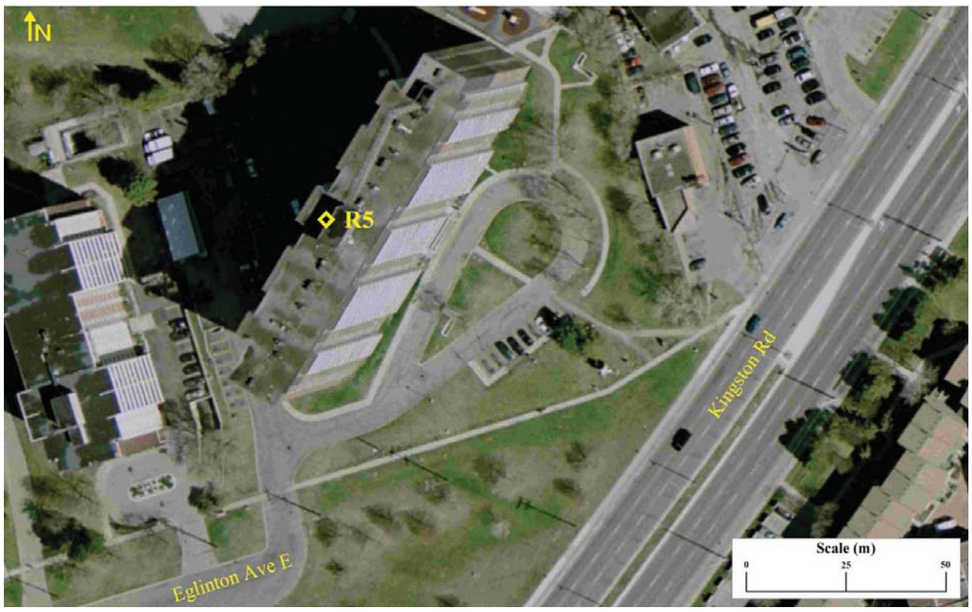
UTM Coordinates:	**Easting (m):** 643377	**Northing (m):** 4844832
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-3	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R4	**Receptor Description:** Apartment – 3400 Eglinton Ave E	



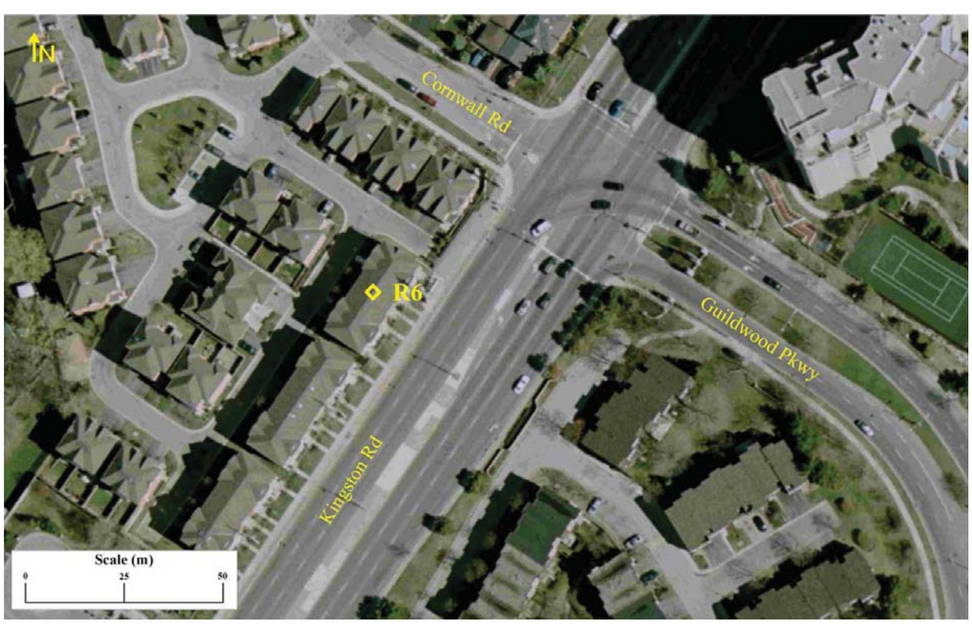
UTM Coordinates:	**Easting (m):** 643880	**Northing (m):** 4845107
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-4	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R5	**Receptor Description:** Apartment – 3434 Eglinton Ave E



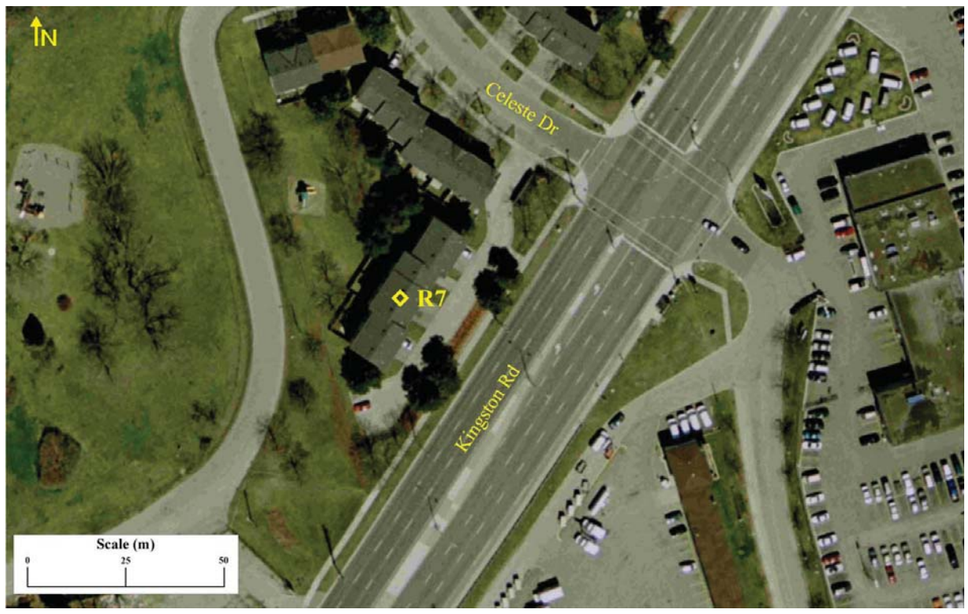
UTM Coordinates:	**Easting (m):** 643880	**Northing (m):** 4845107
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-5	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R6	**Receptor Description:** Townhouse – Kingston Road, South of Guildwood Parkway



UTM Coordinates:	**Easting (m):** 644385	**Northing (m):** 4845601
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-6	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R7	**Receptor Description:** Townhouse – 3 Celeste Drive	



UTM Coordinates:	**Easting (m):** 644897	**Northing (m):** 4846438
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-7	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R8	**Receptor Description:** Townhouse – Kingston Road, South of Poplar Road	

UTM Coordinates:	**Easting (m):** 645525	**Northing (m):** 4847280
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-8	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R9	**Receptor Description:** Residential Dwelling – 302 Morningside Ave	

UTM Coordinates:	**Easting (m):** 645816	**Northing (m):** 4848217
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-9	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R10	**Receptor Description:** Residential Dwelling – 331 Morningside Ave	

UTM Coordinates:	**Easting (m):** 645802	**Northing (m):** 4848442
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-10	**Legend:** Receptor Location R1 Receptor ID	SENES Consultants Limited

Receptor ID: R11	**Receptor Description:** Residential Dwelling – 339 Morningside Ave

UTM Coordinates:	**Easting (m):** 645785	**Northing (m):** 4848493
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-11	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

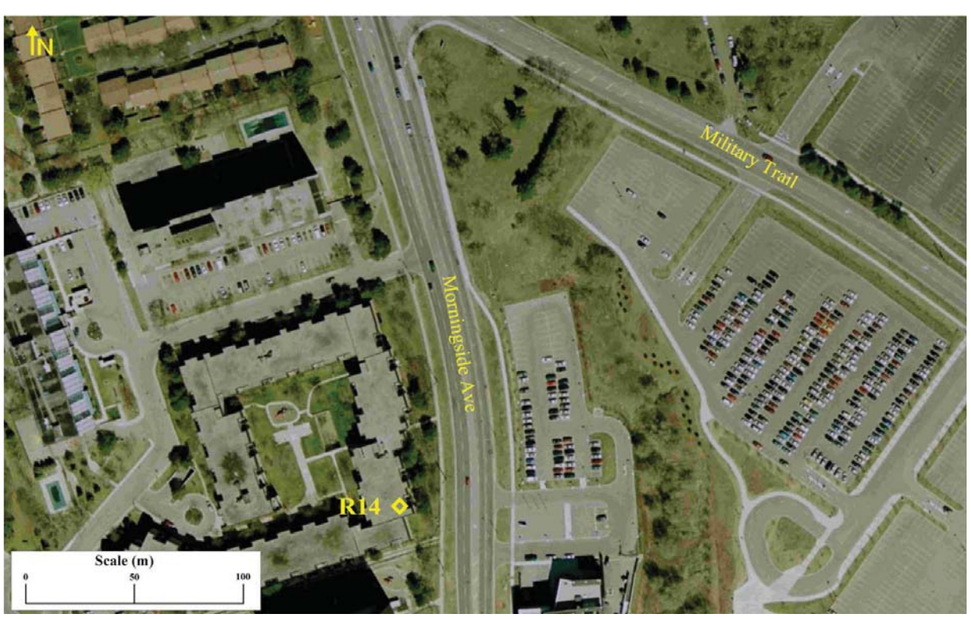
Receptor ID: R12	**Receptor Description:** Residential Dwelling – 357 Morningside Ave

UTM Coordinates:	**Easting (m):** 645753	**Northing (m):** 4848577
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-12	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R13	**Receptor Description:** UTSC North Residence

UTM Coordinates:	**Easting (m):** 645673	**Northing (m):** 4849671
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-13	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R14	**Receptor Description:** Townhouse – 100 Morningside Ave



UTM Coordinates:	**Easting (m):** 645310	**Northing (m):** 4849815
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-14	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

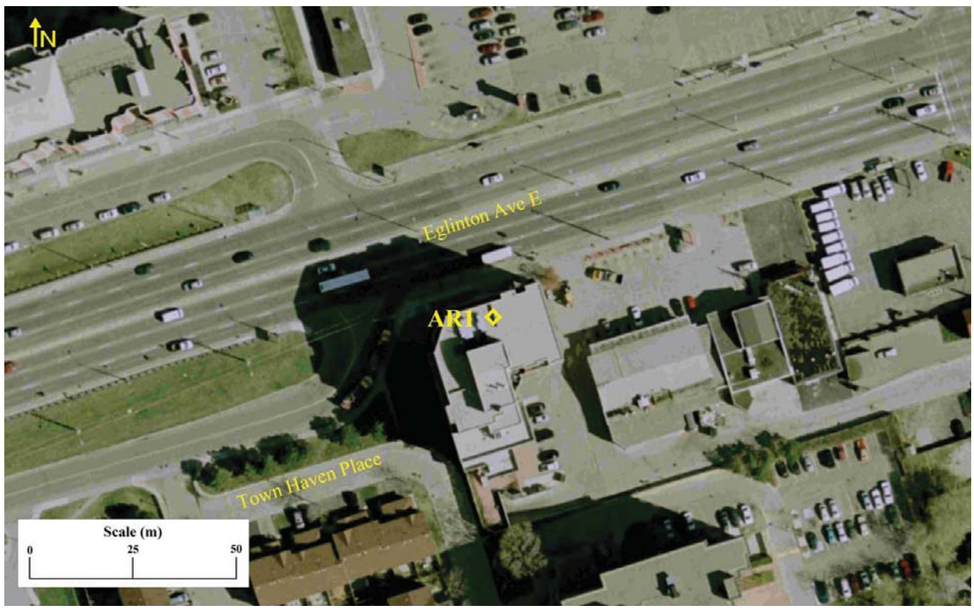
Receptor ID: R15	**Receptor Description:** Townhouse – Bonaspiel Drive	

UTM Coordinates:	**Easting (m):** 645186	**Northing (m):** 4850237
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-15	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: R16	**Receptor Description:** Residential Dwelling – 920 Morningside Ave	

UTM Coordinates:	**Easting (m):** 645109	**Northing (m):** 4850494
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-16	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

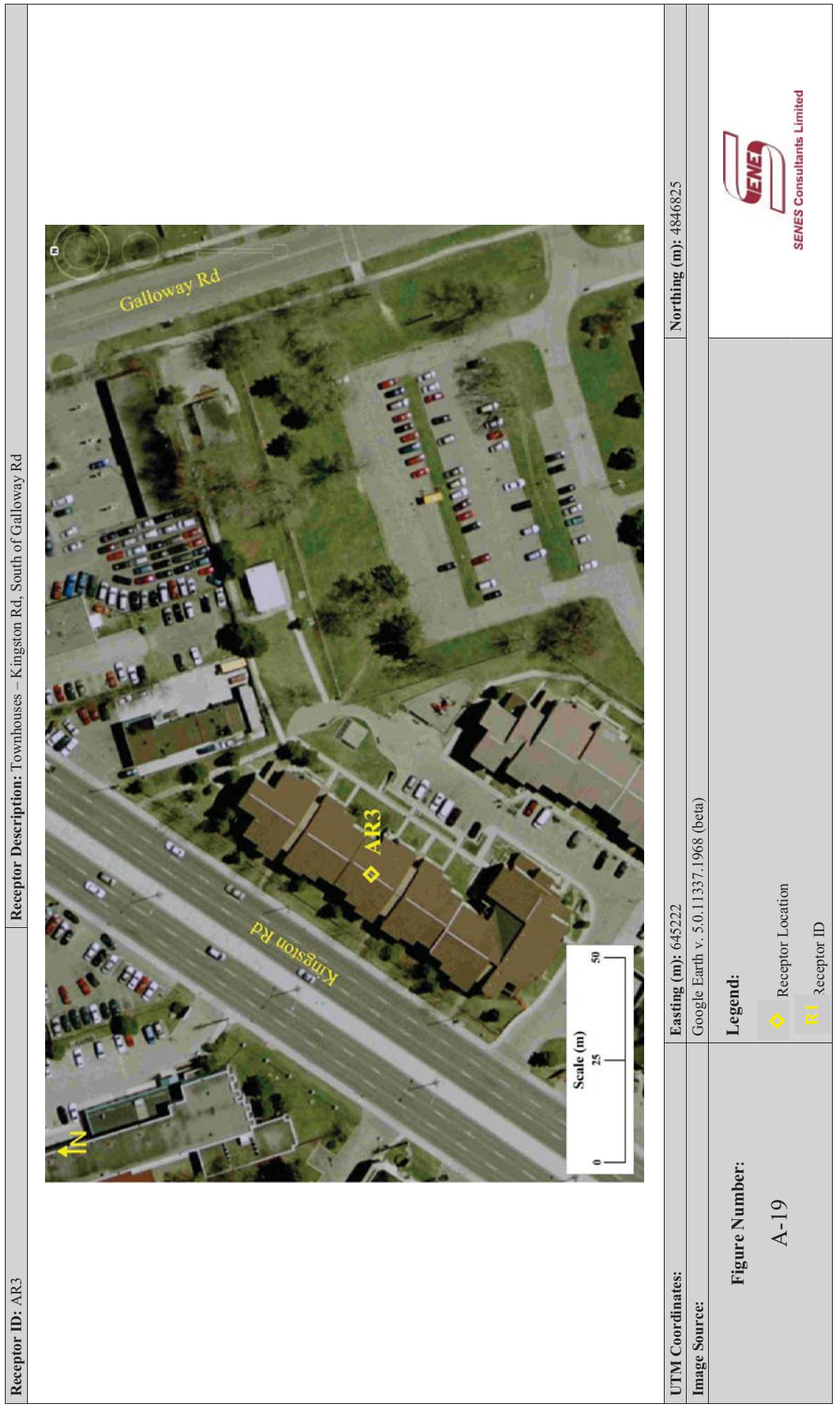
Receptor ID: AR1	**Receptor Description:** Apartment – North-west Corner of Town Haven Place	



UTM Coordinates:	**Easting (m):** 640152	**Northing (m):** 4843791
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-17	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited

Receptor ID: AR2	**Receptor Description:** Townhouses – Kingston Rd, between Eglinton Ave E and Scarborough Golf Club Rd	

UTM Coordinates:	**Easting (m):** 644123	**Northing (m):** 4845060
Image Source:	Google Earth v. 5.0.11337.1968 (beta)	
Figure Number: A-18	**Legend:** Receptor Location; R1 Receptor ID	SENES Consultants Limited



APPENDIX B

MOE REQUESTED RECEPTOR POINTS

Table B.1 – Receptor Locations Requested for Consideration by MOE

Receptor Description	SENES Comment
Eglinton Ave E between Kennedy Rd and Kingston Rd (North Side)	
Apartment between CN Rail and Midland Ave	Outside of the Study Area
Townhouses between Danforth Rd and Barbados Blvd	This is Receptor R1
Two apartment buildings at north-east corner of Eglinton Ave and Cedar Dr	These apartments do not have direct exposure to Eglinton Ave, while nearby R3 and R4 receptors do
Eglinton Ave E between Kennedy Rd and Kingston Rd (South Side)	
Apartment building at north-east corner of Town Haven Place	**Receptor added (AR1)**
Apartment building at south-west corner of Eglinton Ave and Midland Ave	We assume this should be the south-east corner; this can be represented by the receptor AR1 added above. The traffic data is the same at these points and the setback distance is similar
Houses south of Advance Drive	Cannot locate Advance Drive
Apartment buildings between Bellamy Rd and Mason Rd	Traffic data at R3 is roughly the same plus R3 has a closer setback distance and more exposed face
Apartment buildings at south-west corner of Eglinton Ave and Kingston Rd	The build scenario involved realigning the Eglinton WB lane to a location further away from these buildings. It is expected that R4 is the worst-case receptor for this area.
Kingston Rd between Eglinton Ave E and Morningside Ave (North Side)	
Houses between Scarborough Golf Club Rd and Saunders Rd	The traffic data is the same at R6, which has a closer setback distance to Kingston Rd
Houses between Cromwell Rd and Dale Ave	The traffic volume is higher at R6, which also has a closer setback distance to Kingston Rd
Apartment building at north-west corner of Kingston Rd and Dale Ave	Similar traffic data and setback distance as R6
Houses on Livingstone Rd	Same traffic data as R7 which has a closer setback distance to Kingston Rd
Townhouses on Greenvale Terrace	This is where receptor R7 is located
Townhouse between Celeste Dr and Overture Rd	Similar traffic data and setback distance as R7
Townhouses at north-west corner of Overture Rd and Kingston Rd	This appears to be a commercial building
Houses at south-west corner of Galloway Rd and Kingston Rd	Represented by the new receptor AR3 (see below)
Townhouses between Galloway Rd and Lawrence Ave	Assume this is the townhouse at the north-west corner of Galloway Rd and Kingston Rd. This location may be represented by the new receptor location AR3 described below (same traffic data, and similar setback distance)
Apartment building at south-west corner of Morningside Ave and Kingston Rd	Same traffic data as R9 which has a closer setback distance to Morningside Ave

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Receptor Description	SENES Comment
Kingston Rd between Eglinton Ave E and Morningside Ave (South Side)	
Townhouses between Muir Dr and Scarborough Golf Club Rd	**Receptor added (AR2)**
Townhouses between Scarborough Golf Club Rd and Saunders Rd	Same traffic data as R6 and similar setback distance
Townhouses between Saunders Rd and Guildwood Pkwy	Same traffic data as R6 and similar setback distance
Apartment buildings between Guildwood Pkwy and Westlake Rd	Close to R6, which has a closer setback distance
Houses south of Payzac Ave	R7 is closer to Kingston Rd than these houses
Townhouses between Payzac Ave and Galloway Rd	**Receptor added (AR3)**
Apartment building between Galloway Rd and Poplar Rd	Same traffic data as R8 which is closer and assumed to be fully exposed to Kingston Rd
Apartment building at south-east corner of Lawrence Ave and Kingston Rd	Greater setback distance compared to nearby R8
Morningside Ave between Kingston Rd and Sheppard Ave E (East Side)	
School at south-east corner of Tefft Rd and Morningside Ave	Same traffic at R9 and similar setback distance
Houses along Morningside Ave/Fairwood Cres	Represented by R12
Morningside Ave between Kingston Rd and Sheppard Ave E (West Side)	
Apartment building between Kingston Rd and Tefft Rd	Same traffic at R9 and similar setback distance
Houses between Warnsworth St and Fairwood Cres	Same traffic data and similar setback as R10-R12
Houses at south-west corner of Military Trail and Morningside Ave	Same traffic as R14 and similar setback distance
Houses between Tams Rd and Bonspiel Dr	This is Receptor R16
Houses on Bradworthy Court	Outside of Study Area
Houses on Henbury Place	Outside of Study Area

34711-1 - 29Sep09 - MOE Requested Receptor Locations.doc SENES Consultants Limited

APPENDIX C

MOE/TTC PROTOCOL

MOEE/TTC
DRAFT
PROTOCOL FOR NOISE AND VIBRATION ASSESSMENT FOR THE PROPOSED SCARBOROUGH RAPID TRANSIT EXTENSION

May 11, 1993

TABLE OF CONTENTS

PROTOCOL FOR NOISE AND VIBRATION ASSESSMENT

PART A. PURPOSE

The Toronto Transit Commission (TTC) and the Ministry of the Environment and Energy (MOEE) recognize that transit facilities produce noise and vibration which may affect neighbouring properties within urbanized areas. This document identifies the framework within which criteria will be applied for limiting wayside air-borne noise and ground-borne noise and vibration from the TTC's proposed Scarborough Rapid Transit Line Extension (the "Line"). This proposed extension is to run from McCowan station to Markham Road and Sheppard Avenue East. The framework presented in this document is to be applied for planning purposes in order to address the requirements of the Environmental Assessment Act and is to be utilized during implementation of the Line.

The passby sound levels and vibration velocities in this protocol have been developed specifically for the Line and this protocol is not to be applied retroactively to existing TTC transit Lines, routes or facilities, including the existing SRT line, nor to transit authorities other than TTC. Further, the criteria specified for this project are not precedent setting for future projects.

Prediction and measurement methods are being developed by the TTC. This will be done in consultation with MOEE and the Ministry of Transportation (MTO). Studies pertaining to noise and vibration levels are also being conducted by TTC. Upon completion of these studies, the TTC may revisit the assessment criteria and methods in this protocol to modify them as required in consultation with MOEE and the Ministry of Transportation (MTO).

PART B. GENERAL

During design of the Line, predicted wayside sound levels and vibration velocities are to be compared to criteria given in this protocol. This will permit an impact assessment and help determine the type or extent of mitigation measures to reduce that impact. Sound levels and vibration velocities will be predicted from sound levels and velocities of TTC's existing rail technologies.

The criteria presented in this document are based on good operating conditions and the impact assessment assumes this condition. Good operating conditions exist when well maintained vehicles operate on well maintained continuous welded rail without significant rail corrugation. It is recognised that wheel flats or rail corrugations will inevitably occur and will temporarily increase sound and vibration levels until they are corrected. Levels in this protocol do not reflect these occasional events, nor do they apply to maintenance activities on the Line. TTC recognizes that wheel rail squeal is a potential source of noise which may pose a concern to the community. TTC is investigating and will continue to investigate measures to mitigate wheel rail squeal and will endeavour to mitigate this noise source. TTC endeavours to minimize the noise and vibration impacts associated with its transit operations and is committed to providing good operating conditions to the extent technologically, economically and administratively feasible.

It is recognised that levels of sound and vibration at special trackwork, such as at crossovers and turnouts, are inevitably higher than along tangent track. Also, there is a limit to the degree of mitigation that is feasible at special trackwork areas. This is to be taken into account in predicting sound and vibration levels near these features and in applying the levels in this protocol. Special trackwork, such as at crossovers and turnouts, is encompassed within the framework of this document.

This protocol applies to existing and proposed residential development having municipal approval on the date of this protocol. The protocol also applies to existing and municipally approved proposed nursing homes, group homes, hospitals and other such institutional land uses where people reside. This protocol does not apply to commercial and industrial land uses.

This protocol does not apply closer than 15 m to the centreLine of the nearest track. Any such cases shall be assessed on a case by case basis.

Part D of this document deals with airborne noise from the Line and its construction. Part E deals with groundborne noise and vibration from the Line.

PART C. DEFINITIONS

The following definitions apply to both parts D and E of this document.

Ancillary Facilities:

Subsidiary locations associated with either the housing of personnel or equipment engaged in TTC activities or associated with mainLine revenue operations. Examples of ancillary facilities include, but are not limited to, subway stations, bus terminals, emergency services buildings, fans, fan and vent shafts, substations, mechanical equipment plants, maintenance and storage facilities, and vehicle storage and maintenance facilities.

Passby Time Interval:

The passby time interval of a vehicle or train is given by its total length and its speed. The start of the pass-by is defined as that point in time when the leading wheels pass a reference point. The end of the pass-by is defined as that point in time when the last wheels of the vehicle or train pass the same reference point. The reference point is to be chosen to give the highest level at the point of reception or point of assessment, i.e. usually at the point of closest approach. From a signal processing perspective, the passby time interval will be defined in the prediction and measurement methods being developed.

PART D. AIR BORNE NOISE

1.0 DEFINITIONS

The following definitions are to be used only within the context of Part D of this document.

Ambient:

The ambient is the sound existing at the point of reception in the absence of all noise from the Line. In this protocol the ambient is taken to be the noise from road traffic and existing industry. The ambient specifically excludes transient noise from aircraft and railways, except for pre-existing TTC rail operations.

Daytime Equivalent Sound Level:

$L_{eq,16h}$ is the daytime equivalent sound level. The definition of equivalent sound level is provided in Reference 2. The applicable time period is from 07:00 to 23:00 hours.

Nighttime Equivalent Sound Level:

$L_{eq,8h}$ is the nighttime equivalent sound level. The applicable time period is from 23:00 to 07:00 hours.

Point of Reception:

Daytime: 07:00 - 23:00 hours

Any outdoor point on residential property, 15 m or more from the nearest track's centreLine, where sound originating from the Line is received.

Nighttime: 23:00 - 07:00 hours

The plane of any bedroom window, 15 m or more from the nearest track's centreLine, where sound originating from the Line is received. At the planning stage, this is usually assessed at the nearest facade of the premises.

Passby Sound Level, L_{passby} :

Within the context of this document, the passby sound level is defined as the A-weighted equivalent sound level, L_{eq} [Reference 2] over the passby time interval.

2.0 RAIL TRANSIT

In the assessment of noise impact, rail transit is considered to include the movement of trains between stations, the movement and idling of trains inside stations as well as the movement of trains between the mainline and ancillary facilities. Ancillary facilities are not considered part of the rail transit and are assessed as stationary

sources. Trains idling in maintenance yards and storage facilitities are part of the stationary source.

The assessment of noise impact resulting from Line is to be performed in terms of the following sound level descriptors:

1) Daytime equivalent sound level, $L_{eq,16h}$,
2) Nighttime equivalent sound level, $L_{eq,8h}$,
3) Passby Sound Level, L_{passby}.

The predicted daytime and nighttime equivalent sound levels include the effects of both passby sound level and frequency of operation and are used to assess the noise impact of the Line. The Passby Sound Level criterion is used to assess the sound levels received during a single train passby. The criteria and methods to be used are discussed in Sections 2.1 and 2.2.

2.1 Criteria

Noise impact shall be predicted and assessed during design of the Line using the following sound level criteria:

DAYTIME EQUIVALENT SOUND LEVEL:

The limit at a point of reception for the predicted daytime equivalent sound levels for rail transit operating alone (excluding contributions from the ambient) is 55 dBA or the ambient $L_{eq,16h}$, whichever is higher.

NIGHTTIME EQUIVALENT SOUND LEVEL:

The limit at a point of reception for the predicted nighttime equivalent sound levels for rail transit operating alone (excluding contributions from the ambient) is 50 dBA or the ambient $L_{eq,8h}$, whichever is higher.

PASSBY SOUND LEVEL:

The limit at a point of reception for predicted L_{passby} for a single train operating alone and excluding contributions from other sources is 80 dBA. This limit is based on vehicles operating on tangent track. It does not apply within 100m of special trackwork and excludes wheel rail squeal.

Mitigating measures will be incorporated in the design of the Line when predictions show that any of the above limits are exceeded by more than 5 dB. All mitigating measures shall ensure that the predicted sound levels are as close to, or lower than, the respective limits as is technologically, economically, and administratively feasible.

2.2 Prediction

In most cases, a reasonable estimate of the ambient sound level can be made using a road traffic noise prediction method such as that described in Reference 9, and the minimum sound levels in Table 106-2 of Reference 6. Prediction of road traffic L_{eq} is preferred to individual measurements in establishing the ambient. Prediction techniques for the L_{eq} from road traffic and the L_{eq} or L_{passby} from transit shall be compatible with one another. Any impact assessment following this protocol shall include a description of the prediction method and the assumptions and sound level data inherent in it. Prediction and measurement methods compatible with MOEE guidelines and procedures are being developed by the TTC at the date of this protocol in consultation with MTO and MOEE.

3.0 ANCILLARY FACILITIES

Predicted noise impacts from ancillary facilities shall be assessed during the design of the Line in accordance with the stationary source guideLines detailed in Reference 5. The predictions used shall be compatible with and at least as accurate as CSA Standard Z107.55.

4.0 BUSES IN MIXED TRAFFIC

Where buses are part of the road traffic there are no additional criteria requirements beyond those presented in the Ministry of Transportation of Ontario Protocol for dealing with noise concerns during the preparation, review and evaluation of Provincial Highways Environmental Assessments [Reference 1]. Buses should be considered as medium trucks in the traffic noise prediction models.

5.0 CONSTRUCTION

Noise impacts from the construction of the Line are to be examined. For the purposes of impact assessment and identifying the need for mitigation, the Ministry of the Environment and Energy guideLines for construction presented in Reference 7 are to be referred to.

PART E. GROUND-BORNE VIBRATION

The assessment of ground-borne vibration impact is confined to the vibration that is produced by the operation of the Line and excludes vibration due to maintenance activities.

In recognition of the fact that the actual vibration response of a building is affected by its own structural characteristics, this document deals with the assessment of ground borne vibration only on the outside premises. Structural characteristics of buildings are beyond the scope of this protocol and beyond the control of the TTC.

1.0 DEFINITIONS

The following definitions are to be used only within the context of Part E of this document.

Point of Assessment:

A point of assessment is any outdoor point on residential property, 15 m or more from the nearest track's centreLine, where vibration originating from the Line is received.

Vibration Velocity:

Vibration Velocity is the root-mean-square (rms) vibration velocity assessed during a train pass-by. The unit of measure is metres per second (m/s) or millimetres per second (mm/s). For the purposes of this protocol only vertical vibration is assessed. The vertical component of transit vibration is usually higher than the horizontal. Human sensitivity to horizontal vibration at the frequencies of interest is significantly less than the sensitivity to vertical vibration.

2.0 VIBRATION ASSESSMENT

Vibration velocities at points of assessment shall be predicted during design of the Line. If the predicted rms vertical vibration velocity from the Line exceeds 0.1 mm/sec, mitigation methods shall be applied during the detailed design to meet this criterion to the extent technologically, economically, and administratively feasible.

Any impact assessment following this protocol shall include a description of the prediction method and the assumptions and data inherent in it. Prediction and measurement methods are being developed by the TTC at the date of this protocol in cooperation with MTO and MOEE.

References

1)A Protocol for Dealing With Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments, Ministry of Transportation, February 1986.

2)Model Municipal Noise Control By-Law, Final Report, Publication NPC-101 Technical Definitions, Ministry of the Environment, August 1978.

3)Model Municipal Noise Control By-Law, Final Report, Publication NPC-103 Procedures, Ministry of the Environment, August 1978.

4)Model Municipal Noise Control By-Law, Final Report, Publication NPC-104 Sound Level Adjustments, Ministry of the Environment, August 1978.

5)Model Municipal Noise Control By-Law, Final Report, Publication NPC-105 Stationary Sources, Ministry of the Environment, August 1978.

6)Model Municipal Noise Control By-Law, Final Report, Publication NPC-106 Sound Levels of Road Traffic, Ministry of the Environment, August 1978.

7)Noise Control GuideLine For Class Environmental Assessment of Undertakings, February 1980, Ministry of the Environment.

8)Toronto Subway System Track Vibration Isolation System (Double Tie) - Technical Report, TTC Engineering Department, June 1982.

9)STAMSON 4.1, Ontario Ministry of the Environment Road and Rail Noise Prediction Software

MOEE/TTC

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PROTOCOL FOR NOISE AND VIBRATION ASSESSMENT FOR THE PROPOSED WATERFRONT WEST LIGHT RAIL TRANSIT LINE

November 11, 1993

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TABLE OF CONTENTS

PROTOCOL FOR NOISE AND VIBRATION ASSESSMENT

PART A. PURPOSE

The Toronto Transit Commission (TTC) and the Ministry of the Environment and Energy (MOEE) recognise that transit facilities produce noise and vibration which may affect neighbouring properties within urbanised areas. This document identifies the framework within which criteria will be applied for limiting wayside air-borne noise, ground-borne noise and vibration from the TTC's proposed Waterfront West Light Rail Transit Line (the "Line"). The proposed line is to run from Spadina and Queen's Quay West to the CNE Dufferin Street Gate and from the Humber Loop to Legion Road. The framework presented in this document is to be applied for planning purposes in order to address the requirements of the Environmental Assessment Act and is to be utilized during implementation of the Line.

The passby sound levels and vibration velocities in this protocol have been developed specifically for the Line and this protocol is not to be applied retroactively to existing TTC transit lines, routes or facilities, including the existing lines with which this line will intersect, nor to transit authorities other than TTC. Further, the criteria specified for this project are not precedent setting for future projects.

Prediction and measurement methods are being developed by the TTC. This will be done in consultation with MOEE and the Ministry of Transportation (MTO). Studies pertaining to noise and vibration levels are also being conducted by TTC. Upon completion of these studies, the TTC may revisit the assessment criteria and methods in this protocol to modify them as required in consultation with MOEE and the Ministry of Transportation (MTO).

PART B. GENERAL

During design of the Line, predicted wayside sound levels and vibration velocities are to be compared to criteria given in this protocol. This will permit an impact assessment and help determine the type or extent of mitigation measures to reduce that impact. Sound levels and vibration velocities will be predicted from sound levels and velocities of TTC's existing rail technologies.

The criteria presented in this document are based on good operating conditions and the impact assessment assumes this condition. Good operating conditions exist when well maintained vehicles operate on well maintained continuous welded rail without significant rail corrugation. It is recognised that wheel flats or rail corrugations will inevitably occur and will temporarily increase sound and vibration levels until they are corrected. Levels in this protocol do not reflect these occasional events, nor do they apply to maintenance activities on the Line. TTC recognizes that wheel rail squeal is a potential source of noise which may pose a concern to the community. TTC is investigating and will continue to investigate measures to mitigate wheel rail squeal and will endeavour to mitigate this noise source. TTC endeavours to minimize the noise and vibration impacts associated with its transit operations and is committed to providing good operating conditions to the extent technologically, economically and administratively feasible.

It is recognised that levels of sound and vibration at special trackwork, such as at crossovers and turnouts, are inevitably higher than along tangent track. Also, there is a limit to the degree of mitigation that is feasible at special trackwork areas. This is to be taken into account in predicting sound and vibration levels near these features and in applying the levels in this protocol. Special trackwork, such as at crossovers and turnouts, is encompassed within the framework of this document.

This protocol applies to existing and proposed residential development having municipal approval on the date of this protocol. The protocol also applies to existing and municipally approved proposed nursing homes, group homes, hospitals and other such institutional land uses where people reside. This protocol does not apply to commercial and industrial land uses.

This protocol does not apply closer than 15 m to the centreline of the nearest track. Any such cases shall be assessed on a case by case basis.

Part D of this document deals with air-borne noise from the Line and its construction. Part E deals with ground-borne noise and vibration from the Line.

PART C. DEFINITIONS

The following definitions apply to both parts D and E of this document.

Ancillary Facilities:

Subsidiary locations associated with either the housing of personnel or equipment engaged in TTC activities or associated with mainline revenue operations. Examples of ancillary facilities include, but are not limited to, subway stations, bus terminals, emergency services buildings, fans, fan and vent shafts, substations, mechanical equipment plants, maintenance and storage facilities, and vehicle storage and maintenance facilities.

Passby Time Interval:

The passby time interval of a vehicle is given by its total length and its speed. The start of the pass-by is defined as that point in time when the leading wheels pass a reference point. The end of the pass-by is defined as that point in time when the last wheels of the vehicle pass the same reference point. The reference point is to be chosen to give the highest level at the point of reception or point of assessment, i.e. usually at the point of closest approach. From a signal processing perspective, the passby time interval will be defined in the prediction and measurement methods being developed.

PART D. AIR-BORNE NOISE

1.0 DEFINITIONS

The following definitions are to be used only within the context of Part D of this document.

Ambient:

The ambient is the sound existing at the point of reception in the absence of all noise from the Line. In this protocol the ambient is taken to be the noise from road traffic and existing industry. The ambient specifically excludes transient noise from aircraft and railways, except for pre-existing TTC rail operations.

Daytime Equivalent Sound Level:

$L_{eq,16h}$ is the daytime equivalent sound level. The definition of equivalent sound level is provided in Reference 2. The applicable time period is from 07:00 to 23:00 hours.

Nighttime Equivalent Sound Level:

$L_{eq,8h}$ is the nighttime equivalent sound level. The applicable time period is from 23:00 to 07:00 hours.

Point of Reception:

Daytime: 07:00 - 23:00 hours

Any outdoor point on residential property, 15 m or more from the nearest track's centreline, where sound originating from the Line is received.

Nighttime: 23:00 - 07:00 hours

The plane of any bedroom window, 15 m or more from the nearest track's centreline, where sound originating from the Line is received. At the planning stage, this is usually assessed at the nearest facade of the premises.

Passby Sound Level, L_{passby} :

Within the context of this document, the passby sound level is defined as the A-weighted equivalent sound level, L_{eq} [Reference 2] over the passby time interval.

2.0 RAIL TRANSIT

In the assessment of noise impact, rail transit is considered to include the movement of vehicles between stations, the movement and idling of vehicles inside stations as well as the movement of vehicles between the mainline and ancillary facilities. Ancillary facilities are not considered part of the rail transit and are assessed as stationary sources. Vehicles idling in maintenance yards and storage facilities are part of the stationary source.

The assessment of noise impact resulting from the Line is to be performed in terms of the following sound level descriptors:

1) Daytime equivalent sound level, $L_{eq,16h}$,
2) Nighttime equivalent sound level, $L_{eq,8h}$,
3) Passby Sound Level, L_{passby}.

The predicted daytime and nighttime equivalent sound levels include the effects of both passby sound level and frequency of operation and are used to assess the noise impact of the Line. The Passby Sound Level criterion is used to assess the sound levels received during a single vehicle passby. The criteria and methods to be used are discussed in Sections 2.1 and 2.2.

2.1 Criteria

Noise impact shall be predicted and assessed during design of the Line using the following sound level criteria:

DAYTIME EQUIVALENT SOUND LEVEL:

The limit at a point of reception for the predicted daytime equivalent sound levels for rail transit operating alone (excluding contributions from the ambient) is 55 dBA or the ambient $L_{eq,16h}$, whichever is higher.

NIGHTTIME EQUIVALENT SOUND LEVEL:

The limit at a point of reception for the predicted nighttime equivalent sound levels for rail transit operating alone (excluding contributions from the ambient) is 50 dBA or the ambient $L_{eq,8h}$, whichever is higher.

PASSBY SOUND LEVEL:

The limit at a point of reception for predicted L_{passby} for a single vehicle operating alone and excluding contributions from other sources is 80 dBA. This limit is based on vehicles operating on tangent track. It does not apply within 100m of special trackwork and excludes wheel rail squeal.

Mitigating measures will be incorporated in the design of the Line when predictions show that any of the above limits are exceeded by more than 5 dB. All mitigating measures shall ensure that the predicted sound levels are as close to, or lower than, the respective limits as is technologically, economically, and administratively feasible.

2.2 Prediction

In most cases, a reasonable estimate of the ambient sound level can be made using a road traffic noise prediction method such as that described in Reference 8, and the

minimum sound levels in Table 106-2 of Reference 6. Prediction of road traffic L_{eq} is preferred to individual measurements in establishing the ambient. Prediction techniques for the L_{eq} from road traffic and the L_{eq} or L_{passby} from transit shall be compatible with one another. Any impact assessment following this protocol shall include a description of the prediction method and the assumptions and sound level data inherent in it. Prediction and measurement methods compatible with MOEE guidelines and procedures are being developed by the TTC at the date of this protocol in consultation with MTO and MOEE.

3.0 ANCILLARY FACILITIES

Predicted noise impacts from ancillary facilities shall be assessed during the design of the Line in accordance with the stationary source guidelines detailed in Reference 6. The predictions used shall be compatible with and at least as accurate as CSA Standard Z107.56.

4.0 BUSES IN MIXED TRAFFIC

Where buses are part of the road traffic there are no additional criteria requirements beyond those presented in the Ministry of Transportation of Ontario Protocol for dealing with noise concerns during the preparation, review and evaluation of Provincial Highways Environmental Assessments [Reference 1]. Buses should be considered as medium trucks in the traffic noise prediction models.

5.0 CONSTRUCTION

Noise impacts from the construction of the Line are to be examined. For the purposes of impact assessment and identifying the need for mitigation, the Ministry of the Environment and Energy guidelines for construction presented in Reference 7 are to be referred to.

PART E, GROUND-BORNE VIBRATION

The assessment of ground-borne vibration impact is confined to the vibration that is produced by the operation of the Line and excludes vibration due to maintenance activities.

In recognition of the fact that the actual vibration response of a building is affected by its own structural characteristics, this document deals with the assessment of ground-borne vibration only on the outside premises. Structural characteristics of buildings are beyond the scope of this protocol and beyond the control of the TTC.

It is recognised that ground-borne vibration can produce air-borne noise inside a structure and there is a direct correlation between the two. The TTC can only control ground-borne noise by controlling ground-borne vibration. Accordingly, ground-borne noise will be predicted and assessed in terms of vibration measured at a point of assessment using the limit in Section 2.0, Vibration Assessment.

1.0 DEFINITIONS

The following definitions are to be used only within the context of Part E of this document.

Point of Assessment:

A point of assessment is any outdoor point on residential property, 15 m or more from the nearest track's centreline, where vibration originating from the Line is received.

Vibration Velocity:

Vibration Velocity is the root-mean-square (rms) vibration velocity assessed during a vehicle pass-by. The unit of measure is metres per second (m/s) or millimetres per second (mm/s). For the purposes of this protocol only vertical vibration is assessed. The vertical component of transit vibration is usually higher than the horizontal. Human sensitivity to horizontal vibration at the frequencies of interest is significantly less than the sensitivity to vertical vibration.

2.0 VIBRATION ASSESSMENT

Vibration velocities at points of assessment shall be predicted during design of the Line. If the predicted rms vertical vibration velocity from the Line exceeds 0.14 mm/sec, mitigation methods shall be applied during the detailed design to meet this criterion to the extent technologically, economically and administratively feasible.

Any impact assessment following this protocol shall include a description of the prediction method and the assumptions and data inherent in it. Prediction and measurement methods are being developed by the TTC at the date of this protocol in cooperation with MTO and MOEE.

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References

1)**A Protocol for Dealing With Noise Concerns During the Preparation, Review and Evaluation of Provincial Highways Environmental Assessments**, Ministry of Transportation, February 1986.

2)**Model Municipal Noise Control By-Law, Final Report, Publication NPC-101 Technical Definitions**, Ministry of the Environment, August 1978.

3)**Model Municipal Noise Control By-Law, Final Report, Publication NPC-103 Procedures**, Ministry of the Environment, August 1978.

4)**Model Municipal Noise Control By-Law, Final Report, Publication NPC-104 Sound Level Adjustments**, Ministry of the Environment, August 1978.

5)**Model Municipal Noise Control By-Law, Final Report, Publication NPC-105 Stationary Sources**, Ministry of the Environment, August 1978.

6)**Model Municipal Noise Control By-Law, Final Report, Publication NPC-106 Sound Levels of Road Traffic**, Ministry of the Environment, August 1978.

7)**Noise Control Guideline For Class Environmental Assessment of Undertakings**, February 1980, Ministry of the Environment.

8)**STAMSON 4.1**, Ontario Ministry of the Environment Road and Rail Noise Prediction Software

APPENDIX D

TRAFFIC DATA SUMMARY

Table D.1 – Existing Annual Average Daily Traffic (AADT)

LOCATION	SECTION		Segment Width (EP to EP) (m)	Number of Lanes	Lane Width			Lane Width (m)	Posted Speed Limit	24 Hour AADT									
					N or E side	Median	S or W side			Total (cars-bus-trucks)		Cars		Bus		Medium Trucks		Heavy Trucks	
	FROM	TO								NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
North South Roads																			
Morningside Ave	Kingston Rd	Warmsworth St	14.9	4	3.73 x 2	0	3.73 x 2	3.73 x 4	60	9,532	8,798	9,209	8,239	162	132	92	322	69	106
Morningside Ave	Warmsworth St	Fairwood Cres	15.5	4	3.87 x 2	0	3.87 x 2	3.87 x 4	60	11,866	10,954	11,166	10,136	202	285	285	401	214	131
Morningside Ave	Fairwood Cres	Ellesmere Rd	15.6	4	3.9 x 2	0	3.9 x 2	3.9 x 4	60	10,930	11,840	10,193	10,957	186	308	315	433	236	142
Morningside Ave	Ellesmere Rd	Military Trail	15.4	4	3.85 x 2	0	3.85 x 2	3.85 x 4	60	11,357	12,303	10,687	11,485	193	320	273	375	204	123
Morningside Ave	Military Trail	Milner Ave	15.2	4	3.8 x 2	0	3.8 x 2	3.8 x 4	60	14,928	16,172	14,173	15,228	254	420	287	395	215	129
Military Trail	Ellesmere Rd	Morningside Rd	12.8	3	4.4 x 1	4	4.4 x 1	4.4 x 2 + 4 x 1	60	4,176	5,314	3,859	4,875	71	138	140	227	105	74
East West Roads																			
Eglinton Ave E	Midland Ave	Failmouth Ave	25	7	3.58 x 3	3.5	3.58 x 3	3.58 x 6 + 3.5 x 1	60	15,401	13,119	14,161	11,311	616	485	470	756	154	567
Eglinton Ave E	Failmouth Ave	Brimley Rd	25	7	3.58 x 3	3.5	3.58 x 3	3.58 x 6 + 3.5 x 1	60	12,965	15,846	11,920	13,710	415	539	475	913	156	685
Eglinton Ave E	Brimley Rd	Oswego Rd	26.2	7	3.70 x 3	4	3.70 x 3	3.7 x 6 + 4 x 1	60	14,924	13,776	13,842	11,688	478	468	455	926	149	694
Eglinton Ave E	Oswego Rd	McCowan Rd	25.3	7	3.70 x 3	3.1	3.70 x 3	3.7 x 6 + 3.1 x 1	60	15,455	13,165	14,647	11,143	433	474	283	885	93	664
Eglinton Ave E	McCowan Rd	Torrance Rd	25.3	7	3.70 x 3	3.1	3.70 x 3	3.7 x 6 + 3.1 x 1	60	14,700	13,570	13,693	11,599	412	489	448	847	147	635
Eglinton Ave E	Torrance Rd	Cedar Brae Blvd (Bellamy)	25.7	7	3.70 x 3	3.5	3.70 x 3	3.7 x 6 + 3.5 x 1	60	13,047	12,043	12,153	10,497	365	434	398	636	130	477
Eglinton Ave E	Cedar Brae Blvd (Bellamy)	Mason Rd	25.9	7	3.9 x 3	2.5	3.9 x 3	3.9 x 6 + 2.5 x 1	60	11,268	10,402	10,281	9,126	439	489	412	449	135	337
Eglinton Ave E	Mason Rd	Markham Rd	25.1	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	11,248	10,382	10,353	8,848	439	488	343	598	112	449
Eglinton Ave E	Markham Rd	Cedar Drive	25.1	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	9,277	8,563	8,464	7,298	362	402	340	493	111	370
Eglinton Ave E	Cedar Drive	Kingston Rd	22.5	6	4 x 2	2.5	4 x 2	4 x 5 + 2.5 x 1	60	8,703	7,717	8,001	6,762	278	178	319	445	104	333
Ellesmere Rd	Morningside Rd	Military Trail	14.8	4	3.7 x 2	0	3.7 x 2	3.7 x 4	60	7,610	5,741	7,020	4,933	282	132	232	386	76	289
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	27.2	7	3.8 x 3	4.4	3.8 x 3	3.8 x 6 + 4.4 x 1	60	26,426	23,434	24,713	22,633	396	211	893	337	423	253
Kingston	Scarborough Golf Club Rd	Cornwell Rd	27.3	7	3.8 x 3	4.5	3.8 x 3	3.8 x 6 + 4.5 x 1	60	24,152	21,418	23,348	20,758	217	300	442	206	145	154
Kingston	Cornwell Rd	Dale Ave	25.2	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	21,391	18,969	20,678	18,385	193	266	391	182	128	137
Kingston	Dale Ave	Celeste Dr	23.9	7	3.7 x 3	1.7	3.7 x 3	3.7 x 6 + 1.7 x 1	60	18,225	22,275	17,618	21,589	164	312	334	214	109	160
Kingston	Celeste Dr	Overature Rd	27.5	7	3.85 x 3	4.4	3.85 x 3	3.85 x 6 + 4.4 x 1	60	19,580	20,380	18,611	19,752	176	285	597	196	196	147
Kingston	Overature Rd	Galloway Rd	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	18,836	19,604	17,598	18,836	170	274	804	282	264	212
Kingston	Galloway Rd	Poplar Rd	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	16,631	17,309	15,202	16,631	216	242	913	249	299	187
Kingston	Poplar Rd	Lawrence Rd	27.5	7	3.85 x 3	4.4	3.85 x 3	3.85 x 6 + 4.4 x 1	60	16,572	17,248	15,283	16,572	215	241	809	248	265	186
Kingston	Lawrence Rd	Morningside Rd	27.2	7	3.75 x 3	4.7	3.75 x 3	3.75 x 6 + 4.7 x 1	60	16,283	16,947	15,148	16,283	212	237	695	244	228	183
Kingston	Morningside Rd	Amiens Rd	27.2	7	3.8 x 3	4.4	3.8 x 3	3.80 x 6 + 4.4 x 1	60	16,405	17,075	15,196	16,405	279	239	701	246	230	184
Kingston	Amiens Rd	Fairwood Cres	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	16,871	17,559	15,627	16,871	287	246	720	253	236	190

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

Table D.2 – Future No-Build Annual Average Daily Traffic (AADT)

LOCATION	SECTION		Segment Width (EP to EP) (m)	Number of Lanes	Lane Width			Lane Width (m)	Posted Speed Limit	24 Hour AADT									
					N or E side	Median	S or W side			Total (cars-bus-trucks)		Cars		Bus		Medium Trucks		Heavy Trucks	
	FROM	TO								NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
North South Roads																			
Morningside Ave	Kingston Rd	Warmsworth St	14.9	4	3.73 x 2	0	3.73 x 2	3.73 x 4	60	11,629	10,734	11,236	10,051	198	161	112	393	84	129
Morningside Ave	Warmsworth St	Fairwood Cres	15.5	4	3.87 x 2	0	3.87 x 2	3.87 x 4	60	14,477	13,363	13,623	12,366	246	347	347	489	261	160
Morningside Ave	Fairwood Cres	Ellesmere Rd	15.6	4	3.9 x 2	0	3.9 x 2	3.9 x 4	60	13,334	14,445	12,435	13,368	227	376	384	529	288	173
Morningside Ave	Ellesmere Rd	Military Trail	15.4	4	3.85 x 2	0	3.85 x 2	3.85 x 4	60	13,855	15,010	13,038	14,012	236	390	333	458	249	150
Morningside Ave	Military Trail	Milner Ave	15.2	4	3.8 x 2	0	3.8 x 2	3.8 x 4	60	18,212	19,730	17,291	18,578	310	513	350	481	262	158
Military Trail	Ellesmere Rd	Morningside Rd	12.8	3	4.4 x 1	4	4.4 x 1	4.4 x 2 + 4 x 1	60	5,094	6,484	4,708	5,947	87	169	171	277	128	91
East West Roads																			
Eglinton Ave E	Midland Ave	Failmouth Ave	25	7	3.58 x 3	3.5	3.58 x 3	3.58 x 6 + 3.5 x 1	60	18,789	16,005	17,276	13,800	752	592	573	922	188	691
Eglinton Ave E	Failmouth Ave	Brimley Rd	25	7	3.58 x 3	3.5	3.58 x 3	3.58 x 6 + 3.5 x 1	60	15,817	19,332	14,542	16,726	506	657	579	1,113	190	835
Eglinton Ave E	Brimley Rd	Oswego Rd	26.2	7	3.70 x 3	4	3.70 x 3	3.7 x 6 + 4 x 1	60	18,207	16,807	16,887	14,259	583	571	555	1,129	182	847
Eglinton Ave E	Oswego Rd	McCowan Rd	25.3	7	3.70 x 3	3.1	3.70 x 3	3.7 x 6 + 3.1 x 1	60	18,855	16,062	17,869	13,594	528	578	345	1,079	113	810
Eglinton Ave E	McCowan Rd	Torrance Rd	25.3	7	3.70 x 3	3.1	3.70 x 3	3.7 x 6 + 3.1 x 1	60	17,934	16,555	16,706	14,151	502	596	547	1,033	179	775
Eglinton Ave E	Torrance Rd	Cedar Brae Blvd (Bellamy)	25.7	7	3.70 x 3	3.5	3.70 x 3	3.7 x 6 + 3.5 x 1	60	15,917	14,693	14,827	12,806	446	529	485	776	159	582
Eglinton Ave E	Cedar Brae Blvd (Bellamy)	Mason Rd	25.9	7	3.9 x 3	2.5	3.9 x 3	3.9 x 6 + 2.5 x 1	60	13,747	12,690	12,543	11,134	536	596	503	548	165	411
Eglinton Ave E	Mason Rd	Markham Rd	25.1	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	13,722	12,667	12,631	10,794	535	595	419	730	137	547
Eglinton Ave E	Markham Rd	Cedar Drive	25.1	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	11,318	10,447	10,326	8,903	441	491	414	602	136	451
Eglinton Ave E	Cedar Drive	Kingston Rd	22.5	6	4 x 2	2.5	4 x 2	4 x 5 + 2.5 x 1	60	10,617	9,415	9,761	8,250	340	217	389	542	127	407
Ellesmere Rd	Morningside Rd	Military Trail	14.8	4	3.7 x 2	0	3.7 x 2	3.7 x 4	60	9,284	7,003	8,564	6,019	343	161	283	471	93	353
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	27.2	7	3.8 x 3	4.4	3.8 x 3	3.8 x 6 + 4.4 x 1	60	32,239	28,590	30,150	27,612	484	257	1,090	412	516	309
Kingston	Scarborough Golf Club Rd	Cornwell Rd	27.3	7	3.8 x 3	4.5	3.8 x 3	3.8 x 6 + 4.5 x 1	60	29,466	26,130	28,484	25,325	265	366	539	251	177	188
Kingston	Cornwell Rd	Dale Ave	25.2	7	3.6 x 3	3.5	3.6 x 3	3.6 x 6 + 3.5 x 1	60	26,097	23,142	25,228	22,430	235	324	478	222	157	167
Kingston	Dale Ave	Celeste Dr	23.9	7	3.7 x 3	1.7	3.7 x 3	3.7 x 6 + 1.7 x 1	60	22,235	27,176	21,494	26,338	200	380	407	261	133	196
Kingston	Celeste Dr	Overature Rd	27.5	7	3.85 x 3	4.4	3.85 x 3	3.85 x 6 + 4.4 x 1	60	23,888	24,863	22,706	24,097	215	348	729	239	239	179
Kingston	Overature Rd	Galloway Rd	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	22,979	23,917	21,470	22,980	207	335	981	344	322	258
Kingston	Galloway Rd	Poplar Rd	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	20,289	21,117	18,546	20,290	264	296	1,114	304	365	228
Kingston	Poplar Rd	Lawrence Rd	27.5	7	3.85 x 3	4.4	3.85 x 3	3.85 x 6 + 4.4 x 1	60	20,218	21,043	18,645	20,218	263	295	987	303	323	227
Kingston	Lawrence Rd	Morningside Rd	27.2	7	3.75 x 3	4.7	3.75 x 3	3.75 x 6 + 4.7 x 1	60	19,865	20,676	18,480	19,865	258	289	848	298	278	223
Kingston	Morningside Rd	Amiens Rd	27.2	7	3.8 x 3	4.4	3.8 x 3	3.80 x 6 + 4.4 x 1	60	20,014	20,831	18,539	20,015	340	292	855	300	280	225
Kingston	Amiens Rd	Fairwood Cres	27.4	7	3.85 x 3	4.3	3.85 x 3	3.85 x 6 + 4.3 x 1	60	20,582	21,422	19,065	20,583	350	300	879	308	288	231

Table D.3 – Future Build Annual Average Daily Traffic (AADT)

LOCATION	SECTION		Segment Width (EP to EP) (m)	Number of Lanes	Lane Width - Mid Block					24 Hour AADT									
					Bike lane	N or E side	Median / LRT	S or W side	Bike lane	Total (cars-bus-trucks)		Cars		LRT		Medium Trucks		Heavy Trucks	
	FROM	TO								NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB	NB / WB	SB / EB
North South Roads																			
Morningside Ave	Kingston Rd	Warmsworth St	23.6	4	1.6 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.6 x 1	11,629	10,734	11,433	10,212	236	236	112	393	84	129
Morningside Ave	Warmsworth St	Fairwood Cres	29.6	4	1.6 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.6 x 1	14,477	13,363	13,869	12,714	236	236	347	489	261	160
Morningside Ave	Fairwood Cres	Ellesmere Rd	24.1	4	1.6 x1	3.3 x 4	1.6 x 1	3.6 x 2	-	13,334	14,445	12,662	13,742	236	236	384	529	288	173
Morningside Ave	Ellesmere Rd	Military Trail	16.8	4	1.8 x 1	3.3 x 2	0	3.3 x 2	1.8 x 1	13,855	15,010	13,273	14,402	236	236	333	458	249	150
Morningside Ave	Military Trail	Milner Ave	24	4	1.8 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.8 x 1	18,212	19,730	17,600	19,091	236	236	350	481	262	158
Military Trail	Ellesmere Rd	Morningside Rd	24.6	5	0	3.3 x 2	3.3 x 2	3.8 x3	0	5,094	6,484	4,795	6,116	236	236	171	277	128	91
East West Roads																			
Eglinton Ave E	Midland Ave	Failmouth Ave	25	4	2.3 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.3 x 1	18,789	16,005	18,028	14,392	236	236	573	922	188	691
Eglinton Ave E	Failmouth Ave	Brimley Rd	25	4	2.3 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.3 x 1	15,817	19,332	15,048	17,383	236	236	579	1,113	190	835
Eglinton Ave E	Brimley Rd	Oswego Rd	30	4	1.8 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.8 x 1	18,207	16,807	17,470	14,830	236	236	555	1,129	182	847
Eglinton Ave E	Oswego Rd	McCowan Rd	25.3	4	2.45 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.45 x 1	18,855	16,062	18,397	14,173	236	236	345	1,079	113	810
Eglinton Ave E	McCowan Rd	Torrance Rd	25.3	4	2.45 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.45 x 1	17,934	16,555	17,208	14,747	236	236	547	1,033	179	775
Eglinton Ave E	Torrance Rd	Cedar Brae Blvd (Bellamy)	25.7	4	2.65 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.65 x 1	15,917	14,693	15,272	13,335	236	236	485	776	159	582
Eglinton Ave E	Cedar Brae Blvd (Bellamy)	Mason Rd	25.9	4	2.75 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.75 x 1	13,747	12,690	13,079	11,731	236	236	503	548	165	411
Eglinton Ave E	Mason Rd	Markham Rd	25.1	4	2.35 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.35 x 1	13,722	12,667	13,166	11,390	236	236	419	730	137	547
Eglinton Ave E	Markham Rd	Cedar Drive	25.1	4	2.35 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.35 x 1	11,318	10,447	10,768	9,394	236	236	414	602	136	451
Eglinton Ave E	Cedar Drive	Kingston Rd	30.6	4	1.6 x 1	3.3 x 2	varies	3.3 x 2	1.6 x 1	10,617	9,415	10,101	8,466	236	236	389	542	127	407
Ellesmere Rd	Morningside Rd	Military Trail	22	4	-	3.7 x 2	3.6 x 2	3.7 x 2	-	9,284	7,003	8,908	6,180	236	236	283	471	93	353
Kingston	Eglinton Ave E	Scarborough Golf Club Rd	28.2	4	1.6 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.2 x 1	32,239	28,590	30,073	27,895	236	236	1,238	523	928	172
Kingston	Scarborough Golf Club Rd	Cormwell Rd	27.3	4	3.45 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.45 x 1	29,466	26,130	28,723	25,707	236	236	424	319	318	105
Kingston	Cormwell Rd	Dale Ave	25.2	4	2.8 x 1	3.3 x 2	3.6 x 2	3.3 x 2	2.0 x 1	26,097	23,142	25,439	22,768	236	236	376	282	282	93
Kingston	Dale Ave	Celeste Dr	23.9	4	1.75 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.75	22,235	27,176	21,674	26,735	236	236	320	332	240	109
Kingston	Celeste Dr	Overature Rd	27.5	4	3.55 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.55 x 1	23,888	24,863	22,885	24,460	236	236	573	303	430	99
Kingston	Overature Rd	Galloway Rd	27.4	4	3.5 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.5 x 1	22,979	23,917	21,628	23,336	236	236	772	438	579	144
Kingston	Galloway Rd	Poplar Rd	27.4	4	3.5 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.5 x 1	20,289	21,117	18,755	20,604	236	236	876	386	657	127
Kingston	Poplar Rd	Lawrence Rd	28.5	4	1.6 x 1	3.3 x 2	3.6 x 2	3.3 x 2	3.5 x 1	20,218	21,043	18,859	20,531	236	236	776	385	582	126
Kingston	Lawrence Rd	Morningside Rd	29.6	4	1.6 x 1	3.3 x 2	3.6 x 2	3.3 x 2	1.6 x 1	19,865	20,676	18,697	20,173	236	236	667	378	501	124
Kingston	Morningside Rd	Amiens Rd	29.4	4	1.6 x 1	3.3 x 2	5-7.5	3.3 x 2	1.6 x 1	20,014	20,831	18,838	20,325	236	236	672	381	504	125
Kingston	Amiens Rd	Fairwood Cres	30.5	6	1.6 x 1	3.3 x 3	6	3.3 x 3	1.6 x 1	20,582	21,422	19,372	20,902	236	236	692	392	519	129

APPENDIX E

SAMPLE CALCULATIONS

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

34711-1 RPT 24Sep09 TTC NoiseVibration Final.doc SENES Consultants Limited

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R4 Existing Conditions

Receptor ID: R4
Receptor Type: Multi-Storey Apartment
Receptor Location: 3400 Eglinton Ave

Road Segments Exposed To:

Road	Start	End
Eglinton Ave E	Cedar Drive	Kingston Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-20 to 90	60	8,703	8,001	278	319	104	6.86%	1.20%	71	74
EglintonEB	-20 to 90	60	7,717	6,762	178	445	333	8.06%	4.32%	80	83

STAMSON Results:

Day (16-hr): 59.61 dBA

Night (8-hr): 55.09 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R4 2029 Future No-Build

Receptor ID: R4
Receptor Type: Multi-Storey Apartment
Receptor Location: 3400 Eglinton Ave

Road Segments Exposed To:

Road	Start	End
Eglinton Ave E	Cedar Drive	Kingston Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-20 to 90	60	10,617	9,761	340	389	127	6.86%	1.20%	71	74
EglintonEB	-20 to 90	60	9,415	8,250	217	542	407	8.06%	4.32%	80	83

STAMSON Results:

Day (16-hr): 60.47 dBA

Night (8-hr): 55.95 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R4 2029 Future Build

Receptor ID: R4
Receptor Type: Multi-Storey Apartment
Receptor Location: 3400 Eglinton Ave

Road Segments Exposed To:

Road	Start	End
Eglinton Ave E	Cedar Drive	Kingston Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-50 to 90	60	10,617	10,101	n/a	389	127	3.66%	1.20%	19	22
EglintonEB	-40 to 90	60	9,415	8,466	n/a	542	407	5.76%	4.32%	77	80
EglintonLRT	-80 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	39	42

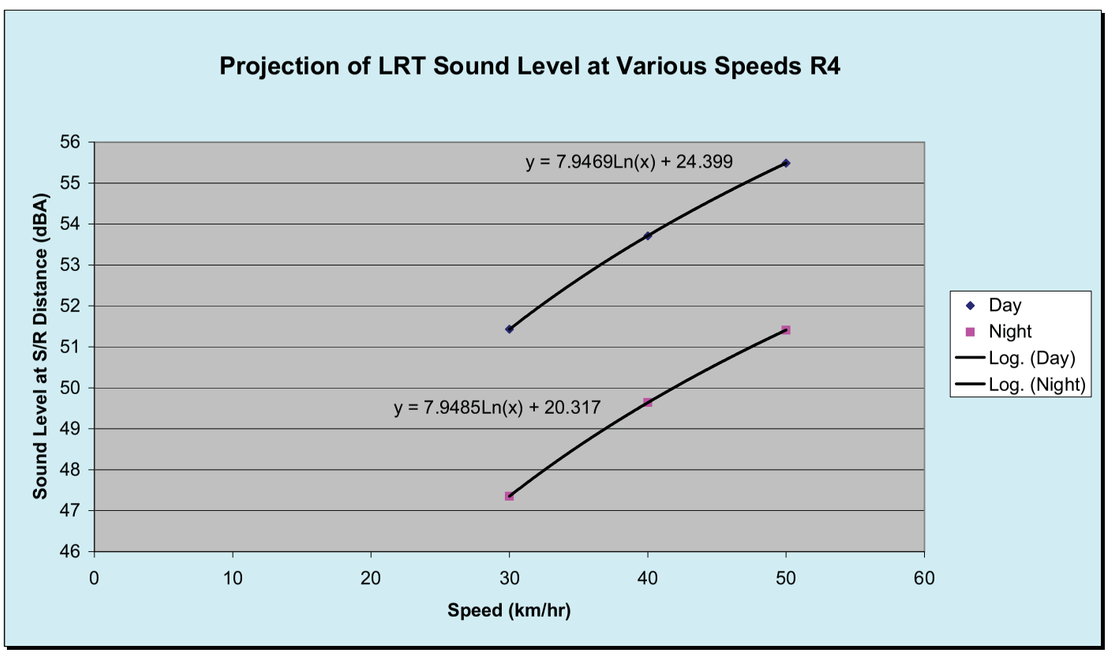
STAMSON Results:

Day - Road Only (16-hr):	61.7	dBA
Day - LRT Only (16-hr):	56.94	dBA
LRT w/ Tonal Penalty:	61.94	dB
Day Total (16-hr):	**64.83**	**dBA**
Night - Road Only (8-hr):	57.42	dBA
Night - LRT Only (8-hr):	52.86	dBA
LRT w/ Tonal Penalty:	57.86	dB
Night - Total (8-hr):	**60.66**	**dBA**

Projection of LRT Sound Level at Receptor R4 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for R4 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	39	42	1.5	4.5	51.43	47.35
40	400	72	39	42	1.5	4.5	53.71	49.64
50	400	72	39	42	1.5	4.5	55.49	51.41



Projected Daytime Sound Level (LRT at 60 km/hr): **56.94 dBA**
Projected Night-time Sound Level (LRT at 60 km/hr): **52.86 dBA**

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R5 Existing Conditions

Receptor ID: R5
Receptor Type: Apartment Building
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	26,426	24,713	396	893	423	4.88%	1.60%	93	96
KingstonSB	-90 to 90	60	23,434	22,633	211	337	253	2.34%	1.08%	78	81
EglintonEB	-15 to 10	60	7,717	6,762	178	445	333	8.06%	4.32%	172	172
EglintonWB	-15 to 10	60	8,703	8,001	278	319	104	6.86%	1.20%	163	163

STAMSON Results:

Day (16-hr): 57.89 dBA

Night (8-hr): 53.85 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R5 2029 Future No-Build

Receptor ID: R5
Receptor Type: Apartment Building
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	32,239	30,150	484	1,090	516	4.88%	1.60%	93	96
KingstonSB	-90 to 90	60	28,590	27,612	257	412	309	2.34%	1.08%	78	81
EglintonEB	-15 to 10	60	9,415	8,250	217	542	407	8.06%	4.32%	172	172
EglintonWB	-15 to 10	60	10,617	9,761	340	389	127	6.86%	1.20%	163	163

STAMSON Results:

Day (16-hr): 58.75 dBA

Night (8-hr): 54.71 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R5 2029 Future Build

Receptor ID: R5
Receptor Type: Apartment Building
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	32,239	30,073	n/a	1,238	928	3.84%	2.88%	94	97
LRTKingston	-90 to 0	60	472	n/a	472	n/a	n/a	n/a	n/a	86	89
KingstonSB	-90 to 90	60	28,590	27,895	n/a	523	172	1.83%	0.60%	76	79
EglintonEB	-5 to 15	60	9,415	8,466	n/a	542	407	5.76%	4.32%	164	164
LRTEglinton	-40 to 45	60	472	n/a	472	n/a	n/a	n/a	n/a	66	66
EglintonWB	-35 to 50	60	10,617	10,101	n/a	389	127	3.66%	1.20%	36	36

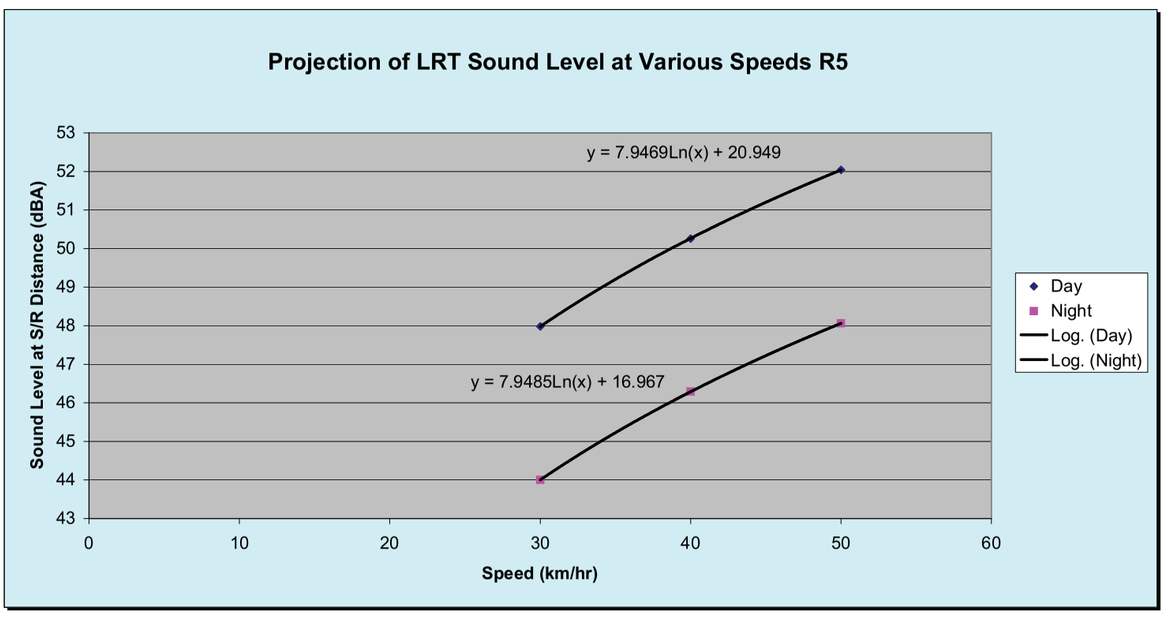
STAMSON Results:

Day - Roads Only (16-hr):	60.03 dBA
Day - LRT Only (16-hr):	53.49 dBA
Total LRT w Tonal Penalty:	58.49 dBA
Total Day (16-hr):	**62.34 dBA**
Night - Roads Only (8-hr):	55.93 dBA
Night - LRT Only (8-hr):	49.51 dBA
Total LRT w Tonal Penalty:	54.51 dBA
Total Night (8-hr):	**58.29 dBA**

Projection of LRT Sound Level at Receptor R5 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for R5 LRT)

Speed (km/hr)	LRT Segment	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
		Day	Night	Day	Night	Day	Night	Day	Night
30	Kingston	400	72	86	86	1.5	4.5	47.98	44.00
	Eglinton	400	72	66	66	1.5	4.5		
40	Kingston	400	72	86	86	1.5	4.5	50.26	46.29
	Eglinton	400	72	66	66	1.5	4.5		
50	Kingston	400	72	86	86	1.5	4.5	52.04	48.06
	Eglinton	400	72	66	66	1.5	4.5		



Projected Daytime Sound Level (LRT at 60 km/hr): **53.49 dBA**
Projected Night-time Sound Level (LRT at 60 km/hr): **49.51 dBA**

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R9 Existing Conditions

Receptor ID: R9
Receptor Type: Single Storey Residential
Receptor Location: 302 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Kingston Rd	Warmsworth St

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideNB	-90 to 90	60	9,532	9,209	162	92	69	2.66%	0.72%	29	32
MorningsideSB	-90 to 90	60	8,798	8,239	132	322	106	5.16%	1.20%	21	24

STAMSON Results:

Day Total (16-hr): 62.32 dBA

Night - Total (8-hr): 57.22 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R9 2029 Future No-Build

Receptor ID: R9
Receptor Type: Single Storey Residential
Receptor Location: 302 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Kingston Rd	Warmsworth St

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideNB	-90 to 90	60	11,629	11,236	198	112	84	2.66%	0.72%	29	32
MorningsideSB	-90 to 90	60	10,734	10,051	161	393	129	5.16%	1.20%	21	24

STAMSON Results:

Day Total (16-hr): 63.17 dBA

Night - Total (8-hr): 58.08 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R9 2029 Future Build

Receptor ID: R9
Receptor Type: Single Storey Residential
Receptor Location: 302 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Kingston Rd	Warmsworth St

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideNB	-90 to 90	60	11,629	11,433	n/a	112	84	0.96%	0.72%	33	36
MorningsideSB	-90 to 90	60	10,734	10,212	n/a	393	129	3.66%	1.20%	17	20
MorningsideLRT	-90 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	25	28

STAMSON Results:

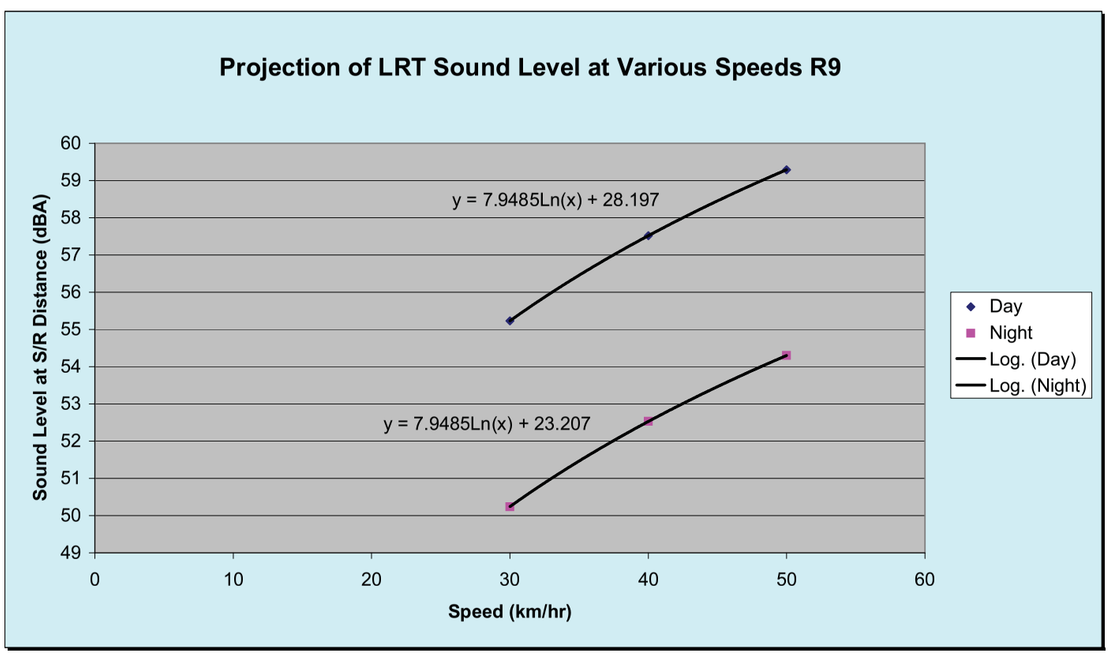
Day - Road Only (16-hr): 63.61 dBA
Day - LRT Only (16-hr): 60.74 dBA
Day Total (16-hr): 65.42 dBA

Night - Road Only (8-hr): 58.3 dBA
Night - LRT Only (8-hr): 55.75 dBA
Night - Total (8-hr): 60.22 dBA

Projection of LRT Sound Level at Receptor R9 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for R9 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	25	28	1.5	4.5	55.23	50.24
40	400	72	25	28	1.5	4.5	57.52	52.53
50	400	72	25	28	1.5	4.5	59.29	54.30



Projected Daytime Sound Level (LRT at 60 km/hr): 60.74 dBA
Projected Night-time Sound Level (LRT at 60 km/hr): 55.75 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R12 Existing Conditions

Receptor ID: R12
Receptor Type: Single Storey Residential
Receptor Location: 357 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Warmsworth St	Fairwood Cres

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideWB	-90 to 90	60	11,866	11,166	202	285	214	4.10%	1.80%	15	18
MorningsideEB	-90 to 90	60	10,954	10,136	285	401	131	6.26%	1.20%	21	24

STAMSON Results:

Day Total (16-hr): 68.28 dBA

Night - Total (8-hr): 63.05 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R12 2029 Future No-Build

Receptor ID: R12
Receptor Type: Single Storey Residential
Receptor Location: 357 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Warmsworth St	Fairwood Cres

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideWB	-90 to 90	60	14,477	13,623	246	347	261	4.10%	1.80%	15	18
MorningsideEB	-90 to 90	60	13,363	12,366	347	489	160	6.26%	1.20%	21	24

STAMSON Results:

Day Total (16-hr): 69.14 dBA

Night - Total (8-hr): 63.90 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R12 2029 Future Build

Receptor ID: R12
Receptor Type: Single Storey Residential
Receptor Location: 357 Morningside Ave

Road Segments Exposed To:

Road	Start	End
Morningside Ave	Warmsworth St	Fairwood Cres

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
MorningsideWB	-90 to 90	60	14,477	13,869	n/a	347	261	2.40%	1.80%	13	16
MorningsideEB	-90 to 90	60	13,363	12,714	n/a	489	160	3.66%	1.20%	33	36
MorningsideLRT	-90 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	23	26

Note: All distances less then 15m were modelled as 15m and adjusted to actual distance due to STAMSON spatial restriction

Adjustments to Sound Levels at Distances Less Than 15 m:

Link	Distance Modelled (r1)		Modelled Sound Level (dBA)		Actual Distance (r2)		Corrected Sound Level (dBA)	
	Day	Night	Day	Night	Day	Night	Day	Night
MorningsideWB	15	16	66.54	61.73	13	16	67.16	61.73
MorningsideEB	33	36	62.50	57.59	33	36	62.50	57.59

STAMSON Results:

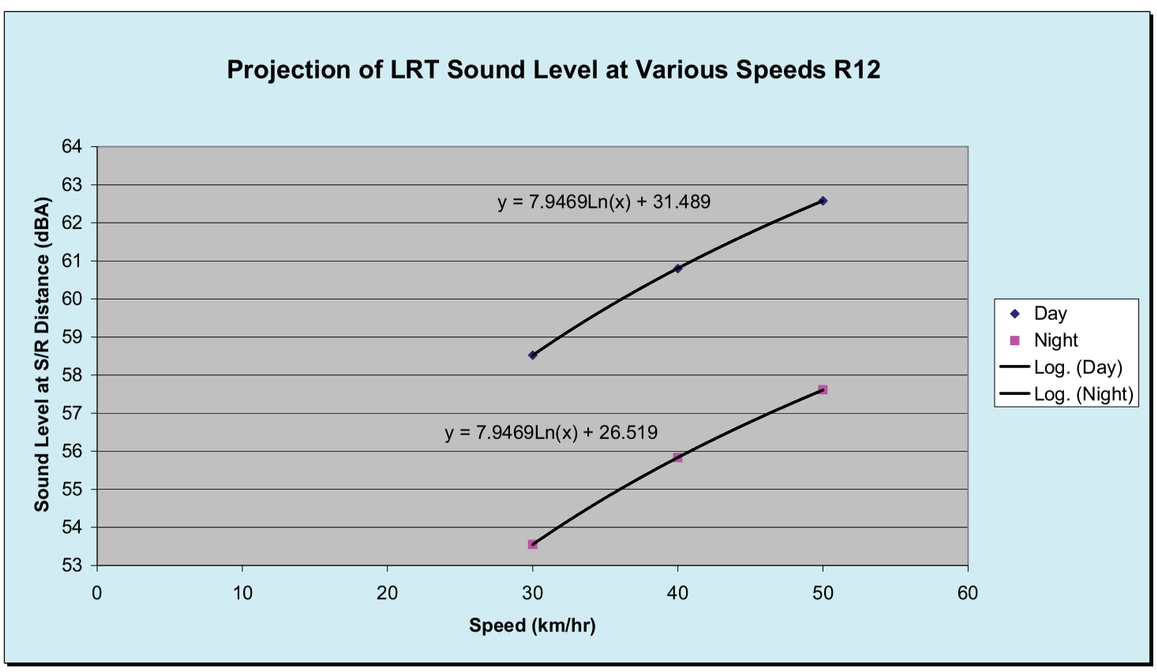
Day - Road Only (16-hr): 68.44 dBA
Day - LRT Only (16-hr): 64.03 dBA
Day Total (16-hr): 69.78 dBA

Night - Road Only (8-hr): 63.15 dBA
Night - LRT Only (8-hr): 59.06 dBA
Night - Total (8-hr): 64.58 dBA

Projection of LRT Sound Level at Receptor R12 - LRT Travelling at 60 km/hr

Modelling Parameters (Prediction for R12 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Modelled Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	23	26	1.5	4.5	58.52	53.55
40	400	72	23	26	1.5	4.5	60.8	55.83
50	400	72	23	26	1.5	4.5	62.58	57.61



Projected Daytime Sound Level (LRT @ 60 km/hr): 64.03 dBA
Projected Night-time Sound Level (LRT @ 60 km/hr): 59.06 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R13 Existing Conditions

Receptor ID: R13
Receptor Type: Two Storey Residential
Receptor Location: UofT Scarborough Campus - North Residence

Road Segments Exposed To:

Road	Start	End
Ellesmere Rd	Morningside Rd	Military Trail

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EllesmereWB	-90 to 90	60	7,610	7,020	282	232	76	6.75%	1.00%	48	51
EllesmereEB	-90 to 90	60	5,741	4,933	132	386	289	9.02%	5.04%	41	44

STAMSON Results:

Day Total (16-hr): 52.69 dBA

Night - Total (8-hr): 49.10 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R13 2029 Future No-Build

Receptor ID: R13
Receptor Type: Two Storey Residential
Receptor Location: UofT Scarborough Campus - North Residence

Road Segments Exposed To:

Road	Start	End
Ellesmere Rd	Morningside Rd	Military Trail

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EllesmereWB	-90 to 90	60	9,284	8,564	343	283	93	6.75%	1.00%	48	51
EllesmereEB	-90 to 90	60	7,003	6,019	161	471	353	9.02%	5.04%	41	44

STAMSON Results:

Day Total (16-hr): 53.56 dBA

Night - Total (8-hr): 50.01 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor R13 2029 Future Build

Receptor ID: R13
Receptor Type: Two Storey Residential
Receptor Location: UofT Scarborough Campus - North Residence

Road Segments Exposed To:

Road	Start	End
Ellesmere Rd	Morningside Rd	Military Trail

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EllesmereWB	-90 to 90	60	9,284	8,908	n/a	283	93	3.05%	1.00%	48	51
EllesmereEB	-90 to 90	60	7,003	6,180	n/a	471	353	6.72%	5.04%	41	44
EllesmereLRT	-90 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	25	28

STAMSON Results:

Day - Road Only (16-hr): 56.20 dBA
Day - LRT Only (16-hr): 50.15 dBA
Day Total (16-hr): 57.16 dBA

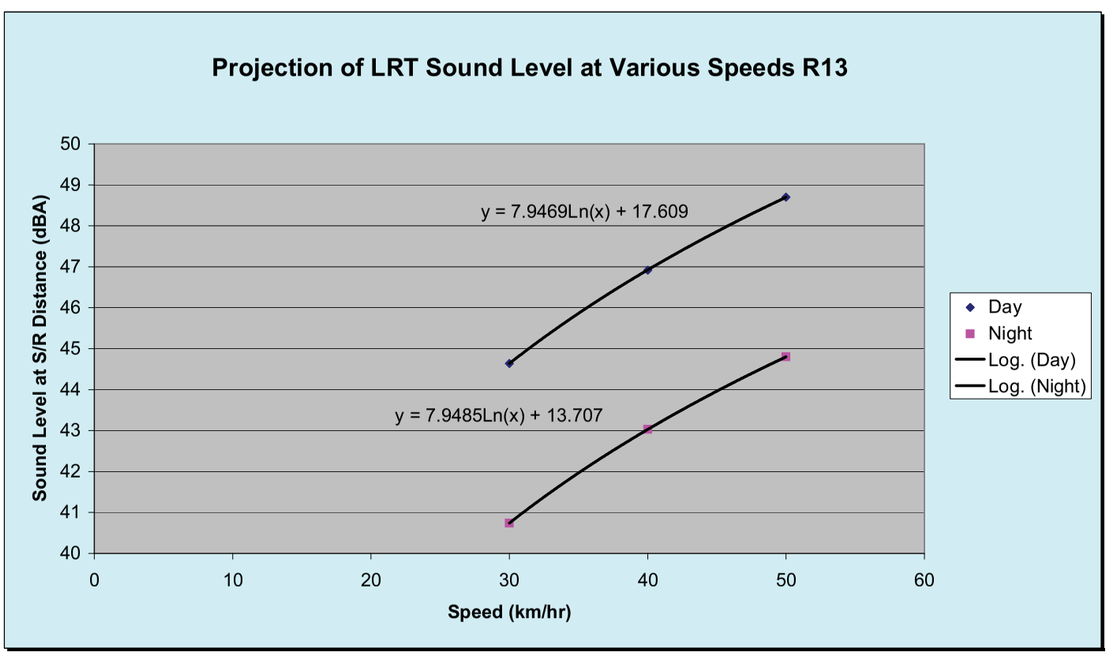
Night - Road Only (8-hr): 53.20 dBA
Night - LRT Only (8-hr): 46.25 dBA
Night - Total (8-hr): 54.00 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Projection of LRT Sound Level at Receptor R13 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for R13 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	25	28	1.5	4.5	44.64	40.74
40	400	72	25	28	1.5	4.5	46.92	43.03
50	400	72	25	28	1.5	4.5	48.7	44.8



Projected Daytime Sound Level (LRT at 60 km/hr): 50.15 dBA
Projected Night-time Sound Level (LRT at 60 km/hr): 46.25 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR1 Existing Conditions

Receptor ID: AR1
Receptor Type: Multi-Storey Apartment
Receptor Location: Town Haven Place

Road Segments Exposed To:

-Eglinton Ave East from Midland Ave to Failmouth Ave

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-90 to 90	60	15,401	14,161	616	470	154	7.05%	1.00%	26.5	29.5
EglintonEB	-90 to 90	60	13,119	11,311	485	756	567	9.46%	4.32%	15.5	18.5

STAMSON Results:

Day (16-hr): 70.31 dBA

Night (8-hr): 65.11 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR1 2029 Future No-Build

Receptor ID: AR1
Receptor Type: Multi-Storey Apartment
Receptor Location: Town Haven Place

Road Segments Exposed To:

Road	Start	End
Eglinton Ave	Midland Ave	Failmouth Ave

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-90 to 90	60	18,789	17,276	752	573	188	7.05%	1.00%	26.5	29.5
EglintonEB	-90 to 90	60	16,005	13,800	592	922	691	9.46%	4.32%	15.5	18.5

STAMSON Results:

Day (16-hr): 71.18 dBA

Night (8-hr): 65.98 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR1 2029 Future Build

Receptor ID: AR1
Receptor Type: Multi-Storey Apartment
Receptor Location: Town Haven Place

Road Segments Exposed To:

Road	Start	End
Eglinton Ave	Midland Ave	Failmouth Ave

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
EglintonWB	-90 to 90	60	18,789	18,028	n/a	573	188	3.05%	1.00%	28	31
EglintonEB	-90 to 90	60	16,005	14,392	n/a	922	691	5.76%	4.32%	13	16
EglintonLRT	-90 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	20	23

Note: All distances less then 15m were modelled as 15m and adjusted to actual distance due to STAMSON spatial restriction

Adjustments to Sound Levels at Distances Less Than 15 m:

Link	Distance Modelled (r1)		Modelled Sound Level (dBA)		Actual Distance (r2)		Corrected Sound Level (dBA)	
	Day	Night	Day	Night	Day	Night	Day	Night
EglintonWB	28	31	64.31	59.34	28	31	64.31	59.34
EglintonEB	15	16	67.96	63.15	13	16	68.58	63.15

STAMSON Results:

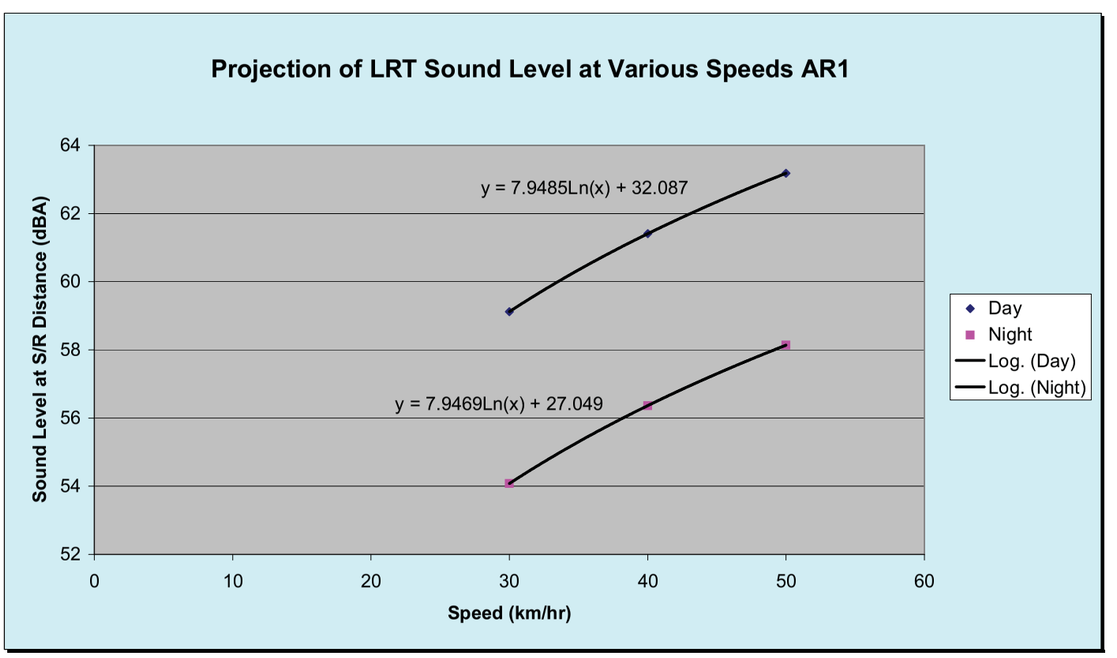
Day - Road Only (16-hr): 69.96 dBA
Day - LRT Only (16-hr): 64.63 dBA
Day Total (16-hr): 71.08 dBA

Night - Road Only (8-hr): 64.66 dBA
Night - LRT Only (8-hr): 59.59 dBA
Night - Total (8-hr): 65.84 dBA

Projection of LRT Sound Level at Receptor AR1 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for AR1 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	20	23	1.5	4.5	59.12	54.08
40	400	72	20	23	1.5	4.5	61.41	56.36
50	400	72	20	23	1.5	4.5	63.18	58.14



Projected Daytime Sound Level (LRT at 60 km/hr): 64.63 dBA
Projected Night-time Sound Level (LRT at 60 km/hr): 59.59 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR2 Existing Conditions

Receptor ID: AR2
Receptor Type: Townhouse
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	26,426	24,713	396	893	423	4.88%	1.60%	27	30
KingstonSB	-90 to 90	60	23,434	22,633	211	337	253	2.34%	1.08%	43	46
EglintonEB	33 to 60	60	7,717	6,762	178	445	333	8.06%	4.32%	141	141
EglintonWB	33 to 60	60	8,703	8,001	278	319	104	6.86%	1.20%	129	129

STAMSON Results:

Day (16-hr): 68.62 dBA

Night (8-hr): 63.69 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR2 2029 Future No-Build

Receptor ID: AR2
Receptor Type: Townhouse
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	32,239	30,150	484	1,090	516	4.88%	1.60%	27	30
KingstonSB	-90 to 90	60	28,590	27,612	257	412	309	2.34%	1.08%	43	46
EglintonEB	33 to 60	60	9,415	8,250	217	542	407	8.06%	4.32%	141	141
EglintonWB	33 to 60	60	10,617	9,761	340	389	127	6.86%	1.20%	129	129

STAMSON Results:

Day (16-hr): 69.49 dBA

Night (8-hr): 64.56 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR2 2029 Future Build

Receptor ID: AR2
Receptor Type: Townhouse
Receptor Location: Eglinton Avenue East and Kingston Road

Road Segments Exposed To:

-Kingston Road from Eglinton Ave to Scarborough Golf Club Road
-Eglinton Ave East from Cedar Drive to Kingston Road

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	32,239	30,073	n/a	1,238	928	3.84%	2.88%	29	32
LRTKingston	0 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	40	40
KingstonSB	-90 to 90	60	28,590	27,895	n/a	523	172	1.83%	0.60%	45	48
EglintonEB	20 to 45	60	9,415	8,466	n/a	542	407	5.76%	4.32%	156	156
LRTEglinton	-90 to -40	60	472	n/a	472	n/a	n/a	n/a	n/a	34	34
EglintonWB	-90 to -25	60	10,617	10,101	n/a	389	127	3.66%	1.20%	68	68

STAMSON Results:

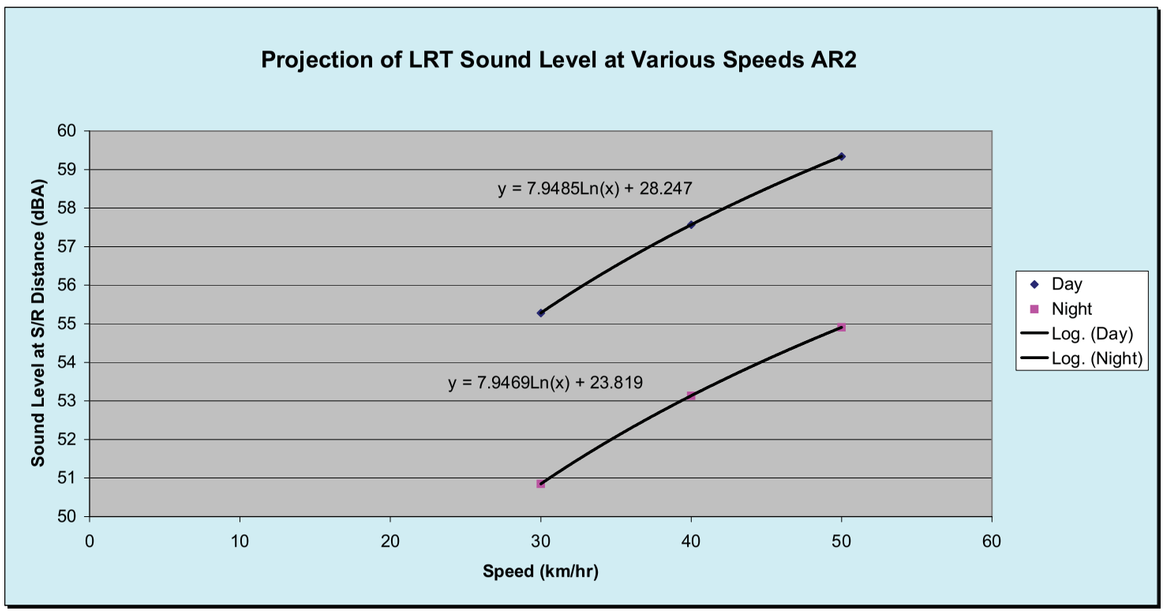
Day - Roads Only (16-hr): 69.61 dBA
Day - LRT Only (16-hr): 60.79 dBA
LRT w/ Tonal Penalty 65.79 dB
Total Day (16-hr): 71.12 dBA

Night - Roads Only (8-hr): 64.71 dBA
Night - LRT Only (8-hr): 56.36 dBA
LRT w/ Tonal Penalty 61.36 dB
Total Night (8-hr): 66.36 dBA

Projection of LRT Sound Level at Receptor AR2 - LRT Travelling at 60 km/hr

STAMSON Modelling Parameters (Prediction for AR2 LRT)

Speed (km/hr)	LRT Segment	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
		Day	Night	Day	Night	Day	Night	Day	Night
30	Kingston	400	72	40	40	1.5	4.5	55.28	50.85
	Eglinton	400	72	34	34	1.5	4.5		
40	Kingston	400	72	40	40	1.5	4.5	57.57	53.13
	Eglinton	400	72	34	34	1.5	4.5		
50	Kingston	400	72	40	40	1.5	4.5	59.34	54.91
	Eglinton	400	72	34	34	1.5	4.5		



Projected Daytime Sound Level (LRT at 60 km/hr): 60.79 dBA
Projected Night-time Sound Level (LRT at 60 km/hr): 56.36 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR3 Existing Conditions

Receptor ID: AR3
Receptor Type: Townhouse
Receptor Location: Kingston Road, South of Galloway Rd

Road Segments Exposed To:

-Kingston Road from Overture Rd to Galloway Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	18,836	17,598	170	804	264	5.17%	1.40%	13	16
KingstonSB	-90 to 90	60	19,604	18,836	274	282	212	2.84%	1.08%	28	31

Note: All distances less then 15m were modelled as 15m and adjusted to actual distance due to STAMSON spatial restriction

Adjustments to Sound Levels at Distances Less Than 15 m:

Link	Distance Modelled (r1)		Modelled Sound Level (dBA)		Actual Distance (r2)		Corrected Sound Level (dBA)	
	Day	Night	Day	Night	Day	Night	Day	Night
KingstonNB	15	16	67.99	64.52	13	16	68.61	64.52
KingstonSB	28	31	63.2	59.57	28	31	63.2	59.57

STAMSON Results:

Day (16-hr): 69.71 dBA

Night (8-hr): 65.73 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR3 2029 Future No-Build

Receptor ID: AR3
Receptor Type: Townhouse
Receptor Location: Kingston Road, South of Galloway Rd

Road Segments Exposed To:

-Kingston Road from Overture Rd to Galloway Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit (km/hr)	24-hr AADT					% Trucks		Source Receptor Distance	
			Total	Cars	Bus	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	22,979	21,470	207	981	322	5.17%	1.40%	13	16
KingstonSB	-90 to 90	60	23,917	22,980	335	344	258	2.84%	1.08%	28	31

Note: All distances less then 15m were modelled as 15m and adjusted to actual distance due to STAMSON spatial restriction

Adjustments to Sound Levels at Distances Less Than 15 m:

Link	Distance Modelled (r1)		Modelled Sound Level (dBA)		Actual Distance (r2)		Corrected Sound Level (dBA)	
	Day	Night	Day	Night	Day	Night	Day	Night
KingstonNB	15	16	68.85	64.04	13	16	69.471	64.04
KingstonSB	28	31	65.39	60.43	28	31	65.39	60.43

STAMSON Results:

Day (16-hr): 70.90 dBA

Night (8-hr): 65.61 dBA

Traffic Volumes Summary for Use in STAMSON Modelling and Results of Modelling Receptor AR3 2029 Future Build

Receptor ID: AR3
Receptor Type: Townhouse
Receptor Location: Kingston Road, South of Galloway Road

Road Segments Exposed To:

-Kingston Road from Overture Rd to Galloway Rd

STAMSON Road Segments:

Road Segment ID	Exposure Angle	Speed Limit	24-hr AADT					% Trucks		Source Receptor Distance	
		(km/hr)	Total	Cars	LRT	Med. Trucks	Heavy Trucks	Medium	Heavy	Day (16-hr)	Night (8-hr)
KingstonNB	-90 to 90	60	22,979	21,628	n/a	772	579	3.36%	2.52%	9	12
LRTKingston	-90 to 90	60	472	n/a	472	n/a	n/a	n/a	n/a	17	20
KingstonSB	-90 to 90	60	23,917	23,336	n/a	438	144	1.83%	0.60%	23	26

Note: All distances less then 15m were modelled as 15m and adjusted to actual distance due to STAMSON spatial restriction

Adjustments to Sound Levels at Distances Less Than 15 m:

Link	Distance Modelled (r1)		Modelled Sound Level (dBA)		Actual Distance (r2)		Corrected Sound Level (dBA)	
	Day	Night	Day	Night	Day	Night	Day	Night
KingstonNB	15	15	69.39	64.88	9	12	71.61	65.85
KingstonSB	23	26	65.32	60.29	23	26	65.32	60.29

STAMSON Results:

Day - Roads Only (16-hr): 72.53 dBA
Day - LRT Only (16-hr): 65.34 dBA
Total Day (16-hr): 73.29 dBA

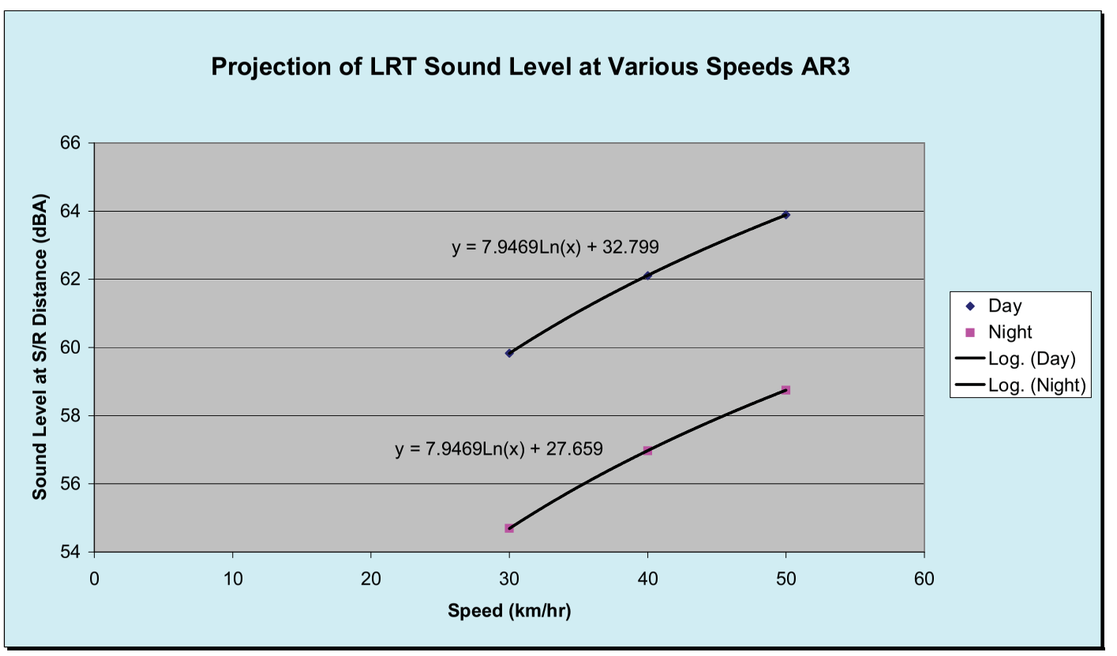
Night - Roads Only (8-hr): 66.91 dBA
Night - LRT Only (8-hr): 60.20 dBA
Total Night (8-hr): 67.75 dBA

Scarborough Malvern Light Rail Transit - Noise and Vibration Impact Assessment

Projection of LRT Sound Level at Receptor AR3 - LRT Travelling at 60 km/hr

Modelling Parameters (Prediction for AR3 LRT)

Speed (km/hr)	No. per Time Period		S/R Dist. (m)		R Height		Predicted Sound Level	
	Day	Night	Day	Night	Day	Night	Day	Night
30	400	72	17	20	1.5	4.5	59.83	54.69
40	400	72	17	20	1.5	4.5	62.11	56.97
50	400	72	17	20	1.5	4.5	63.89	58.75



Projected Daytime Sound Level (LRT at 60 km/hr): 65.34 dBA
Projected Night-time Sound Level (LRT at 60 km/hr): 60.20 dBA

APPENDIX F

STAMSON OUTPUTS FOR SAMPLE CALCULATIONS


```
STAMSON 5.0        NORMAL REPORT        Date: 12-06-2009 17:11:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4fwo.te             Time Period: Day/Night 16/8 hours
Description:   Receptor R4 - Future No-Build

Road data, segment # 1: EglintonW (day/night)
-----------------------------------------------
Car traffic volume  :  8297/1464  veh/TimePeriod  *
Medium truck volume :   619/109   veh/TimePeriod  *
Heavy truck volume  :   108/19    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  10617
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   6.86
    Heavy Truck  % of Total Volume     :   1.20
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: EglintonW (day/night)
-----------------------------------------------
Angle1   Angle2           : -20.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  71.00 / 71.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Car traffic volume : 7012/1237 veh/TimePeriod *
Medium truck volume : 645/114 veh/TimePeriod *
Heavy truck volume : 346/61 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 9415
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 8.06
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -20.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 80.00 / 80.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: EglintonW (day)

Source height = 1.05 m

ROAD (0.00 + 56.82 + 0.00) = 56.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	90	0.00	65.71	0.00	-6.75	-2.14	0.00	0.00	0.00	56.82

Segment Leq : 56.82 dBA

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Results segment # 2: EglintonE (day)

Source height = 1.44 m

ROAD (0.00 + 58.02 + 0.00) = 58.02 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	90	0.00	67.43	0.00	-7.27	-2.14	0.00	0.00	0.00	58.02

Segment Leq : 58.02 dBA

Total Leq All Segments: 60.47 dBA

Results segment # 1: EglintonW (night)

Source height = 1.05 m

ROAD (0.00 + 52.29 + 0.00) = 52.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	90	0.00	61.18	0.00	-6.75	-2.14	0.00	0.00	0.00	52.29

Segment Leq : 52.29 dBA

Results segment # 2: EglintonE (night)

Source height = 1.44 m

ROAD (0.00 + 53.50 + 0.00) = 53.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-20	90	0.00	62.91	0.00	-7.27	-2.14	0.00	0.00	0.00	53.50

Segment Leq : 53.50 dBA

Total Leq All Segments: 55.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.47
(NIGHT): 55.95

```
STAMSON 5.0        NORMAL REPORT        Date: 12-06-2009 17:05:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4funew.te           Time Period: Day/Night 16/8 hours
Description:   Receptor R4 - Future Build (Road Only)

Road data, segment # 1: EglintonW (day/night)
----------------------------------------------
Car traffic volume  :  8586/1515  veh/TimePeriod  *
Medium truck volume :   330/58    veh/TimePeriod  *
Heavy truck volume  :   108/19    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  10617
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.66
    Heavy Truck  % of Total Volume     :   1.20
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: EglintonW (day/night)
-------------------------------------------
Angle1   Angle2           : -50.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```



```
Road data, segment # 2: EglintonE (day/night)
----------------------------------------------
Car traffic volume  :  7196/1270  veh/TimePeriod  *
Medium truck volume :   461/81    veh/TimePeriod  *
Heavy truck volume  :   346/61    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   9415
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   5.76
    Heavy Truck  % of Total Volume     :   4.32
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: EglintonE (day/night)
-------------------------------------------
Angle1   Angle2           : -40.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  77.00 / 77.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.05 m

ROAD (0.00 + 61.09 + 0.00) = 61.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -50     90   0.66  64.92   0.00  -1.70  -2.13   0.00   0.00   0.00  61.09
-------------------------------------------------------------------------------

Segment Leq : 61.09 dBA
```

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Results segment # 2: EglintonE (day)

Source height = 1.44 m

ROAD (0.00 + 52.86 + 0.00) = 52.86 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	90	0.66	67.11	0.00	-11.79	-2.46	0.00	0.00	0.00	52.86

Segment Leq : 52.86 dBA

Total Leq All Segments: 61.70 dBA

Results segment # 1: EglintonW (night)

Source height = 1.05 m

ROAD (0.00 + 56.73 + 0.00) = 56.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	90	0.58	60.39	0.00	-1.63	-2.04	0.00	0.00	0.00	56.73

Segment Leq : 56.73 dBA

Results segment # 2: EglintonE (night)

Source height = 1.44 m

ROAD (0.00 + 49.07 + 0.00) = 49.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	90	0.57	62.58	0.00	-11.17	-2.35	0.00	0.00	0.00	49.07

Segment Leq : 49.07 dBA

Total Leq All Segments: 57.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.70
(NIGHT): 57.42

STAMSON 5.0 NORMAL REPORT Date: 30-03-2009 10:53:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4l30.te Time Period: Day/Night 16/8 hours
Description: **Receptor R4 – LRT at 30 km/hr**
RT/Custom data, segment # 1: EglintonLRT (day/night)
---

1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 30 km/h

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

Angle1 Angle2	: -80.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 42.00 / 42.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: EglintonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 51.43 + 0.00) = 51.43 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.66	60.37	-7.42	-1.52	0.00	0.00	0.00	51.43

Segment Leq : 51.43 dBA

Total Leq All Segments: 51.43 dBA

Results segment # 1: EglintonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 47.35 + 0.00) = 47.35 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-80	90	0.60	55.93	-7.15	-1.43	0.00	0.00	0.00	47.35

Segment Leq : 47.35 dBA

Total Leq All Segments: 47.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.43
(NIGHT): 47.35

```
STAMSON 5.0        NORMAL REPORT        Date: 30-03-2009 10:51:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4l40.te             Time Period: Day/Night 16/8 hours
Description:     Receptor R4 - LRT at 40 km/hr

RT/Custom data, segment # 1: EglintonLRT (day/night)
-------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: EglintonLRT (day/night)
-----------------------------------------------
Angle1   Angle2           : -80.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  42.00 / 42.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 53.71 + 0.00) = 53.71 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -80     90   0.66  62.66 -7.42  -1.52   0.00   0.00   0.00  53.71
-------------------------------------------------------------------------

Segment Leq : 53.71 dBA

Total Leq All Segments: 53.71 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 49.64 + 0.00) = 49.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -80     90   0.60  58.22 -7.15  -1.43   0.00   0.00   0.00  49.64
-------------------------------------------------------------------------

Segment Leq : 49.64 dBA

Total Leq All Segments: 49.64 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.71
                           (NIGHT): 49.64
```



```
STAMSON 5.0        NORMAL REPORT        Date: 30-03-2009 10:51:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4l50.te             Time Period: Day/Night 16/8 hours
Description:    Receptor R4 - LRT at 50 km/hr

RT/Custom data, segment # 1: EglintonLRT (day/night)
-------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: EglintonLRT (day/night)
-----------------------------------------------
Angle1   Angle2           : -80.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  42.00 / 42.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 55.49 + 0.00) = 55.49 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -80     90   0.66  64.43 -7.42  -1.52   0.00   0.00   0.00  55.49
-------------------------------------------------------------------------

Segment Leq : 55.49 dBA

Total Leq All Segments: 55.49 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 51.41 + 0.00) = 51.41 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -80     90   0.60  59.99 -7.15  -1.43   0.00   0.00   0.00  51.41
-------------------------------------------------------------------------

Segment Leq : 51.41 dBA

Total Leq All Segments: 51.41 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.49
                           (NIGHT): 51.41
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-06-2009 18:15:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5fwo.te             Time Period: Day/Night 16/8 hours
Description:    Receptor R5 - Future No-Build

Road data, segment # 1: KingstonNB (day/night)
-----------------------------------------------
Car traffic volume  : 25627/4522  veh/TimePeriod  *
Medium truck volume :  1337/236   veh/TimePeriod  *
Heavy truck volume  :   438/77    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  32239
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   4.88
    Heavy Truck  % of Total Volume     :   1.60
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: KingstonNB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  93.00 / 96.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```



```
Road data, segment # 2: KingstonSB (day/night)
-----------------------------------------------
Car traffic volume  : 23470/4142  veh/TimePeriod  *
Medium truck volume :   569/100   veh/TimePeriod  *
Heavy truck volume  :   262/46    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  28590
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.34
    Heavy Truck  % of Total Volume     :   1.08
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: KingstonSB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  78.00 / 81.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Page 3

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

Car traffic volume : 7012/1237 veh/TimePeriod *
Medium truck volume : 645/114 veh/TimePeriod *
Heavy truck volume : 346/61 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	9415
Percentage of Annual Growth	0.00
Number of Years of Growth	0.00
Medium Truck % of Total Volume	8.06
Heavy Truck % of Total Volume	4.32
Day (16 hrs) % of Total Volume	85.00

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

Angle1 Angle2	-15.00 deg	10.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	172.00 / 172.00 m	
Receiver height	1.50 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Page 4
Road data, segment # 4: EglintonWB (day/night)

Car traffic volume : 8297/1464 veh/TimePeriod *
Medium truck volume : 619/109 veh/TimePeriod *
Heavy truck volume : 108/19 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)
* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT)	10617
Percentage of Annual Growth	0.00
Number of Years of Growth	0.00
Medium Truck % of Total Volume	6.86
Heavy Truck % of Total Volume	1.20
Day (16 hrs) % of Total Volume	85.00

Data for Segment # 4: EglintonWB (day/night)

Angle1 Angle2	-15.00 deg	10.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	163.00 / 163.00 m	
Receiver height	1.50 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Reference angle	0.00	

Results segment # 1: KingstonNB (day)

Source height = 1.12 m

ROAD (0.00 + 55.82 + 0.00) = 55.82 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.43	0.00	-13.15	-1.46	0.00	0.00	0.00	55.82

Segment Leq : 55.82 dBA

Results segment # 2: KingstonSB (day)

Source height = 1.02 m

ROAD (0.00 + 55.38 + 0.00) = 55.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	68.72	0.00	-11.89	-1.46	0.00	0.00	0.00	55.38

Segment Leq : 55.38 dBA

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Results segment # 3: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 41.25 + 0.00) = 41.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	10	0.66	67.43	0.00	-17.59	-8.60	0.00	0.00	0.00	41.25

Segment Leq : 41.25 dBA

Results segment # 4: EglintonWB (day)

Source height = 1.05 m

ROAD (0.00 + 39.91 + 0.00) = 39.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	10	0.66	65.71	0.00	-17.20	-8.60	0.00	0.00	0.00	39.91

Segment Leq : 39.91 dBA

Total Leq All Segments: 58.75 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.12 m

ROAD (0.00 + 51.83 + 0.00) = 51.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	65.90	0.00	-12.75	-1.32	0.00	0.00	0.00	51.83

Segment Leq : 51.83 dBA

Results segment # 2: KingstonSB (night)

Source height = 1.02 m

ROAD (0.00 + 51.26 + 0.00) = 51.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	64.19	0.00	-11.60	-1.33	0.00	0.00	0.00	51.26

Segment Leq : 51.26 dBA

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Results segment # 3: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 37.66 + 0.00) = 37.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	10	0.57	62.91	0.00	-16.65	-8.60	0.00	0.00	0.00	37.66

Segment Leq : 37.66 dBA

Results segment # 4: EglintonWB (night)

Source height = 1.05 m

ROAD (0.00 + 36.17 + 0.00) = 36.17 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-15	10	0.58	61.18	0.00	-16.41	-8.60	0.00	0.00	0.00	36.17

Segment Leq : 36.17 dBA

Total Leq All Segments: 54.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.75
(NIGHT): 54.71

STAMSON 5.0 NORMAL REPORT Date: 12-06-2009 18:03:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5fu29.te Time Period: Day/Night 16/8 hours
Description: **Receptor R5 – Future Build (Roads Only)**

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

Car traffic volume : 25627/4522 veh/TimePeriod
Medium truck volume : 1337/236 veh/TimePeriod
Heavy truck volume : 438/77 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 94.00 / 97.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 23711/4184 veh/TimePeriod *
Medium truck volume : 445/78 veh/TimePeriod *
Heavy truck volume : 146/26 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 28590
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.83
Heavy Truck % of Total Volume : 0.60
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 76.00 / 79.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 7196/1270 veh/TimePeriod *
Medium truck volume : 461/81 veh/TimePeriod *
Heavy truck volume : 346/61 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 9415
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 5.76
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -5.00 deg 15.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 164.00 / 164.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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Road data, segment # 4: EglintonWB (day/night)

Car traffic volume	: 8586/1515	veh/TimePeriod *
Medium truck volume	: 330/58	veh/TimePeriod *
Heavy truck volume	: 108/19	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 0	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	: 10617
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 3.66
Heavy Truck % of Total Volume	: 1.20
Day (16 hrs) % of Total Volume	: 85.00

Data for Segment # 4: EglintonWB (day/night)

Angle1 Angle2	: -35.00 deg	50.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 36.00 / 36.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: KingstonNB (day)

Source height = 1.12 m

ROAD (0.00 + 55.74 + 0.00) = 55.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	70.43	0.00	-13.23	-1.46	0.00	0.00	0.00	55.74

Segment Leq : 55.74 dBA

Results segment # 2: KingstonSB (day)

Source height = 0.88 m

ROAD (0.00 + 54.80 + 0.00) = 54.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	67.96	0.00	-11.70	-1.46	0.00	0.00	0.00	54.80

Segment Leq : 54.80 dBA

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Results segment # 3: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 40.30 + 0.00) = 40.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	15	0.66	67.11	0.00	-17.24	-9.57	0.00	0.00	0.00	40.30

Segment Leq : 40.30 dBA

Results segment # 4: EglintonWB (day)

Source height = 1.05 m

ROAD (0.00 + 55.05 + 0.00) = 55.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	50	0.66	64.92	0.00	-6.31	-3.56	0.00	0.00	0.00	55.05

Segment Leq : 55.05 dBA

Total Leq All Segments: 60.03 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.12 m

ROAD (0.00 + 51.76 + 0.00) = 51.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	65.90	0.00	-12.82	-1.32	0.00	0.00	0.00	51.76

Segment Leq : 51.76 dBA

Results segment # 2: KingstonSB (night)

Source height = 0.88 m

ROAD (0.00 + 50.64 + 0.00) = 50.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	63.44	0.00	-11.46	-1.33	0.00	0.00	0.00	50.64

Segment Leq : 50.64 dBA

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Results segment # 3: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 36.69 + 0.00) = 36.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-5	15	0.57	62.58	0.00	-16.33	-9.56	0.00	0.00	0.00	36.69

Segment Leq : 36.69 dBA

Results segment # 4: EglintonWB (night)

Source height = 1.05 m

ROAD (0.00 + 50.85 + 0.00) = 50.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-35	50	0.58	60.39	0.00	-6.02	-3.52	0.00	0.00	0.00	50.85

Segment Leq : 50.85 dBA

Total Leq All Segments: 55.93 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.03
(NIGHT): 55.93

STAMSON 5.0 NORMAL REPORT Date: 15-09-2009 09:18:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt30.te Time Period: Day/Night 16/8 hours
Description: **Receptor R5 – LRT at 30 km/hr**

RT/Custom data, segment # 1: KingstonLRT (day/night)
---

1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 30 km/h

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

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 86.00 / 86.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
---

1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 30 km/h

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

Angle1 Angle2 : -40.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 66.00 / 66.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 43.31 + 0.00) = 43.31 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	60.37	-12.59	-4.47	0.00	0.00	0.00	43.31

Segment Leq : 43.31 dBA

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Results segment # 2: EglintonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 46.16 + 0.00) = 46.16 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.66	60.37	-10.68	-3.53	0.00	0.00	0.00	46.16

Segment Leq : 46.16 dBA

Total Leq All Segments: 47.98 dBA

Results segment # 1: KingstonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 39.43 + 0.00) = 39.43 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.60	55.93	-12.13	-4.37	0.00	0.00	0.00	39.43

Segment Leq : 39.43 dBA

Results segment # 2: EglintonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 42.13 + 0.00) = 42.13 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.60	55.93	-10.30	-3.51	0.00	0.00	0.00	42.13

Segment Leq : 42.13 dBA

Total Leq All Segments: 44.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 47.98
(NIGHT): 44.00

STAMSON 5.0 NORMAL REPORT Date: 15-09-2009 09:20:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt40.te Time Period: Day/Night 16/8 hours
Description: **Receptor R5 – LRT at 40 km/hr**

RT/Custom data, segment # 1: KingstonLRT (day/night)
---
1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 40 km/h

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

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 86.00 / 86.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
---
1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 40 km/h

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

Angle1 Angle2 : -40.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 66.00 / 66.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 45.60 + 0.00) = 45.60 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	62.66	-12.59	-4.47	0.00	0.00	0.00	45.60

Segment Leq : 45.60 dBA

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Results segment # 2: EglintonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 48.44 + 0.00) = 48.44 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.66	62.66	-10.68	-3.53	0.00	0.00	0.00	48.44

Segment Leq : 48.44 dBA

Total Leq All Segments: 50.26 dBA

Results segment # 1: KingstonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 41.72 + 0.00) = 41.72 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.60	58.22	-12.13	-4.37	0.00	0.00	0.00	41.72

Segment Leq : 41.72 dBA

Results segment # 2: EglintonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 44.42 + 0.00) = 44.42 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.60	58.22	-10.30	-3.51	0.00	0.00	0.00	44.42

Segment Leq : 44.42 dBA

Total Leq All Segments: 46.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.26
(NIGHT): 46.29

STAMSON 5.0 NORMAL REPORT Date: 15-09-2009 09:21:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt50.te Time Period: Day/Night 16/8 hours
Description: **Receptor R5 – LRT at 50 km/hr**

RT/Custom data, segment # 1: KingstonLRT (day/night)
---
1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 50 km/h

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

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 86.00 / 86.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
---
1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 50 km/h

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

Angle1 Angle2 : -40.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 66.00 / 66.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 47.37 + 0.00) = 47.37 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	64.43	-12.59	-4.47	0.00	0.00	0.00	47.37

Segment Leq : 47.37 dBA

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Results segment # 2: EglintonLRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 50.22 + 0.00) = 50.22 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.66	64.43	-10.68	-3.53	0.00	0.00	0.00	50.22

Segment Leq : 50.22 dBA

Total Leq All Segments: 52.04 dBA

Results segment # 1: KingstonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 43.49 + 0.00) = 43.49 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.60	59.99	-12.13	-4.37	0.00	0.00	0.00	43.49

Segment Leq : 43.49 dBA

Results segment # 2: EglintonLRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 46.19 + 0.00) = 46.19 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-40	45	0.60	59.99	-10.30	-3.51	0.00	0.00	0.00	46.19

Segment Leq : 46.19 dBA

Total Leq All Segments: 48.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.04
(NIGHT): 48.06

STAMSON 5.0 COMPREHENSIVE REPORT Date: 15-06-2009 20:22:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9fwo.te Time Period: Day/Night 16/8 hours
Description: **Receptor R9 – Future No-Build**

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

Car traffic volume : 9551/1685 veh/TimePeriod *
Medium truck volume : 263/46 veh/TimePeriod *
Heavy truck volume : 71/13 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 11629
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.66
Heavy Truck % of Total Volume : 0.72
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.00 / 32.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume	: 8544/1508	veh/TimePeriod *
Medium truck volume	: 471/83	veh/TimePeriod *
Heavy truck volume	: 109/19	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 0	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	: 10734
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 5.16
Heavy Truck % of Total Volume	: 1.20
Day (16 hrs) % of Total Volume	: 85.00

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

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 21.00 / 24.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Segment # 1: MorningSideN (day)

Source height = 0.92 m

ROAD (0.00 + 58.28 + 0.00) = 58.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.49	0.00	-4.75	-1.46	0.00	0.00	0.00	58.28

Segment Leq : 58.28 dBA

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Segment # 2: MorningSideS (day)

Source height = 1.05 m

ROAD (0.00 + 61.47 + 0.00) = 61.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	65.36	0.00	-2.43	-1.46	0.00	0.00	0.00	61.47

Segment Leq : 61.47 dBA

Total Leq All Segments: 63.17 dBA

Segment # 1: MorningSideN (night)

Source height = 0.93 m

ROAD (0.00 + 53.43 + 0.00) = 53.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	59.99	0.00	-5.22	-1.33	0.00	0.00	0.00	53.43

Segment Leq : 53.43 dBA

Segment # 2: MorningSideS (night)

Source height = 1.04 m

ROAD (0.00 + 56.26 + 0.00) = 56.26 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	60.82	0.00	-3.23	-1.33	0.00	0.00	0.00	56.26

Segment Leq : 56.26 dBA

Total Leq All Segments: 58.08 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.17
(NIGHT): 58.08

```
STAMSON 5.0        NORMAL REPORT        Date: 14-06-2009 18:30:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9fu.te              Time Period: Day/Night 16/8 hours
Description:    Receptor R9 - Future Build (Roads Only)

Road data, segment # 1: MorningSideN (day/night)
-----------------------------------------------
Car traffic volume  :  9719/1715  veh/TimePeriod  *
Medium truck volume :    95/17    veh/TimePeriod  *
Heavy truck volume  :    71/13    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  11629
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   0.96
    Heavy Truck  % of Total Volume     :   0.72
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: MorningSideN (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  33.00 / 36.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```



```
Road data, segment # 2: MorningSideS (day/night)
-----------------------------------------------
Car traffic volume  :  8680/1532  veh/TimePeriod  *
Medium truck volume :   334/59    veh/TimePeriod  *
Heavy truck volume  :   109/19    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  10734
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.66
    Heavy Truck  % of Total Volume     :   1.20
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: MorningSideS (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  17.00 / 20.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.92 m

ROAD (0.00 + 56.75 + 0.00) = 56.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  63.89   0.00  -5.68  -1.46   0.00   0.00   0.00  56.75
-------------------------------------------------------------------------------

Segment Leq : 56.75 dBA
```

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Results segment # 2: MorningSideS (day)

Source height = 1.05 m

ROAD (0.00 + 62.61 + 0.00) = 62.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	64.97	0.00	-0.90	-1.46	0.00	0.00	0.00	62.61

Segment Leq : 62.61 dBA

Total Leq All Segments: 63.61 dBA

Results segment # 1: MorningSideN (night)

Source height = 0.93 m

ROAD (0.00 + 52.05 + 0.00) = 52.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	59.42	0.00	-6.03	-1.33	0.00	0.00	0.00	52.05

Segment Leq : 52.05 dBA

Results segment # 2: MorningSideS (night)

Source height = 1.04 m

ROAD (0.00 + 57.13 + 0.00) = 57.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	60.43	0.00	-1.98	-1.33	0.00	0.00	0.00	57.13

Segment Leq : 57.13 dBA

Total Leq All Segments: 58.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.61
(NIGHT): 58.30

STAMSON 5.0 NORMAL REPORT Date: 03-04-2009 14:54:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9l30.te Time Period: Day/Night 16/8 hours
Description: **Receptor R9 – LRT at 30 km/hr**
RT/Custom data, segment # 1: LRT (day/night)
---
1 - ALRV:
Traffic volume : 400/72 veh/TimePeriod
Speed : 30 km/h

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 28.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: LRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 55.23 + 0.00) = 55.23 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	60.37	-3.68	-1.46	0.00	0.00	0.00	55.23

Segment Leq : 55.23 dBA

Total Leq All Segments: 55.23 dBA

Results segment # 1: LRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 50.24 + 0.00) = 50.24 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	55.93	-4.34	-1.35	0.00	0.00	0.00	50.24

Segment Leq : 50.24 dBA

Total Leq All Segments: 50.24 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.23
(NIGHT): 50.24

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2009 14:54:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9l40.te             Time Period: Day/Night 16/8 hours
Description:    Receptor R9 - LRT at 40 km/hr

RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  25.00 / 28.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 57.52 + 0.00) = 57.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.66  62.66  -3.68  -1.46   0.00   0.00   0.00  57.52
-------------------------------------------------------------------------

Segment Leq : 57.52 dBA

Total Leq All Segments: 57.52 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 52.53 + 0.00) = 52.53 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  58.22  -4.34  -1.35   0.00   0.00   0.00  52.53
-------------------------------------------------------------------------
Segment Leq : 52.53 dBA

Total Leq All Segments: 52.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.52
                           (NIGHT): 52.53
```



```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2009 14:55:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9l50.te             Time Period: Day/Night 16/8 hours
Description:    Receptor R9 - LRT at 50 km/hr
RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  25.00 / 28.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 59.29 + 0.00) = 59.29 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.66  64.43  -3.68  -1.46   0.00   0.00   0.00  59.29
-------------------------------------------------------------------------

Segment Leq : 59.29 dBA

Total Leq All Segments: 59.29 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 54.30 + 0.00) = 54.30 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  59.99  -4.34  -1.35   0.00   0.00   0.00  54.30
-------------------------------------------------------------------------

Segment Leq : 54.30 dBA

Total Leq All Segments: 54.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.29
                           (NIGHT): 54.30
```

STAMSON 5.0 COMPREHENSIVE REPORT Date: 15-06-2009 09:38:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12fwo.te Time Period: Day/Night 16/8 hours
Description: **Receptor R12 – Future No-Build**

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

Car traffic volume : 11579/2043 veh/TimePeriod *
Medium truck volume : 505/89 veh/TimePeriod *
Heavy truck volume : 221/39 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 14477
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 4.10
Heavy Truck % of Total Volume : 1.80
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 18.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

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

Car traffic volume : 10511/1855 veh/TimePeriod *
Medium truck volume : 711/125 veh/TimePeriod *
Heavy truck volume : 136/24 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 13363
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 6.26
Heavy Truck % of Total Volume : 1.20
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 21.00 / 24.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Segment # 1: MorningSideN (day)

Source height = 1.16 m

ROAD (0.00 + 66.95 + 0.00) = 66.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.95	0.00	0.00	0.00	0.00	0.00	0.00	66.95

Segment Leq : 66.95 dBA

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Segment # 2: MorningSideS (day)

Source height = 1.05 m

ROAD (0.00 + 65.11 + 0.00) = 65.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.57	0.00	-1.46	0.00	0.00	0.00	0.00	65.11

Segment Leq : 65.11 dBA

Total Leq All Segments: 69.14 dBA

Segment # 1: MorningSideN (night)

Source height = 1.16 m

ROAD (0.00 + 61.63 + 0.00) = 61.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.42	0.00	-0.79	0.00	0.00	0.00	0.00	61.63

Segment Leq : 61.63 dBA

Segment # 2: MorningSideS (night)

Source height = 1.05 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.04	0.00	-2.04	0.00	0.00	0.00	0.00	60.00

Segment Leq : 60.00 dBA

Total Leq All Segments: 63.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.14
(NIGHT): 63.90

STAMSON 5.0 NORMAL REPORT Date: 15-06-2009 09:19:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12fu.te Time Period: Day/Night 16/8 hours
Description: **Receptor R12 – Future Build**

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

```
Car traffic volume  : 11789/2080  veh/TimePeriod  *
Medium truck volume :   295/52    veh/TimePeriod  *
Heavy truck volume  :   221/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)
```

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

```
    24 hr Traffic Volume (AADT or SADT):  14477
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.40
    Heavy Truck  % of Total Volume     :   1.80
    Day (16 hrs) % of Total Volume     :  85.00
```

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

```
Angle1   Angle2          : -90.00 deg   90.00 deg
Wood depth               :      0       (No woods.)
No of house rows         :      0 / 0
Surface                  :      2       (Reflective ground surface)
Receiver source distance :  15.00 / 16.00  m
Receiver height          :   1.50 / 4.50   m
Topography               :      1       (Flat/gentle slope; no barrier)
Reference angle          :   0.00
```

Page 2

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

Car traffic volume	: 10807/1907	veh/TimePeriod *
Medium truck volume	: 416/73	veh/TimePeriod *
Heavy truck volume	: 136/24	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 0	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	: 13363
Percentage of Annual Growth	: 0.00
Number of Years of Growth	: 0.00
Medium Truck % of Total Volume	: 3.66
Heavy Truck % of Total Volume	: 1.20
Day (16 hrs) % of Total Volume	: 85.00

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

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 2	(Reflective ground surface)
Receiver source distance	: 33.00 / 36.00	m
Receiver height	: 1.50 / 4.50	m
Topography	: 1	(Flat/gentle slope; no barrier)
Reference angle	: 0.00	

Results segment # 1: MorningSideN (day)

Source height = 1.16 m

ROAD (0.00 + 66.54 + 0.00) = 66.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.54	0.00	0.00	0.00	0.00	0.00	0.00	66.54

Segment Leq : 66.54 dBA

Page 3

Results segment # 2: MorningSideS (day)

Source height = 1.05 m

ROAD (0.00 + 62.50 + 0.00) = 62.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.92	0.00	-3.42	0.00	0.00	0.00	0.00	62.50

Segment Leq : 62.50 dBA

Total Leq All Segments: 67.98 dBA

Results segment # 1: MorningSideN (night)

Source height = 1.16 m

ROAD (0.00 + 61.73 + 0.00) = 61.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.01	0.00	-0.28	0.00	0.00	0.00	0.00	61.73

Segment Leq : 61.73 dBA

Results segment # 2: MorningSideS (night)

Source height = 1.05 m

ROAD (0.00 + 57.59 + 0.00) = 57.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	61.40	0.00	-3.80	0.00	0.00	0.00	0.00	57.59

Segment Leq : 57.59 dBA

Total Leq All Segments: 63.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.98
(NIGHT): 63.15

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2009 09:46:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12l30.te            Time Period: Day/Night 16/8 hours
Description:    Receptor R12 - LRT at 30 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 26.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 58.52 + 0.00) = 58.52 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  60.37  -1.86   0.00   0.00   0.00   0.00  58.52
-------------------------------------------------------------------------

Segment Leq : 58.52 dBA

Total Leq All Segments: 58.52 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 53.55 + 0.00) = 53.55 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  55.93  -2.39   0.00   0.00   0.00   0.00  53.55
-------------------------------------------------------------------------

Segment Leq : 53.55 dBA

Total Leq All Segments: 53.55 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 58.52
                           (NIGHT): 53.55
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2009 09:46:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12l40.te            Time Period: Day/Night 16/8 hours
Description:     Receptor R12 - LRT at 40 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 26.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 60.80 + 0.00) = 60.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  62.66  -1.86   0.00   0.00   0.00   0.00  60.80
-------------------------------------------------------------------------

Segment Leq : 60.80 dBA

Total Leq All Segments: 60.80 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 55.83 + 0.00) = 55.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  58.22  -2.39   0.00   0.00   0.00   0.00  55.83
-------------------------------------------------------------------------

Segment Leq : 55.83 dBA

Total Leq All Segments: 55.83 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 60.80
                           (NIGHT): 55.83
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2009 09:47:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12l50.te            Time Period: Day/Night 16/8 hours
Description:     Receptor R12 - LRT at 50 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 26.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 62.58 + 0.00) = 62.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  64.43  -1.86   0.00   0.00   0.00   0.00  62.58
-------------------------------------------------------------------------

Segment Leq : 62.58 dBA

Total Leq All Segments: 62.58 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 57.61 + 0.00) = 57.61 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.99  -2.39   0.00   0.00   0.00   0.00  57.61
-------------------------------------------------------------------------

Segment Leq : 57.61 dBA

Total Leq All Segments: 57.61 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 62.58
                           (NIGHT): 57.61
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

STAMSON 5.0 NORMAL REPORT Date: 25-06-2009 12:20:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ner13fwo.te Time Period: Day/Night 16/8 hours
Description: **Receptor R13 - Future No-Build**

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

Car traffic volume : 7280/1285 veh/TimePeriod *
Medium truck volume : 533/94 veh/TimePeriod *
Heavy truck volume : 79/14 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 9284
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 6.75
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 48.00 / 51.00 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 4.00 m
Elevation : 4.00 m
Barrier receiver distance : 36.90 / 39.90 m
Source elevation : 0.00 m
Receiver elevation : 4.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

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

Car traffic volume : 5116/903 veh/TimePeriod *
Medium truck volume : 537/95 veh/TimePeriod *
Heavy truck volume : 300/53 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 7003
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 9.02
Heavy Truck % of Total Volume : 5.04
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 41.00 / 44.00 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 4.00 m
Elevation : 4.00 m
Barrier receiver distance : 37.30 / 40.30 m
Source elevation : 0.00 m
Receiver elevation : 4.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: EllesmereWB (day)

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.00	1.50	2.04	2.04

ROAD (0.00 + 50.78 + 0.00) = 50.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.93	0.00	-5.05	0.00	0.00	0.00	-9.10	50.78

Segment Leq : 50.78 dBA

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Results segment # 2: EllesmereEB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.86	1.86

ROAD (0.00 + 50.30 + 0.00) = 50.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.61	0.00	-4.37	0.00	0.00	0.00	-11.95	50.30

Segment Leq : 50.30 dBA

Total Leq All Segments: 53.56 dBA

Results segment # 1: EllesmereWB (night)

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.00	4.50	2.63	2.63

ROAD (0.00 + 47.62 + 0.00) = 47.62 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.41	0.00	-5.31	0.00	0.00	0.00	-7.47	47.62

Segment Leq : 47.62 dBA

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Results segment # 2: EllesmereEB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	2.09	2.09

ROAD (0.00 + 46.27 + 0.00) = 46.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.10	0.00	-4.67	0.00	0.00	0.00	-11.16	46.27

Segment Leq : 46.27 dBA

Total Leq All Segments: 50.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.56
(NIGHT): 50.01

STAMSON 5.0 NORMAL REPORT Date: 17-06-2009 10:37:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: NewR13fu.te Time Period: Day/Night 16/8 hours
Description: **Receptor R13 – Future Build (Roads Only)**

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

Car traffic volume	:	7572/1336	veh/TimePeriod *
Medium truck volume	:	241/42	veh/TimePeriod *
Heavy truck volume	:	79/14	veh/TimePeriod *
Posted speed limit	:	60 km/h	
Road gradient	:	0 %	
Road pavement	:	1 (Typical asphalt or concrete)	

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

24 hr Traffic Volume (AADT or SADT)	:	9284
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	3.05
Heavy Truck % of Total Volume	:	1.00
Day (16 hrs) % of Total Volume	:	85.00

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

Angle1 Angle2	:	-90.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	2	(Reflective ground surface)
Receiver source distance	:	48.00 / 51.00	m
Receiver height	:	1.50 / 4.50	m
Topography	:	4	(Elevated; with barrier)
Barrier angle1	:	-90.00 deg	Angle2 : 90.00 deg
Barrier height	:	4.00	m
Elevation	:	4.00	m
Barrier receiver distance	:	29.70 / 32.70	m
Source elevation	:	0.00	m
Receiver elevation	:	4.00	m
Barrier elevation	:	0.00	m
Reference angle	:	0.00	

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

Car traffic volume	:	5253/927	veh/TimePeriod *
Medium truck volume	:	400/71	veh/TimePeriod *
Heavy truck volume	:	300/53	veh/TimePeriod *
Posted speed limit	:	60 km/h	
Road gradient	:	0 %	
Road pavement	:	1 (Typical asphalt or concrete)	

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

24 hr Traffic Volume (AADT or SADT)	:	7003
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	6.72
Heavy Truck % of Total Volume	:	5.04
Day (16 hrs) % of Total Volume	:	85.00

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

Angle1 Angle2	:	-90.00 deg	90.00 deg
Wood depth	:	0	(No woods.)
No of house rows	:	0 / 0	
Surface	:	2	(Reflective ground surface)
Receiver source distance	:	41.00 / 44.00	m
Receiver height	:	1.50 / 4.50	m
Topography	:	4	(Elevated; with barrier)
Barrier angle1	:	-90.00 deg	Angle2 : 90.00 deg
Barrier height	:	4.00	m
Elevation	:	4.00	m
Barrier receiver distance	:	30.10 / 33.10	m
Source elevation	:	0.00	m
Receiver elevation	:	4.00	m
Barrier elevation	:	0.00	m
Reference angle	:	0.00	

Results segment # 1: EllesmereWB (day)

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.00	1.50	2.72	2.72

ROAD (0.00 + 52.03 + 0.00) = 52.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.96	0.00	-5.05	0.00	0.00	0.00	-6.88	52.03

Segment Leq : 52.03 dBA

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Results segment # 2: EllesmereEB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	2.56	2.56

ROAD (0.00 + 54.10 + 0.00) = 54.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.33	0.00	-4.37	0.00	0.00	0.00	-7.86	54.10

Segment Leq : 54.10 dBA

Total Leq All Segments: 56.20 dBA

Results segment # 1: EllesmereWB (night)

Source height = 1.00 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.00	4.50	3.69	3.69

ROAD (0.00 + 48.99 + 0.00) = 48.99 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	59.43	0.00	-5.31	0.00	0.00	0.00	-5.13	48.99

Segment Leq : 48.99 dBA

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Results segment # 2: EllesmereEB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	4.50	3.23	3.23

ROAD (0.00 + 51.13 + 0.00) = 51.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	61.81	0.00	-4.67	0.00	0.00	0.00	-6.01	51.13

Segment Leq : 51.13 dBA

Total Leq All Segments: 53.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.20
(NIGHT): 53.20

```
STAMSON 5.0        NORMAL REPORT        Date: 25-06-2009 15:05:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13l30.te            Time Period: Day/Night 16/8 hours
Description:   Receptor R13 - LRT at 30 km/hr

RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 28.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.00 m
Elevation                 :   4.00 m
Barrier receiver distance :  21.40 / 24.40  m
Source elevation          :   0.00 m
Receiver elevation        :   4.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.22 !         1.22

RT/Custom (0.00 + 44.64 + 0.00) = 44.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  60.37  -2.22   0.00   0.00   0.00 -13.52  44.64
-------------------------------------------------------------------

Segment Leq : 44.64 dBA

Total Leq All Segments: 44.64 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
Page 2

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        4.50 !        1.53 !         1.53

RT/Custom (0.00 + 40.74 + 0.00) = 40.74 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  55.93  -2.71   0.00   0.00   0.00 -12.48  40.74
-------------------------------------------------------------------

Segment Leq : 40.74 dBA

Total Leq All Segments: 40.74 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 44.64
                           (NIGHT): 40.74
```

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```
STAMSON 5.0        NORMAL REPORT        Date: 25-06-2009 15:10:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13l40.te            Time Period: Day/Night 16/8 hours
Description:   Receptor R13 - LRT at 40 km/hr

RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 28.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.00 m
Elevation                 :   4.00 m
Barrier receiver distance :  21.40 / 24.40  m
Source elevation          :   0.00 m
Receiver elevation        :   4.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.22 !         1.22

RT/Custom (0.00 + 46.92 + 0.00) = 46.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  62.66  -2.22   0.00   0.00   0.00 -13.52  46.92
-------------------------------------------------------------------

Segment Leq : 46.92 dBA

Total Leq All Segments: 46.92 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
Page 2

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        4.50 !        1.53 !         1.53

RT/Custom (0.00 + 43.03 + 0.00) = 43.03 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  58.22  -2.71   0.00   0.00   0.00 -12.48  43.03
-------------------------------------------------------------------

Segment Leq : 43.03 dBA

Total Leq All Segments: 43.03 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 46.92
                           (NIGHT): 43.03
```

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```
STAMSON 5.0        NORMAL REPORT        Date: 25-06-2009 15:13:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13l50.te            Time Period: Day/Night 16/8 hours
Description:     Receptor R13 - LRT at 50 km/hr

RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 28.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      4       (Elevated; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   4.00 m
Elevation                 :   4.00 m
Barrier receiver distance :  21.40 / 24.40  m
Source elevation          :   0.00 m
Receiver elevation        :   4.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        1.50 !        1.22 !         1.22

RT/Custom (0.00 + 48.70 + 0.00) = 48.70 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  64.43  -2.22   0.00   0.00   0.00 -13.52  48.70
-------------------------------------------------------------------

Segment Leq : 48.70 dBA

Total Leq All Segments: 48.70 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
Page 2

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

Source height = 0.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       0.50 !        4.50 !        1.53 !         1.53

RT/Custom (0.00 + 44.80 + 0.00) = 44.80 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90     90   0.00  59.99  -2.71   0.00   0.00   0.00 -12.48  44.80
-------------------------------------------------------------------

Segment Leq : 44.80 dBA

Total Leq All Segments: 44.80 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 48.70
                           (NIGHT): 44.80
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

STAMSON 5.0 NORMAL REPORT Date: 10-09-2009 14:50:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: AR1FWO.te Time Period: Day/Night 16/8 hours
Description: **Receptor AR1 – Future No-Build**

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

Car traffic volume : 14685/2591 veh/TimePeriod *
Medium truck volume : 1126/199 veh/TimePeriod *
Heavy truck volume : 160/28 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 18789
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.05
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 26.50 / 29.50 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

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

Car traffic volume : 11730/2070 veh/TimePeriod *
Medium truck volume : 1287/227 veh/TimePeriod *
Heavy truck volume : 588/104 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 16005
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 9.46
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.50 / 18.50 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: EglintonWB (day)

Source height = 1.00 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.06	0.00	-2.47	0.00	0.00	0.00	0.00	65.59

Segment Leq : 65.59 dBA

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Results segment # 2: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 69.78 + 0.00) = 69.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.92	0.00	-0.14	0.00	0.00	0.00	0.00	69.78

Segment Leq : 69.78 dBA

Total Leq All Segments: 71.18 dBA

Results segment # 1: EglintonWB (night)

Source height = 1.00 m

ROAD (0.00 + 60.60 + 0.00) = 60.60 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.53	0.00	-2.94	0.00	0.00	0.00	0.00	60.60

Segment Leq : 60.60 dBA

Results segment # 2: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 64.49 + 0.00) = 64.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.40	0.00	-0.91	0.00	0.00	0.00	0.00	64.49

Segment Leq : 64.49 dBA

Total Leq All Segments: 65.98 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.18
(NIGHT): 65.98

STAMSON 5.0 NORMAL REPORT Date: 10-09-2009 15:04:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ar1fb.te Time Period: Day/Night 16/8 hours
Description: **Receptor AR1 – Future Build (Roads Only)**

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

Car traffic volume : 15324/2704 veh/TimePeriod *
Medium truck volume : 487/86 veh/TimePeriod *
Heavy truck volume : 160/28 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 18789
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.05
Heavy Truck % of Total Volume : 1.00
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 28.00 / 31.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 12233/2159 veh/TimePeriod *
Medium truck volume : 784/138 veh/TimePeriod *
Heavy truck volume : 588/104 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 16005
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 5.76
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 16.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: EglintonWB (day)

Source height = 1.00 m

ROAD (0.00 + 64.31 + 0.00) = 64.31 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.02	0.00	-2.71	0.00	0.00	0.00	0.00	64.31

Segment Leq : 64.31 dBA

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Results segment # 2: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 67.96 + 0.00) = 67.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	69.42	0.00	0.00	-1.46	0.00	0.00	0.00	67.96

Segment Leq : 67.96 dBA

Total Leq All Segments: 69.52 dBA

Results segment # 1: EglintonWB (night)

Source height = 1.00 m

ROAD (0.00 + 59.34 + 0.00) = 59.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.49	0.00	-3.15	0.00	0.00	0.00	0.00	59.34

Segment Leq : 59.34 dBA

Results segment # 2: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 63.15 + 0.00) = 63.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.57	64.90	0.00	-0.44	-1.31	0.00	0.00	0.00	63.15

Segment Leq : 63.15 dBA

Total Leq All Segments: 64.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.52
(NIGHT): 64.66

```
STAMSON 5.0        NORMAL REPORT        Date: 10-09-2009 15:09:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt30.te             Time Period: Day/Night 16/8 hours
Description:   Receptor AR1 - LRT at 30 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 59.12 + 0.00) = 59.12 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  60.37  -1.25   0.00   0.00   0.00   0.00  59.12
-------------------------------------------------------------------------

Segment Leq : 59.12 dBA

Total Leq All Segments: 59.12 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 54.08 + 0.00) = 54.08 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  55.93  -1.86   0.00   0.00   0.00   0.00  54.08
-------------------------------------------------------------------------

Segment Leq : 54.08 dBA

Total Leq All Segments: 54.08 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 59.12
                           (NIGHT): 54.08
```

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```
STAMSON 5.0        NORMAL REPORT        Date: 10-09-2009 15:09:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt40.te             Time Period: Day/Night 16/8 hours
Description:  Receptor AR2 - LRT at 40 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 61.41 + 0.00) = 61.41 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  62.66  -1.25   0.00   0.00   0.00   0.00  61.41
-------------------------------------------------------------------------

Segment Leq : 61.41 dBA

Total Leq All Segments: 61.41 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 56.36 + 0.00) = 56.36 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  58.22  -1.86   0.00   0.00   0.00   0.00  56.36
-------------------------------------------------------------------------

Segment Leq : 56.36 dBA

Total Leq All Segments: 56.36 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 61.41
                           (NIGHT): 56.36
```

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```
STAMSON 5.0        NORMAL REPORT        Date: 10-09-2009 15:10:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt50.te             Time Period: Day/Night 16/8 hours
Description:    Receptor AR1 - LRT at 50 km/hr


RT/Custom data, segment # 1: LRT (day/night)
-----------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 23.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 63.18 + 0.00) = 63.18 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  64.43  -1.25   0.00   0.00   0.00   0.00  63.18
-------------------------------------------------------------------------

Segment Leq : 63.18 dBA

Total Leq All Segments: 63.18 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 58.14 + 0.00) = 58.14 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.99  -1.86   0.00   0.00   0.00   0.00  58.14
-------------------------------------------------------------------------

Segment Leq : 58.14 dBA

Total Leq All Segments: 58.14 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 63.18
                           (NIGHT): 58.14
```

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STAMSON 5.0 NORMAL REPORT Date: 11-09-2009 08:33:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ar2fwo.te Time Period: Day/Night 16/8 hours
Description: **Receptor AR2 – Future No-Build**

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

Car traffic volume : 25627/4522 veh/TimePeriod *
Medium truck volume : 1337/236 veh/TimePeriod *
Heavy truck volume : 438/77 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	32239
Percentage of Annual Growth	0.00
Number of Years of Growth	0.00
Medium Truck % of Total Volume	4.88
Heavy Truck % of Total Volume	1.60
Day (16 hrs) % of Total Volume	85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 27.00 / 30.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 23470/4142 veh/TimePeriod *
Medium truck volume : 569/100 veh/TimePeriod *
Heavy truck volume : 262/46 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	28590
Percentage of Annual Growth	0.00
Number of Years of Growth	0.00
Medium Truck % of Total Volume	2.34
Heavy Truck % of Total Volume	1.08
Day (16 hrs) % of Total Volume	85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 43.00 / 46.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 7012/1237 veh/TimePeriod *
Medium truck volume : 645/114 veh/TimePeriod *
Heavy truck volume : 346/61 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 9415
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 8.06
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : 33.00 deg 60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 141.00 / 141.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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Road data, segment # 4: EglintonWB (day/night)

Car traffic volume : 8297/1464 veh/TimePeriod *
Medium truck volume : 619/109 veh/TimePeriod *
Heavy truck volume : 108/19 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 10617
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 6.86
Heavy Truck % of Total Volume : 1.20
Day (16 hrs) % of Total Volume : 85.00

Data for Segment # 4: EglintonWB (day/night)

Angle1 Angle2 : 33.00 deg 60.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 129.00 / 129.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonNB (day)

Source height = 1.12 m

ROAD (0.00 + 67.88 + 0.00) = 67.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.43	0.00	-2.55	0.00	0.00	0.00	0.00	67.88

Segment Leq : 67.88 dBA

Results segment # 2: KingstonSB (day)

Source height = 1.02 m

ROAD (0.00 + 64.15 + 0.00) = 64.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.72	0.00	-4.57	0.00	0.00	0.00	0.00	64.15

Segment Leq : 64.15 dBA

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Results segment # 3: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 49.46 + 0.00) = 49.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	60	0.00	67.43	0.00	-9.73	-8.24	0.00	0.00	0.00	49.46

Segment Leq : 49.46 dBA

Results segment # 4: EglintonWB (day)

Source height = 1.05 m

ROAD (0.00 + 48.12 + 0.00) = 48.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	60	0.00	65.71	0.00	-9.34	-8.24	0.00	0.00	0.00	48.12

Segment Leq : 48.12 dBA

Total Leq All Segments: 69.49 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.12 m

ROAD (0.00 + 62.89 + 0.00) = 62.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.90	0.00	-3.01	0.00	0.00	0.00	0.00	62.89

Segment Leq : 62.89 dBA

Results segment # 2: KingstonSB (night)

Source height = 1.02 m

ROAD (0.00 + 59.32 + 0.00) = 59.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.19	0.00	-4.87	0.00	0.00	0.00	0.00	59.32

Segment Leq : 59.32 dBA

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Results segment # 3: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 44.94 + 0.00) = 44.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	60	0.00	62.91	0.00	-9.73	-8.24	0.00	0.00	0.00	44.94

Segment Leq : 44.94 dBA

Results segment # 4: EglintonWB (night)

Source height = 1.05 m

ROAD (0.00 + 43.59 + 0.00) = 43.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
33	60	0.00	61.18	0.00	-9.34	-8.24	0.00	0.00	0.00	43.59

Segment Leq : 43.59 dBA

Total Leq All Segments: 64.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.49
(NIGHT): 64.56

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 09:11:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ar2fb.te             Time Period: Day/Night 16/8 hours
Description:   Receptor AR2 - Future Build (Roads Only)


Road data, segment # 1: KingstonNB (day/night)
-----------------------------------------------
Car traffic volume  : 25562/4511  veh/TimePeriod  *
Medium truck volume :  1052/186   veh/TimePeriod  *
Heavy truck volume  :   789/139   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  32239
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   3.84
    Heavy Truck  % of Total Volume     :   2.88
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: KingstonNB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  29.00 / 32.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment


```
Road data, segment # 2: KingstonSB (day/night)
-----------------------------------------------
Car traffic volume  : 23711/4184  veh/TimePeriod  *
Medium truck volume :   445/78    veh/TimePeriod  *
Heavy truck volume  :   146/26    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  28590
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   1.83
    Heavy Truck  % of Total Volume     :   0.60
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: KingstonSB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  45.00 / 48.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Car traffic volume : 7196/1270 veh/TimePeriod *
Medium truck volume : 461/81 veh/TimePeriod *
Heavy truck volume : 346/61 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 9415
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 5.76
Heavy Truck % of Total Volume : 4.32
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : 20.00 deg 45.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 156.00 / 156.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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Road data, segment # 4: EglintonWB (day/night)

Car traffic volume : 8586/1515 veh/TimePeriod *
Medium truck volume : 330/58 veh/TimePeriod *
Heavy truck volume : 108/19 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 10617
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.66
Heavy Truck % of Total Volume : 1.20
Day (16 hrs) % of Total Volume : 85.00

Data for Segment # 4: EglintonWB (day/night)

Angle1 Angle2 : -90.00 deg 25.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 68.00 / 68.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonNB (day)

Source height = 1.30 m

ROAD (0.00 + 68.37 + 0.00) = 68.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	71.23	0.00	-2.86	0.00	0.00	0.00	0.00	68.37

Segment Leq : 68.37 dBA

Results segment # 2: KingstonSB (day)

Source height = 0.88 m

ROAD (0.00 + 63.18 + 0.00) = 63.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.96	0.00	-4.77	0.00	0.00	0.00	0.00	63.18

Segment Leq : 63.18 dBA

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Results segment # 3: EglintonEB (day)

Source height = 1.44 m

ROAD (0.00 + 48.37 + 0.00) = 48.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
20	45	0.00	67.11	0.00	-10.17	-8.57	0.00	0.00	0.00	48.37

Segment Leq : 48.37 dBA

Results segment # 4: EglintonWB (day)

Source height = 1.05 m

ROAD (0.00 + 50.96 + 0.00) = 50.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	25	0.66	64.92	0.00	-10.90	-3.07	0.00	0.00	0.00	50.96

Segment Leq : 50.96 dBA

Total Leq All Segments: 69.61 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.30 m

ROAD (0.00 + 63.42 + 0.00) = 63.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.71	0.00	-3.29	0.00	0.00	0.00	0.00	63.42

Segment Leq : 63.42 dBA

Results segment # 2: KingstonSB (night)

Source height = 0.88 m

ROAD (0.00 + 58.38 + 0.00) = 58.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.44	0.00	-5.05	0.00	0.00	0.00	0.00	58.38

Segment Leq : 58.38 dBA

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Results segment # 3: EglintonEB (night)

Source height = 1.44 m

ROAD (0.00 + 43.84 + 0.00) = 43.84 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
20	45	0.00	62.58	0.00	-10.17	-8.57	0.00	0.00	0.00	43.84

Segment Leq : 43.84 dBA

Results segment # 4: EglintonWB (night)

Source height = 1.05 m

ROAD (0.00 + 47.03 + 0.00) = 47.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	25	0.58	60.39	0.00	-10.40	-2.97	0.00	0.00	0.00	47.03

Segment Leq : 47.03 dBA

Total Leq All Segments: 64.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.61
(NIGHT): 64.71

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 09:15:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt30.te             Time Period: Day/Night 16/8 hours
Description:  Receptor AR2 - LRT at 30 km/hr

RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 2: EglintonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -40.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 / 34.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 53.10 + 0.00) = 53.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
     0     90   0.00  60.37  -4.26  -3.01   0.00   0.00   0.00  53.10
-------------------------------------------------------------------
Segment Leq : 53.10 dBA
```



```
Page 2

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

Source height = 0.50 m

RT/Custom (0.00 + 51.25 + 0.00) = 51.25 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -40   0.00  60.37  -3.55  -5.56   0.00   0.00   0.00  51.25
-------------------------------------------------------------------

Segment Leq : 51.25 dBA

Total Leq All Segments: 55.28 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 48.66 + 0.00) = 48.66 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
     0     90   0.00  55.93  -4.26  -3.01   0.00   0.00   0.00  48.66
-------------------------------------------------------------------

Segment Leq : 48.66 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 46.82 + 0.00) = 46.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -40   0.00  55.93  -3.55  -5.56   0.00   0.00   0.00  46.82
-------------------------------------------------------------------

Segment Leq : 46.82 dBA

Total Leq All Segments: 50.85 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 55.28
                           (NIGHT): 50.85
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 09:16:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt40.te             Time Period: Day/Night 16/8 hours
Description:    Receptor AR2 - LRT at 40 km/hr

RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 2: EglintonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -40.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 / 34.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 55.39 + 0.00) = 55.39 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  62.66  -4.26  -3.01   0.00   0.00   0.00  55.39
-------------------------------------------------------------------------
Segment Leq : 55.39 dBA
```



```
Page 2

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

Source height = 0.50 m

RT/Custom (0.00 + 53.54 + 0.00) = 53.54 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -40   0.00  62.66  -3.55  -5.56   0.00   0.00   0.00  53.54
-------------------------------------------------------------------------

Segment Leq : 53.54 dBA

Total Leq All Segments: 57.57 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 50.95 + 0.00) = 50.95 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  58.22  -4.26  -3.01   0.00   0.00   0.00  50.95
-------------------------------------------------------------------------

Segment Leq : 50.95 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 49.10 + 0.00) = 49.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -40   0.00  58.22  -3.55  -5.56   0.00   0.00   0.00  49.10
-------------------------------------------------------------------------

Segment Leq : 49.10 dBA

Total Leq All Segments: 53.13 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 57.57
                           (NIGHT): 53.13
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 09:16:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt50.te             Time Period: Day/Night 16/8 hours
Description:   Receptor AR2 - LRT at 50 km/hr

RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  40.00 / 40.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

RT/Custom data, segment # 2: EglintonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 2: EglintonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -40.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  34.00 / 34.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 57.16 + 0.00) = 57.16 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  64.43  -4.26  -3.01   0.00   0.00   0.00  57.16
-------------------------------------------------------------------------
Segment Leq : 57.16 dBA
```



```
Results segment # 2: EglintonLRT (day)
--------------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 55.31 + 0.00) = 55.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -40   0.00  64.43  -3.55  -5.56   0.00   0.00   0.00  55.31
-------------------------------------------------------------------------

Segment Leq : 55.31 dBA

Total Leq All Segments: 59.34 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 52.72 + 0.00) = 52.72 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.00  59.99  -4.26  -3.01   0.00   0.00   0.00  52.72
-------------------------------------------------------------------------

Segment Leq : 52.72 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 50.88 + 0.00) = 50.88 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -40   0.00  59.99  -3.55  -5.56   0.00   0.00   0.00  50.88
-------------------------------------------------------------------------

Segment Leq : 50.88 dBA

Total Leq All Segments: 54.91 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 59.34
                           (NIGHT): 54.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 09:42:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: af3fwo.te            Time Period: Day/Night 16/8 hours
Description:   Receptor AR3 - Future No-Build


Road data, segment # 1: KingstonNB (day/night)
-----------------------------------------------
Car traffic volume  : 18249/3220  veh/TimePeriod  *
Medium truck volume :  1010/178   veh/TimePeriod  *
Heavy truck volume  :   273/48    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  22979
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   5.17
    Heavy Truck  % of Total Volume     :   1.40
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 1: KingstonNB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 16.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```



```
Road data, segment # 2: KingstonSB (day/night)
-----------------------------------------------
Car traffic volume  : 19533/3447  veh/TimePeriod  *
Medium truck volume :   577/102   veh/TimePeriod  *
Heavy truck volume  :   220/39    veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  23917
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   2.84
    Heavy Truck  % of Total Volume     :   1.08
    Day (16 hrs) % of Total Volume     :  85.00

Data for Segment # 2: KingstonSB (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  28.00 / 31.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.09 m

ROAD (0.00 + 68.85 + 0.00) = 68.85 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.85   0.00   0.00   0.00   0.00   0.00   0.00  68.85
-------------------------------------------------------------------------------

Segment Leq : 68.85 dBA
```

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Results segment # 2: KingstonSB (day)

Source height = 1.02 m

ROAD (0.00 + 65.39 + 0.00) = 65.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.10	0.00	-2.71	0.00	0.00	0.00	0.00	65.39

Segment Leq : 65.39 dBA

Total Leq All Segments: 70.47 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.09 m

ROAD (0.00 + 64.04 + 0.00) = 64.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.32	0.00	-0.28	0.00	0.00	0.00	0.00	64.04

Segment Leq : 64.04 dBA

Results segment # 2: KingstonSB (night)

Source height = 1.02 m

ROAD (0.00 + 60.43 + 0.00) = 60.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	63.58	0.00	-3.15	0.00	0.00	0.00	0.00	60.43

Segment Leq : 60.43 dBA

Total Leq All Segments: 65.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.47
(NIGHT): 65.61

STAMSON 5.0 NORMAL REPORT Date: 11-09-2009 09:58:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ar3fb.te Time Period: Day/Night 16/8 hours
Description: **Receptor AR3 – Future Build (Roads Only)**

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

Car traffic volume	: 18384/3244	veh/TimePeriod *
Medium truck volume	: 656/116	veh/TimePeriod *
Heavy truck volume	: 492/87	veh/TimePeriod *
Posted speed limit	: 60	km/h
Road gradient	: 0	%
Road pavement	: 1	(Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT)	:	22979
Percentage of Annual Growth	:	0.00
Number of Years of Growth	:	0.00
Medium Truck % of Total Volume	:	3.36
Heavy Truck % of Total Volume	:	2.52
Day (16 hrs) % of Total Volume	:	85.00

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

Angle1 Angle2	:	-90.00 deg 90.00 deg
Wood depth	:	0 (No woods.)
No of house rows	:	0 / 0
Surface	:	2 (Reflective ground surface)
Receiver source distance	:	15.00 / 15.00 m
Receiver height	:	1.50 / 4.50 m
Topography	:	1 (Flat/gentle slope; no barrier)
Reference angle	:	0.00

Page 2

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

Car traffic volume : 19835/3500 veh/TimePeriod *
Medium truck volume : 372/66 veh/TimePeriod *
Heavy truck volume : 122/22 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 23917
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.83
Heavy Truck % of Total Volume : 0.60
Day (16 hrs) % of Total Volume : 85.00

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

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 23.00 / 26.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: KingstonNB (day)

Source height = 1.26 m

ROAD (0.00 + 69.39 + 0.00) = 69.39 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	69.39	0.00	0.00	0.00	0.00	0.00	0.00	69.39

Segment Leq : 69.39 dBA

Page 3

Results segment # 2: KingstonSB (day)

Source height = 0.88 m

ROAD (0.00 + 65.32 + 0.00) = 65.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	67.18	0.00	-1.86	0.00	0.00	0.00	0.00	65.32

Segment Leq : 65.32 dBA

Total Leq All Segments: 70.83 dBA

Results segment # 1: KingstonNB (night)

Source height = 1.26 m

ROAD (0.00 + 64.88 + 0.00) = 64.88 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	64.88	0.00	0.00	0.00	0.00	0.00	0.00	64.88

Segment Leq : 64.88 dBA

Results segment # 2: KingstonSB (night)

Source height = 0.88 m

ROAD (0.00 + 60.29 + 0.00) = 60.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	62.68	0.00	-2.39	0.00	0.00	0.00	0.00	60.29

Segment Leq : 60.29 dBA

Total Leq All Segments: 66.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.83
(NIGHT): 66.18

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 10:02:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt30.te             Time Period: Day/Night 16/8 hours
Description:  Receptor AR3 - LRT at 30 km/hr


RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    30 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 20.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 59.83 + 0.00) = 59.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  60.37  -0.54   0.00   0.00   0.00   0.00  59.83
-------------------------------------------------------------------------

Segment Leq : 59.83 dBA

Total Leq All Segments: 59.83 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 54.69 + 0.00) = 54.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  55.93  -1.25   0.00   0.00   0.00   0.00  54.69
-------------------------------------------------------------------------

Segment Leq : 54.69 dBA

Total Leq All Segments: 54.69 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 59.83
                           (NIGHT): 54.69
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 10:02:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt40.te             Time Period: Day/Night 16/8 hours
Description:   Receptor AR3 - LRT at 40 km/hr


RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 20.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 62.11 + 0.00) = 62.11 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  62.66  -0.54   0.00   0.00   0.00   0.00  62.11
-------------------------------------------------------------------------

Segment Leq : 62.11 dBA

Total Leq All Segments: 62.11 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 56.97 + 0.00) = 56.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  58.22  -1.25   0.00   0.00   0.00   0.00  56.97
-------------------------------------------------------------------------

Segment Leq : 56.97 dBA

Total Leq All Segments: 56.97 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

```
TOTAL Leq FROM ALL SOURCES (DAY): 62.11
                           (NIGHT): 56.97
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

```
STAMSON 5.0        NORMAL REPORT        Date: 11-09-2009 10:03:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: lrt50.te             Time Period: Day/Night 16/8 hours
Description:  Receptor AR3 - LRT at 50 km/hr


RT/Custom data, segment # 1: KingstonLRT (day/night)
----------------------------------------------------
1 - ALRV:
Traffic volume    :   400/72    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: KingstonLRT (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 20.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 0.50 m

RT/Custom (0.00 + 63.89 + 0.00) = 63.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  64.43  -0.54   0.00   0.00   0.00   0.00  63.89
-------------------------------------------------------------------------

Segment Leq : 63.89 dBA

Total Leq All Segments: 63.89 dBA

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

Source height = 0.50 m

RT/Custom (0.00 + 58.75 + 0.00) = 58.75 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.99  -1.25   0.00   0.00   0.00   0.00  58.75
-------------------------------------------------------------------------

Segment Leq : 58.75 dBA

Total Leq All Segments: 58.75 dBA
```


Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment

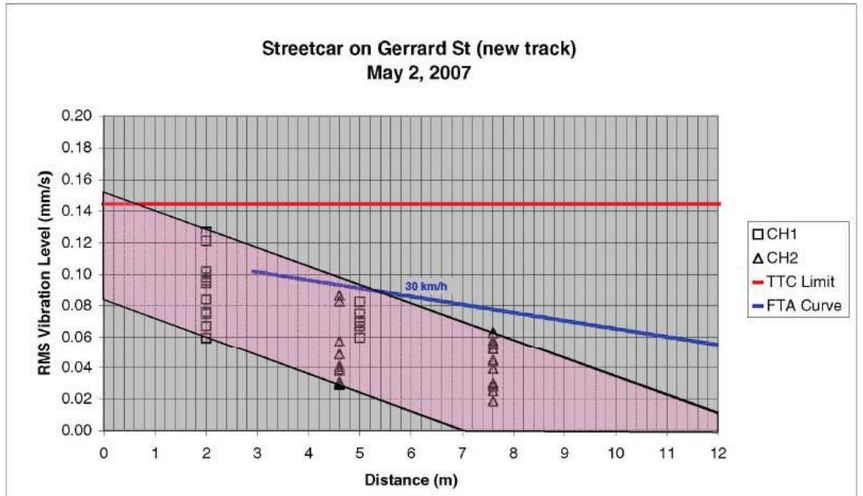
```
TOTAL Leq FROM ALL SOURCES (DAY): 63.89
                           (NIGHT): 58.75
```

34711-1 - 22Sep09 - STAMSON Outputs for Sample Calcs.doc SENES Consultants Limited

APPENDIX G

VIBRATION MEASUREMENT DATA

Scarborough Malvern Light Rail Transit – Noise and Vibration Impact Assessment



* Federal Transit Administration (FTA) generalized base curve shown for reference purposes only. The curve for Light Rail Vehicles normalized to 30 km/h is plotted.

Streetcar Vibration Levels on Gerrard St (new track) and Propagation Curves	Drawn by: JTT	Figure: 5	RWDI
TTC Eastern Waterfront West Don Lands - Toronto, Ontario Project #W05-5120C	Approx. Scale: N/A		
	Date: May 22, 2007		