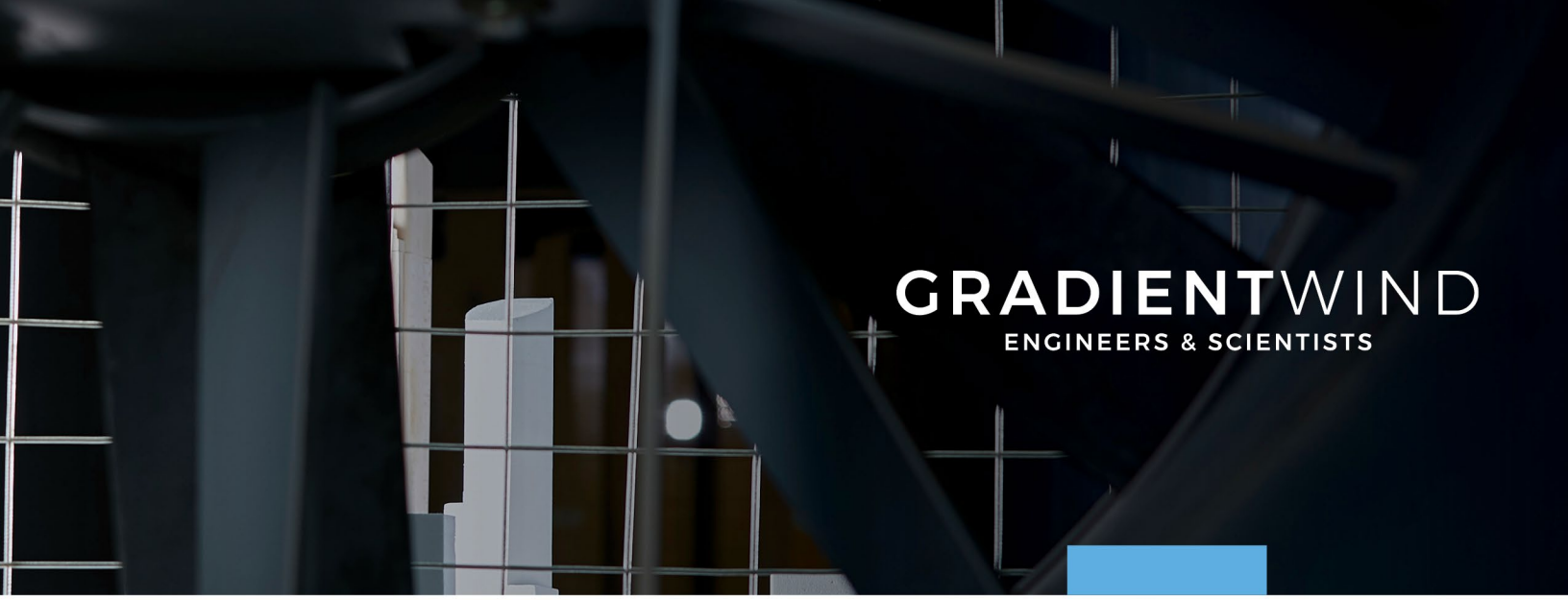
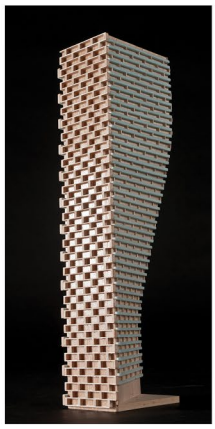


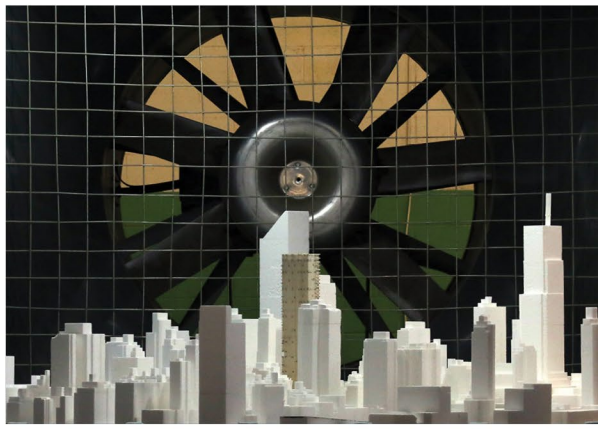
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE & VIBRATION ASSESSMENT

1437-1455 Queen Street West
Toronto, Ontario

REPORT: 23-029 – Transportation Noise & Vibration





April 20, 2023

PREPARED FOR

Jameson Plaza Limited
2700 Dufferin St., Unit 50
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EXECUTIVE SUMMARY

This report describes a transportation noise and vibration assessment to satisfy concurrent Zoning By-Law Amendment (ZBA) and Site Plan Control application submission requirements for the proposed mixed-use residential development located at 1437-1455 Queen Street West in Toronto, Ontario. The primary sources of transportation noise include Queen Street West, Jameson Avenue, and the Toronto Transit Commission (TTC) Route 501 Queen Street West streetcar. As the site is within 75 m of the TTC streetcar, a ground vibration impact assessment on the proposed development was conducted following the procedures outlined in the Federal Transit Authorities (FTA) protocol. Figure 1 illustrates a complete site plan with the surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP); (ii) noise level criteria as specified by NPC-300; (iii) future vehicular traffic volumes based on the City of Toronto's Official Plan roadway classifications; (iv) architectural drawings provided by RAW Design Inc. in March 2023; and (v), ground-borne vibration criteria as specified by the Federal Transit Authority (FTA) Protocol.

The results of the current analysis indicate that noise levels will range between 52 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the north façade, which is nearest and most exposed to Queen Street West. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3 and Table 4.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Noise levels at select terraces are expected to exceed 55 dBA during the daytime period without a noise barrier. Further analysis investigated the noise mitigating impact of raising the perimeter guards/barriers from 1.1 m to 3 m above the walking surface. Results of the investigation proved that noise levels can be reduced to 55 or below 60 dBA with an appropriate barrier height. The preferred barrier heights for the

amenity spaces are outlined in Table 5. Reducing noise levels to 60 dBA at R10 would require excessive barrier heights that would not be administratively and financially feasible. Where OLA noise levels are between 55 and 60 dBA, a Type B Warning Clause will be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Estimated vibration levels at the foundation to the streetcar line are expected to be 0.071 mm/s RMS (69 dBV), based on the FTA protocol and a conservative offset distance of 5 m to the nearest streetcar track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the property line, vibration mitigation will not be required. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable. As the site is in proximity to the TTC Route 501 Queen Street West streetcar, a TTC Warning Clause will be required on all Lease, Purchase and Sale agreements, as summarized in Section 6.

Moreover, the stationary noise impacts of the building on the surroundings and itself would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

Addendum: The noise study was performed based on architectural drawings received on March 31, 2023. An updated set of drawings were distributed to the consultant team by RAW Design Inc. on April 14, 2023. Notably, additional surface details for the Level 9 roof and terrace, and mechanical penthouse roof were included. Overall, the updates are not expected to change the main conclusions of the noise study.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Jameson Plaza Limited to undertake a transportation noise and vibration assessment to satisfy concurrent Zoning By-Law Amendment (ZBA) and Site Plan Control application submission requirements for the proposed mixed-use residential development located at 1437-1455 Queen Street West in Toronto, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local transportation noise and vibration sources.

Our work is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[1] guidelines. Noise calculations were based on architectural drawings provided by RAW Design Inc. in March 2023, with future traffic volumes corresponding to the City of Toronto's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located at 1437-1455 Queen Street West in Toronto situated at the southwest intersection of Queen Street West and Jameson Avenue on a rectangular parcel of land. The site is bounded by Queen Street West to the north, Jameson Avenue and a low-rise building to the east, a mid-rise building and a high-rise building to the south, and a low-rise building to the west. The proposed development comprises a nominally rectangular 12-storey mixed-use building, topped a mechanical penthouse (MPH).

Above a below-grade parking level, the ground floor of the proposed development includes a residential main entrance to the north, retail spaces at the northwest and northeast corners, an indoor amenity to the south, and a loading space to the west. An outdoor amenity is situated along the south elevation of the subject site. Access to the underground parking is provided by a ramp at the southwest corner via a laneway along the west elevation of the subject site from Queen Street West. Levels 2-12 comprise residential units. The building steps back from the north elevation at Level 4, from the northwest, west, and southwest elevations at Level 5, from the northeast, east, and southeast elevations at Level 6, from

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

the northwest and west elevations at Level 9, and from the north, west, south, and east elevations at Level 11 to accommodate private/communal terraces.

The near-field surroundings of the development are characterized by low-rise massing in all compass directions with mid-rise buildings to the southwest, west, north-northeast, and east, the Parkdale Collegiate Institute to the southeast, and high-rise residential buildings to the south. Notably, a six-storey mixed-use residential building is approved (ZBA) at 1488 Queen Street West, to the immediate north, and a seven-storey mixed-use residential building is approved (ZBA) at 1375 Queen Street West, approximately 140 m to the east-northeast. The far-field surroundings are characterized by mostly low-rise massing and isolated mid- and high-rise buildings from the west clockwise to the southeast, with clusters of high-rise buildings to the east and east-southeast, and a mix of low-, mid-, and high-rise massing followed by the open exposure of Lake Ontario in the remaining compass directions. Notably, Humber Bay is located approximately 650 m to the southwest.

The primary sources of transportation noise include Queen Street West, Jameson Avenue, and the Toronto Transit Commission (TTC) Route 501 Queen Street West streetcar. As the site is within 75 m of the TTC streetcar, a ground vibration impact assessment on the proposed development was conducted following the procedures outlined in the Federal Transit Authorities (FTA) protocol. Figure 1 illustrates a complete site plan with the surrounding context.

Moreover, the stationary noise impacts of the building on the surroundings and itself would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local road and railway traffic, (ii) predict vibration levels on the study building produced from the TTC Route 501 Queen Street West streetcar, and (iii) ensure that interior and exterior noise and vibration levels do not exceed the allowable limits specified by the Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines (NPC-300) as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Transportation Noise

4.2.1 Criteria for Transportation Noise

For surface roadway traffic noise, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The recommended indoor noise

[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

limit range (that is relevant to this study) is 50, 45 and 40 dBA for retail/offices, living rooms and sleeping quarters respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD/STREETCAR) [3]

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, **retail stores**, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, **individual or semi-private offices, conference rooms**, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Furthermore, noise levels at the OLA must not exceed 60 dBA if mitigation can be technically and administratively achieved.

[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data. Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks.
- The day/night split for all streets was taken to be 90%/10%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptors considered the existing buildings as a barrier partially or fully obstructing exposure to the source.
- Noise receptors were strategically placed at 11 locations around the study area (see Figure 2).
- The route 501 Queen Streetcar was considered as a CLRV.

4.2.3 Transportation Traffic Volumes

The NPC-300 dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the Toronto Road Classification System map[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on theoretical capacities for each roadway classification. Table 2 (below) summarizes the AADT values used for each segment included in this assessment. Streetcar volumes are based on the TTC posted streetcar schedules, projected at 2.5% over 10 years.

[7] Toronto Road Classification System map by Transportation Services Division, 2018

TABLE 2: TRANSPORTATION TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	AADT Count
Queen Street West	2-Lane Major Arterial	40	**15,000**
Streetcar Line 501	Streetcar	40	**470/97***
Jameson Avenue	2-Lane Minor Arterial	40	**12,000**

*Daytime/Nighttime volumes based on the TTC posted streetcar schedules, projected at 2.5% over 10 years.

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

4.4 Ground Vibration and Ground-borne Noise

4.4.1 Background on Vibrations

Transit systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more often, a complex layering of soils and rock strata.

Similar to sound waves in air, ground vibrations also produce perceptible motions and regenerated noise known as 'ground-borne noise' when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when there is excitation of the ground, such as from a train. The repetitive motion of steel wheels on the track or rubber tires passing over an uneven surface causes vibrations to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a noise signature that is unique to that structure and soil combination.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical measurement units of ground vibration are millimeters per second (mm/s) or inches per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is

[9] CMHC, Road & Rail Noise: Effects on Housing

common practice to use the reference value of one micro-inch per second (µin/s) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

4.4.2 Ground Vibration Criteria

The Canadian Railway Association and Canadian Association of Municipalities have set standards for new sensitive land developments within 300 metres of a railway right-of-way, as published in their document *Guidelines for New Development in Proximity to Railway Operations*[10], which indicate that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one second time-period at the first floor and above of the proposed building.

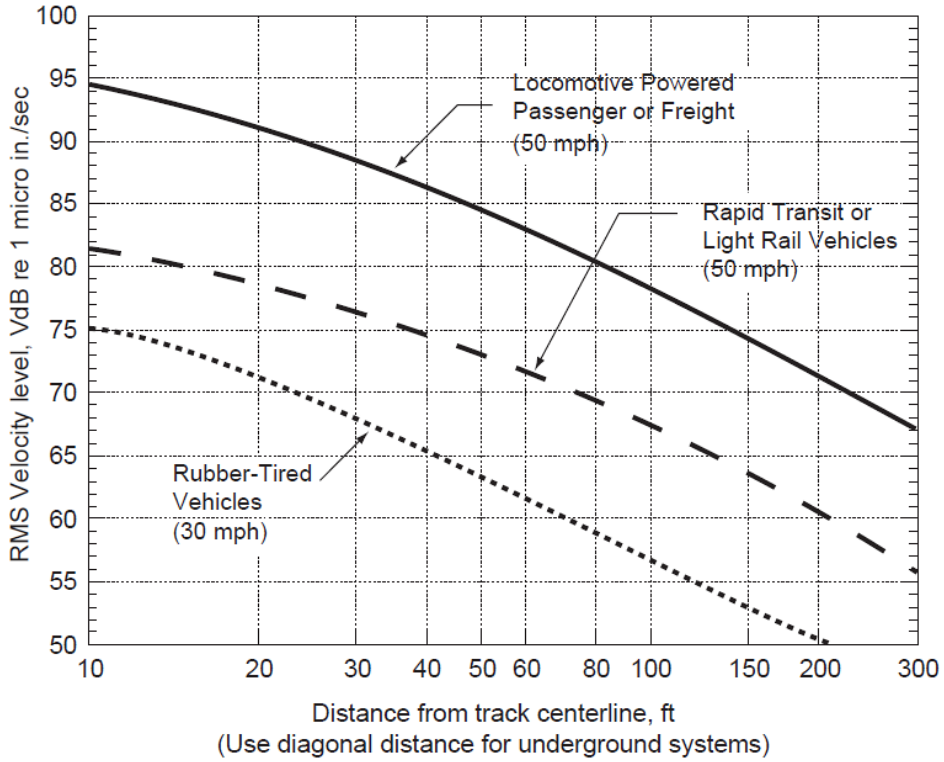
4.4.3 Theoretical Ground Vibration Prediction Procedure

Potential vibration impacts of the trains were predicted using the Federal Transit Authority's (FTA) Transit Noise and Vibration Impact Assessment[11] protocol. The FTA general vibration assessment is based on an upper bound generic set of curves that show vibration level attenuation with distance. These curves, illustrated in the figure on the following page, are based on ground vibration measurements at various transit systems throughout North America. Vibration levels at points of reception are adjusted by various factors to incorporate known characteristics of the system being analyzed, such as operating speed of vehicle, conditions of the track, construction of the track and geology, as well as the structural type of the impacted building structures. The vibration impact on the building was determined using a set of curves for LRT at a speed of 50 mph. Adjustment factors were considered based on the following information:

- The maximum operating speed of the streetcars is 40 km/h (25 mph).
- The distance between the development and the closest track is 5 m.

[10] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Associated of Canada, May 2013
[11] C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

- The vehicles are assumed to have soft primary suspensions.
- Tracks are not welded, though in otherwise good condition.
- Soil conditions do not efficiently propagate vibrations.
- The building's foundation is large masonry on piles.



FTA GENERALIZED CURVES OF VIBRATION LEVELS VERSUS DISTANCE (ADOPTED FROM FIGURE 10-1, FTA TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT)

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	12	POW – 4th Floor West Façade	65	60
2	37.15	POW – 12th Floor West Façade	64	58
3	37.15	POW – 12th Floor North Façade	68	62
4	37.15	POW – 12th Floor East Façade	66	60
5	37.15	POW – 12th Floor South Façade	57	51
6	15	OLA – 5th Floor Terrace	64	N/A*
7	27.35	OLA – 9th Floor Terrace	55	N/A*
8	12	OLA – 4th Floor Terrace	67	N/A*
9	33.85	OLA – 11th Floor Terrace	58	N/A*
10	18	OLA – 6th Floor Terrace	66	N/A*
11	1.5	OLA – At-Grade Amenity	52	N/A*

*Nighttime noise levels are not considered as per NPC-300

The results of the current analysis indicate that noise levels will range between 52 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the north façade, which is nearest and most exposed to Queen Street West.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per NPC-300 requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized in Table 4 below for various units within the development (see Figure 3).

TABLE 4: NOISE CONTROL REQUIREMENTS

Façade	Window STC (Bedroom/Living Room/Retail & Office)	Exterior Wall STC	Warning Clauses	A/C
North, East	31/26/26	45	Type D	Yes

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window/wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

5.3 Noise Barrier Calculation

Noise levels at select terraces are expected to exceed 55 dBA during the daytime period without a noise barrier. If these areas are to be used as outdoor living areas, noise control measures are required to reduce noise levels as close as possible to 55 dBA but not exceeding 60 dBA. Further analysis investigated the noise mitigating impact of raising the perimeter guards/barriers from 1.1 m to 3 m above the walking surface as outlined in Table 5. Results of the investigation proved that noise levels can be reduced to 55 or below 60 dBA with an appropriate barrier height. The preferred barrier heights for the amenity spaces are associated to the noise levels in **bold** font and outlined in Figure 4. Reducing noise levels to 60 dBA at R10 would require excessive barrier heights that would not be administratively and financially feasible. Where OLA noise levels are between 55 and 60 dBA, a Type B Warning Clause will be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

TABLE 5: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height Above Grade/Roof (m)	Receptor Location	Daytime L_{eq} Noise Levels (dBA)					
			No Barrier	With 1.1m Barrier	With 1.5m Barrier	With 1.7m Barrier	With 2m Barrier	With 3m Barrier
6	15	OLA – 5th Floor Terrace	64	61	61	**60**	-	-
8	12	OLA – 4th Floor Terrace	67	**59**	-	-	-	-
9	33.85	OLA – 11th Floor Terrace	58	**55**	-	-	-	-
10	18	OLA – 6th Floor Terrace	66	62	62	**62**	62	61

5.4 Ground Vibrations and Ground-Borne Noise Levels

Estimated vibration levels at the foundation to the streetcar line are expected to be 0.071 mm/s RMS (69 dBV), based on the FTA protocol and a conservative offset distance of 5 m to the nearest streetcar track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the property line, vibration mitigation will not be required. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 52 and 68 dBA during the daytime period (07:00-23:00) and between 51 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the north façade, which is nearest and most exposed to Queen Street West. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 3 and Table 4.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized below.

Type D:

> *"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

Noise levels at select terraces are expected to exceed 55 dBA during the daytime period without a noise barrier. Further analysis investigated the noise mitigating impact of raising the perimeter guards/barriers from 1.1 m to 3 m above the walking surface. Results of the investigation proved that noise levels can be reduced to 55 or below 60 dBA with an appropriate barrier height. The preferred barrier heights for the amenity spaces are outlined in Table 5 and in Figure 4. Reducing noise levels to 60 dBA at R10 would require excessive barrier heights that would not be administratively and financially feasible. Where OLA noise levels are between 55 and 60 dBA, a Type B Warning Clause will be required on all Lease, Purchase and Sale Agreements, as summarized below.

Type B:

> *" Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment."*

Estimated vibration levels at the foundation to the streetcar line are expected to be 0.071 mm/s RMS (69 dBV), based on the FTA protocol and a conservative offset distance of 5 m to the nearest streetcar track centerline. Details of the calculation are provided in Appendix B. Since predicted vibration levels do not exceed the criterion of 0.14 mm/s RMS at the property line, vibration mitigation will not be required. As vibration levels are acceptable, correspondingly, regenerated noise levels are also expected to be acceptable.

As the site is in proximity to the TTC Route 501 Queen Street West streetcar, the following Warning Clause will be required on all Lease, Purchase and Sale agreements.

TTC Warning Clause:

> *"As this site is near TTC Route 501 Queen Street West streetcar operations, noise, vibration, electro-magnetic interference (EMI), and stray current may be transmitted by TTC transit operations. The TTC will not accept responsibility for such effects on any building(s) and/or occupants."*

Moreover, the stationary noise impacts of the building on the surroundings and itself would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

This concludes our transportation noise and vibration assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

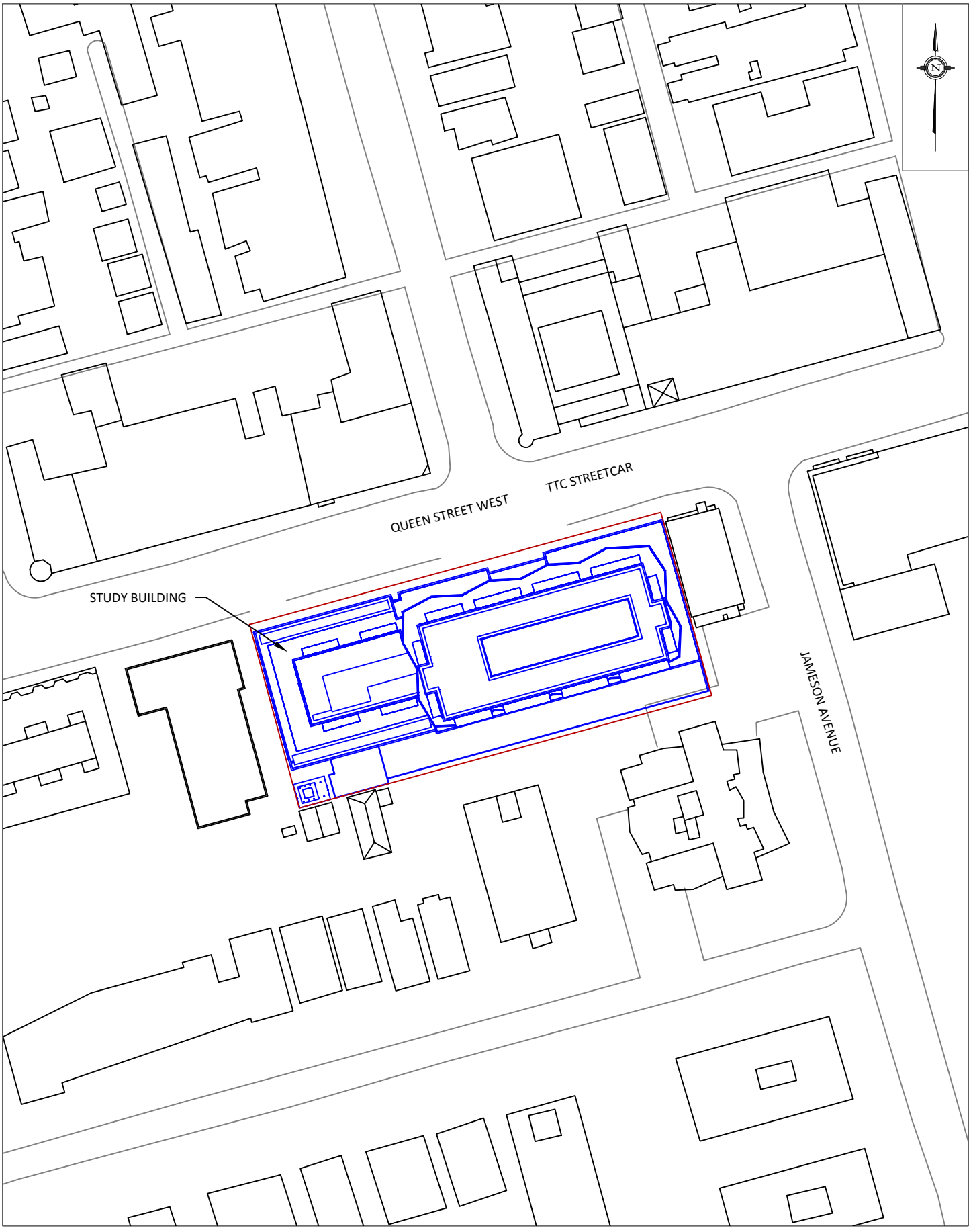
Sincerely,

Gradient Wind Engineering Inc.

Giuseppe Garro, MASc.
Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #23-029



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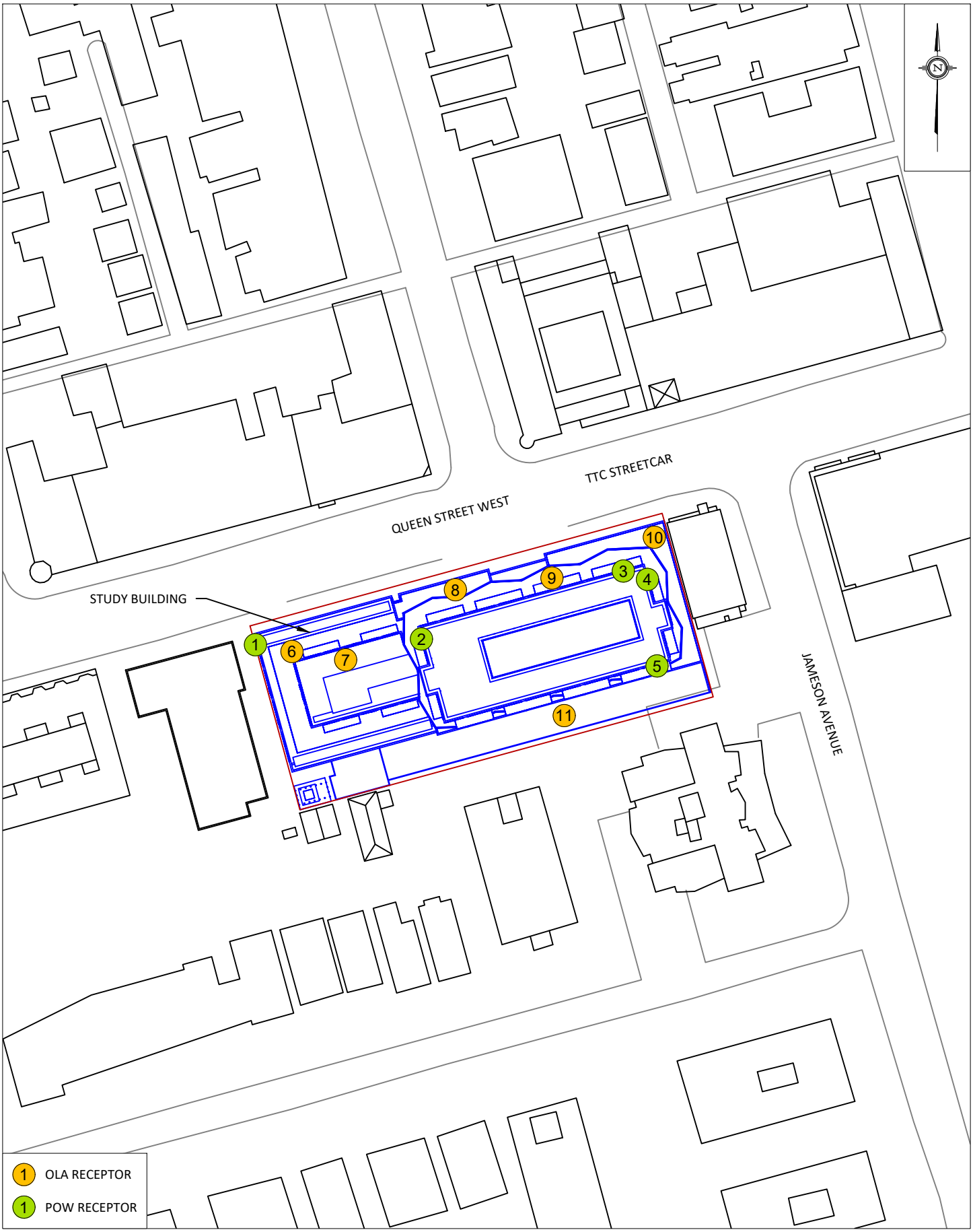
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-1
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN WITH SURROUNDING CONTEXT



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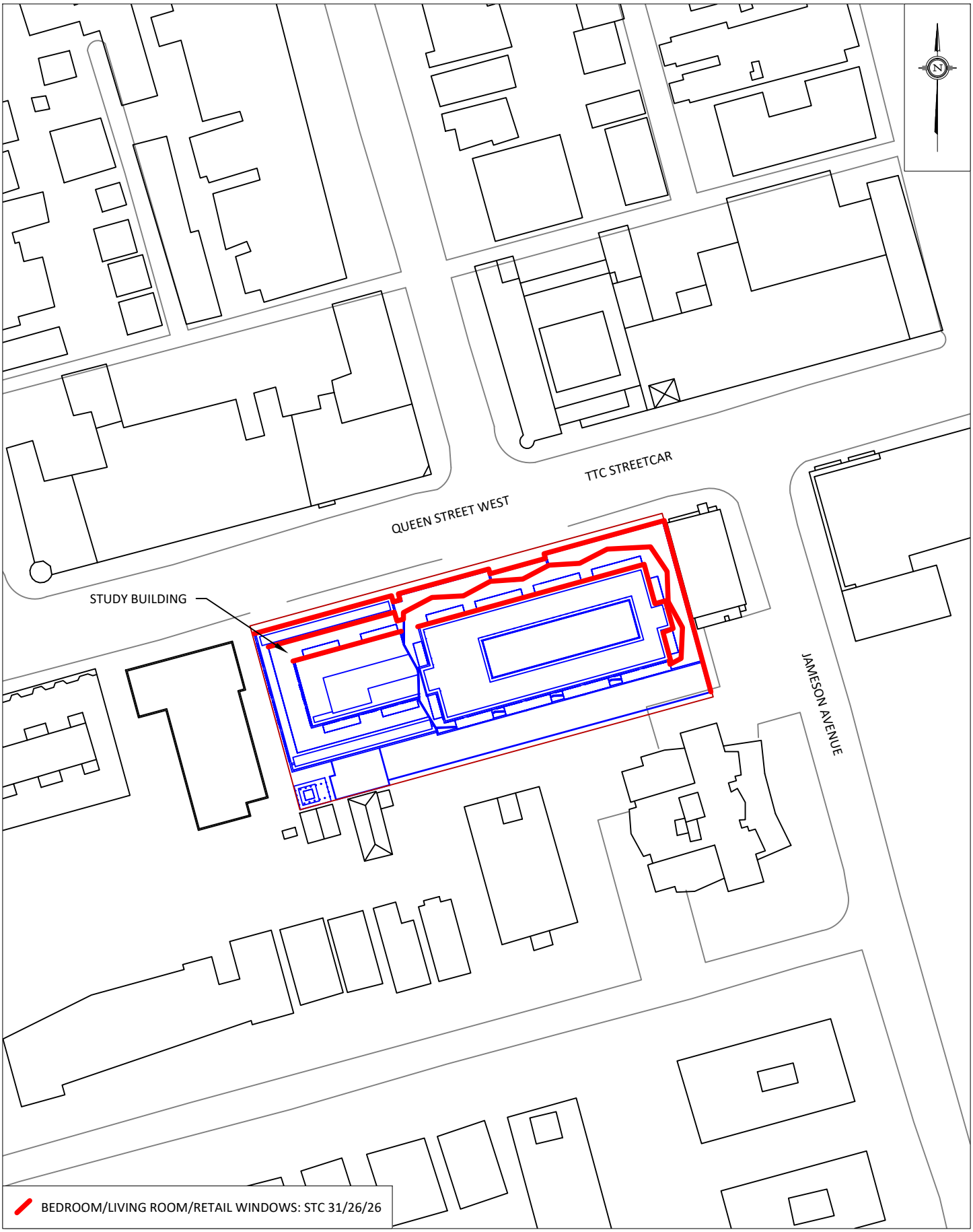
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-2
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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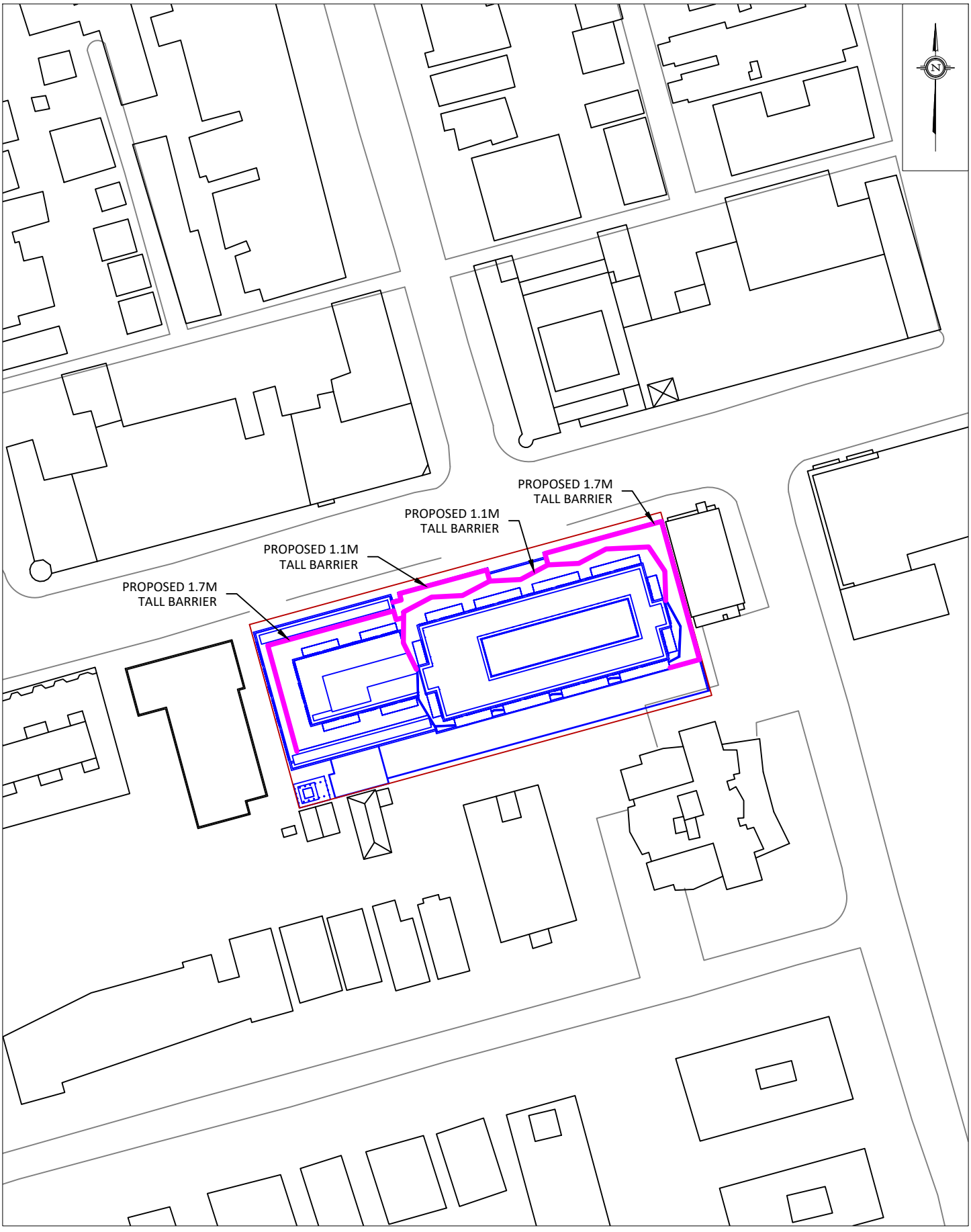
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-3
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
WINDOW STC REQUIREMENTS



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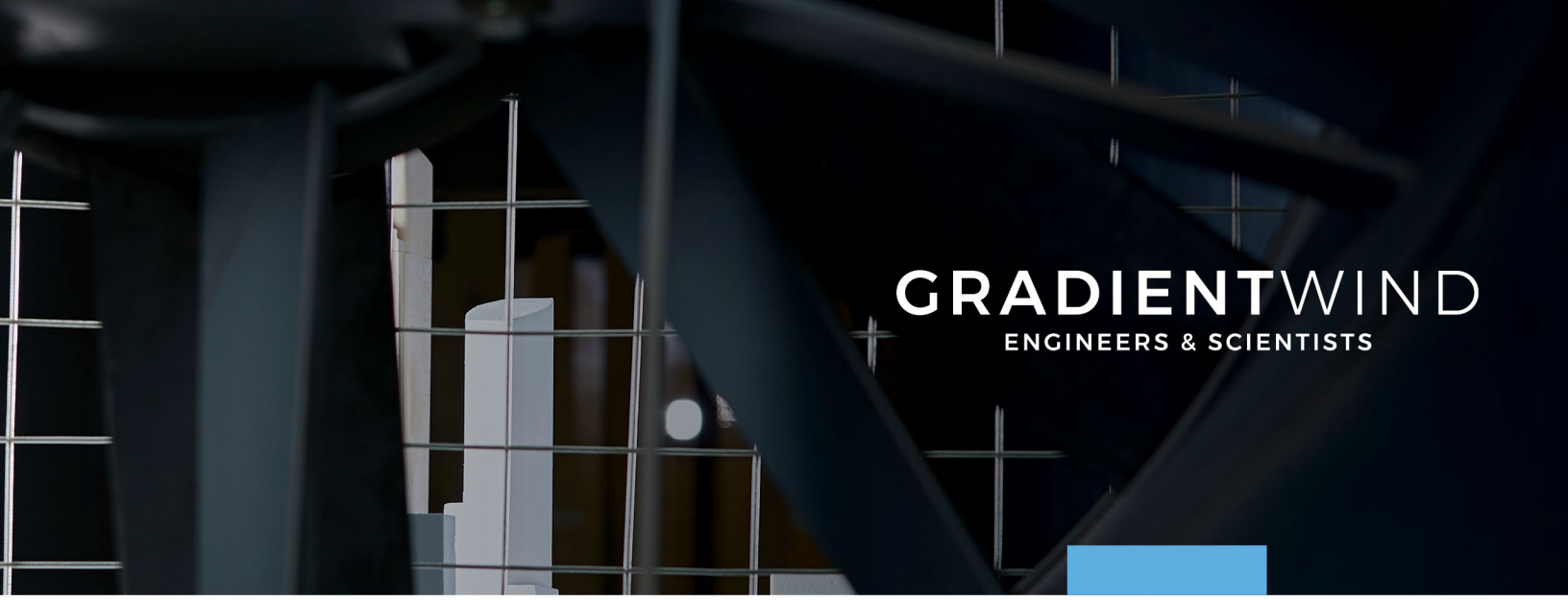
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-4
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE 4:
NOISE BARRIER LOCATIONS



GRADIENTWIND
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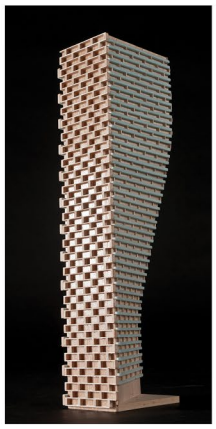
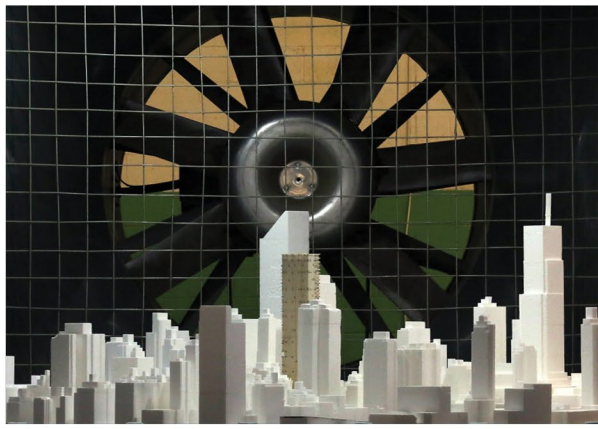




APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

```
 STAMSON 5.0         NORMAL REPORT         Date: 03-04-2023 15:11:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te                 Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 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           :  12.00 / 12.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 63.58 + 0.00) = 63.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  66.59   0.00   0.00  -3.01   0.00   0.00   0.00
63.58
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 63.58 dBA

Total Leq All Segments: 63.58 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.05 + 0.00) = 57.05 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  60.06   0.00   0.00  -3.01   0.00   0.00   0.00
57.05
-------------------------------------------------------------------------
--

Segment Leq : 57.05 dBA

Total Leq All Segments: 57.05 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 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           :  12.00 / 12.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: SC501 (day)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 60.35 + 0.00) = 60.35 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90      0   0.00  63.36   0.00  -3.01   0.00   0.00   0.00  60.35
-------------------------------------------------------------------------

Segment Leq : 60.35 dBA

Total Leq All Segments: 60.35 dBA


Results segment # 1: SC501 (night)
----------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 56.51 + 0.00) = 56.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.00  59.52   0.00  -3.01   0.00   0.00   0.00  56.51
-------------------------------------------------------------------------

Segment Leq : 56.51 dBA

Total Leq All Segments: 56.51 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 65.27
                           (NIGHT): 59.80
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:12:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 62.12 + 0.00) = 62.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  66.59   0.00  -1.46  -3.01   0.00   0.00   0.00
62.12
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 62.12 dBA

Total Leq All Segments: 62.12 dBA

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

Source height = 1.50 m

ROAD (0.00 + 55.59 + 0.00) = 55.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  60.06   0.00  -1.46  -3.01   0.00   0.00   0.00
55.59
-------------------------------------------------------------------------
--

Segment Leq : 55.59 dBA

Total Leq All Segments: 55.59 dBA

RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: SC501 (day)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 58.89 + 0.00) = 58.89 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.00  63.36  -1.46  -3.01   0.00   0.00   0.00  58.89
-------------------------------------------------------------------------
```

```
Segment Leq : 58.89 dBA

Total Leq All Segments: 58.89 dBA

Results segment # 1: SC501 (night)
----------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 55.04 + 0.00) = 55.04 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.00  59.52  -1.46  -3.01   0.00   0.00   0.00  55.04
-------------------------------------------------------------------------

Segment Leq : 55.04 dBA

Total Leq All Segments: 55.04 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 63.81
                           (NIGHT): 58.33
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:12:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
--------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
```

```
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  31.00 / 31.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 65.56 + 0.00) = 65.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.59   0.00  -1.03   0.00   0.00   0.00   0.00
65.56
-------------------------------------------------------------------------
--

Segment Leq : 65.56 dBA


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

Source height = 1.50 m

ROAD (0.00 + 54.97 + 0.00) = 54.97 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -32      0   0.00  65.62   0.00  -3.15  -7.50   0.00   0.00   0.00
54.97
-------------------------------------------------------------------------
--

Segment Leq : 54.97 dBA
```

```
Total Leq All Segments: 65.92 dBA


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

Source height = 1.50 m

ROAD (0.00 + 59.03 + 0.00) = 59.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.06   0.00  -1.03   0.00   0.00   0.00   0.00
59.03
-------------------------------------------------------------------------
--

Segment Leq : 59.03 dBA


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

Source height = 1.50 m

ROAD (0.00 + 48.44 + 0.00) = 48.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -32      0   0.00  59.09   0.00  -3.15  -7.50   0.00   0.00   0.00
48.44
-------------------------------------------------------------------------
--

Segment Leq : 48.44 dBA

Total Leq All Segments: 59.39 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
```

```
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: SC501 (day)
---------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 62.33 + 0.00) = 62.33 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.36 -1.03   0.00   0.00   0.00   0.00  62.33
-------------------------------------------------------------------------

Segment Leq : 62.33 dBA

Total Leq All Segments: 62.33 dBA


Results segment # 1: SC501 (night)
-----------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 58.49 + 0.00) = 58.49 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.52 -1.03   0.00   0.00   0.00   0.00  58.49
-------------------------------------------------------------------------

Segment Leq : 58.49 dBA

Total Leq All Segments: 58.49 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 67.50
                           (NIGHT): 61.98
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:12:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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  :  22.00 / 22.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
--------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
```

```
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -40.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 61.92 + 0.00) = 61.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  66.59   0.00  -1.66  -3.01   0.00   0.00   0.00
61.92
-------------------------------------------------------------------------
--

Segment Leq : 61.92 dBA


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

Source height = 1.50 m

ROAD (0.00 + 61.82 + 0.00) = 61.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -40     90   0.00  65.62   0.00  -2.39  -1.41   0.00   0.00   0.00
61.82
-------------------------------------------------------------------------
--

Segment Leq : 61.82 dBA
```

```
Total Leq All Segments: 64.88 dBA


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

Source height = 1.50 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
-------------------------------------------------------------------------
--
     0     90   0.00  60.06   0.00  -1.66  -3.01   0.00   0.00   0.00
55.38
-------------------------------------------------------------------------
--

Segment Leq : 55.38 dBA


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

Source height = 1.50 m

ROAD (0.00 + 55.29 + 0.00) = 55.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -40     90   0.00  59.09   0.00  -2.39  -1.41   0.00   0.00   0.00
55.29
-------------------------------------------------------------------------
--

Segment Leq : 55.29 dBA

Total Leq All Segments: 58.35 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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  :  22.00 / 22.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: SC501 (day)

Source height = 0.50 m

RT/Custom (0.00 + 58.68 + 0.00) = 58.68 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	63.36	-1.66	-3.01	0.00	0.00	0.00	58.68

Segment Leq : 58.68 dBA

Total Leq All Segments: 58.68 dBA

Results segment # 1: SC501 (night)

Source height = 0.50 m

RT/Custom (0.00 + 54.84 + 0.00) = 54.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	59.52	-1.66	-3.01	0.00	0.00	0.00	54.84

Segment Leq : 54.84 dBA

Total Leq All Segments: 54.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.81
(NIGHT): 59.95

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: JA (day/night)
----------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: JA (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  :  29.00 / 29.00  m
Receiver height           :  37.15 / 37.15  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  51.00 deg   Angle2 : 90.00 deg
Barrier height            :  33.00 m
Barrier receiver distance :  16.00 / 16.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

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

```
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       37.15 !       17.48 !        17.48

ROAD (57.28 + 40.22 + 0.00) = 57.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     51   0.00  65.62   0.00  -2.86  -5.48   0.00   0.00   0.00
57.28
-------------------------------------------------------------------------
--
    51     90   0.00  65.62   0.00  -2.86  -6.64   0.00   0.00 -15.90
40.22
-------------------------------------------------------------------------
--

Segment Leq : 57.37 dBA

Total Leq All Segments: 57.37 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       37.15 !       17.48 !        17.48

ROAD (50.75 + 33.68 + 0.00) = 50.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     51   0.00  59.09   0.00  -2.86  -5.48   0.00   0.00   0.00
50.75
-------------------------------------------------------------------------
--
    51     90   0.00  59.09   0.00  -2.86  -6.64   0.00   0.00 -15.90
33.68
-------------------------------------------------------------------------
--

Segment Leq : 50.83 dBA
```

```
Total Leq All Segments: 50.83 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.37
                           (NIGHT): 50.83
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  13.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

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

```
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (57.64 + 60.33 + 0.00) = 62.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  66.59   0.00  -0.54  -8.40   0.00   0.00   0.00
57.64
-------------------------------------------------------------------------
--
   -64     90   0.00  66.59   0.00  -0.54  -0.68   0.00   0.00  -5.04
60.33
-------------------------------------------------------------------------
--

Segment Leq : 62.20 dBA

Total Leq All Segments: 62.20 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (51.11 + 53.80 + 0.00) = 55.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  60.06   0.00  -0.54  -8.40   0.00   0.00   0.00
51.11
-------------------------------------------------------------------------
--
   -64     90   0.00  60.06   0.00  -0.54  -0.68   0.00   0.00  -5.04
53.80
-------------------------------------------------------------------------
--

Segment Leq : 55.67 dBA
```

```
Total Leq All Segments: 55.67 dBA

RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  13.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (54.41 + 56.93 + 0.00) = 58.86 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -64   0.00  63.36  -0.54  -8.40   0.00   0.00   0.00  54.41
-------------------------------------------------------------------------
   -64     90   0.00  63.36  -0.54  -0.68   0.00   0.00  -5.20  56.93
-------------------------------------------------------------------------

Segment Leq : 58.86 dBA

Total Leq All Segments: 58.86 dBA
```

```
Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (50.57 + 53.09 + 0.00) = 55.02 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -64   0.00  59.52  -0.54  -8.40   0.00   0.00   0.00  50.57
-------------------------------------------------------------------------
   -64     90   0.00  59.52  -0.54  -0.68   0.00   0.00  -5.20  53.09
-------------------------------------------------------------------------

Segment Leq : 55.02 dBA

Total Leq All Segments: 55.02 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 63.85
                           (NIGHT): 58.37
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b1.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  14.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

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

```
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (57.64 + 55.42 + 0.00) = 59.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  66.59   0.00  -0.54  -8.40   0.00   0.00   0.00
57.64
-------------------------------------------------------------------------
--
   -64     90   0.00  66.59   0.00  -0.54  -0.68   0.00   0.00  -9.95
55.42
-------------------------------------------------------------------------
--

Segment Leq : 59.68 dBA

Total Leq All Segments: 59.68 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (51.11 + 48.89 + 0.00) = 53.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  60.06   0.00  -0.54  -8.40   0.00   0.00   0.00
51.11
-------------------------------------------------------------------------
--
   -64     90   0.00  60.06   0.00  -0.54  -0.68   0.00   0.00  -9.95
48.89
-------------------------------------------------------------------------
--

Segment Leq : 53.15 dBA
```

```
Total Leq All Segments: 53.15 dBA

RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  14.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (54.41 + 51.79 + 0.00) = 56.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -64   0.00  63.36  -0.54  -8.40   0.00   0.00   0.00  54.41
-------------------------------------------------------------------
   -64     90   0.00  63.36  -0.54  -0.68   0.00   0.00 -10.35  51.79
-------------------------------------------------------------------

Segment Leq : 56.31 dBA

Total Leq All Segments: 56.31 dBA
```

```
Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (50.57 + 47.95 + 0.00) = 52.46 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -64   0.00  59.52  -0.54  -8.40   0.00   0.00   0.00  50.57
-------------------------------------------------------------------------
   -64     90   0.00  59.52  -0.54  -0.68   0.00   0.00 -10.35  47.95
-------------------------------------------------------------------------

Segment Leq : 52.46 dBA

Total Leq All Segments: 52.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.32
                           (NIGHT): 55.83
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b2.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
----------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.00 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (57.64 + 53.40 + 0.00) = 59.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  66.59   0.00  -0.54  -8.40   0.00   0.00   0.00
57.64
-------------------------------------------------------------------------
--
   -64     90   0.00  66.59   0.00  -0.54  -0.68   0.00   0.00 -11.97
53.40
-------------------------------------------------------------------------
--

Segment Leq : 59.03 dBA

Total Leq All Segments: 59.03 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (51.11 + 46.87 + 0.00) = 52.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  60.06   0.00  -0.54  -8.40   0.00   0.00   0.00
51.11
-------------------------------------------------------------------------
--
   -64     90   0.00  60.06   0.00  -0.54  -0.68   0.00   0.00 -11.97
46.87
-------------------------------------------------------------------------
--

Segment Leq : 52.50 dBA

Total Leq All Segments: 52.50 dBA
```

```
RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.00 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (54.41 + 49.86 + 0.00) = 55.72 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -64   0.00  63.36  -0.54  -8.40   0.00   0.00   0.00  54.41
-------------------------------------------------------------------
   -64     90   0.00  63.36  -0.54  -0.68   0.00   0.00 -12.28  49.86
-------------------------------------------------------------------

Segment Leq : 55.72 dBA

Total Leq All Segments: 55.72 dBA
```

```
Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (50.57 + 46.01 + 0.00) = 51.87 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -64   0.00  59.52  -0.54  -8.40   0.00   0.00   0.00  50.57
-------------------------------------------------------------------------
   -64     90   0.00  59.52  -0.54  -0.68   0.00   0.00 -12.28  46.01
-------------------------------------------------------------------------

Segment Leq : 51.87 dBA

Total Leq All Segments: 51.87 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 60.69
                           (NIGHT): 55.21
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b3.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
----------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.20 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (57.64 + 52.51 + 0.00) = 58.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  66.59   0.00  -0.54  -8.40   0.00   0.00   0.00
57.64
-------------------------------------------------------------------------
--
   -64     90   0.00  66.59   0.00  -0.54  -0.68   0.00   0.00 -12.86
52.51
-------------------------------------------------------------------------
--

Segment Leq : 58.80 dBA

Total Leq All Segments: 58.80 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.00 !       13.41 !        13.41

ROAD (51.11 + 45.97 + 0.00) = 52.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -64   0.00  60.06   0.00  -0.54  -8.40   0.00   0.00   0.00
51.11
-------------------------------------------------------------------------
--
   -64     90   0.00  60.06   0.00  -0.54  -0.68   0.00   0.00 -12.86
45.97
-------------------------------------------------------------------------
--

Segment Leq : 52.27 dBA

Total Leq All Segments: 52.27 dBA
```

```
RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  15.00 / 15.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -64.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.20 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (54.41 + 49.00 + 0.00) = 55.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
   -90    -64   0.00  63.36  -0.54  -8.40   0.00   0.00   0.00  54.41
-------------------------------------------------------------------
   -64     90   0.00  63.36  -0.54  -0.68   0.00   0.00 -13.14  49.00
-------------------------------------------------------------------

Segment Leq : 55.51 dBA

Total Leq All Segments: 55.51 dBA
```

```
Results segment # 1: SC501 (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 !       15.00 !       13.29 !        13.29

RT/Custom (50.57 + 45.16 + 0.00) = 51.67 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90    -64   0.00  59.52  -0.54  -8.40   0.00   0.00   0.00  50.57
-------------------------------------------------------------------------
   -64     90   0.00  59.52  -0.54  -0.68   0.00   0.00 -13.14  45.16
-------------------------------------------------------------------------

Segment Leq : 51.67 dBA

Total Leq All Segments: 51.67 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 60.47
                           (NIGHT): 54.99
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (day/night)
---------------------------------------
Angle1   Angle2           : -90.00 deg   66.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  27.35 / 27.35  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 66.00 deg
Barrier height            :  25.85 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       27.35 !       23.66 !        23.66

ROAD (0.00 + 53.70 + 0.00) = 53.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     66   0.00  66.59   0.00  -1.46  -0.62   0.00   0.00 -10.81
53.70
-------------------------------------------------------------------------
--

Segment Leq : 53.70 dBA

Total Leq All Segments: 53.70 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       27.35 !       23.66 !        23.66

ROAD (0.00 + 47.17 + 0.00) = 47.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     66   0.00  60.06   0.00  -1.46  -0.62   0.00   0.00 -10.81
47.17
-------------------------------------------------------------------------
--

Segment Leq : 47.17 dBA

Total Leq All Segments: 47.17 dBA

RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (day/night)
---------------------------------------
```

```
Angle1   Angle2           : -90.00 deg   66.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  27.35 / 27.35  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 66.00 deg
Barrier height            :  25.85 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       27.35 !       23.51 !        23.51

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
-------------------------------------------------------------------------
   -90     66   0.00  63.36  -1.46  -0.62   0.00   0.00 -11.06  50.22
-------------------------------------------------------------------------

Segment Leq : 50.22 dBA

Total Leq All Segments: 50.22 dBA

Results segment # 1: SC501 (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 !       27.35 !       23.51 !        23.51

RT/Custom (0.00 + 46.38 + 0.00) = 46.38 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90     66   0.00  59.52  -1.46  -0.62   0.00   0.00 -11.06  46.38
-------------------------------------------------------------------------

Segment Leq : 46.38 dBA

Total Leq All Segments: 46.38 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 55.31
                           (NIGHT): 49.80
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:13:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  12.00 / 12.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       12.00 !       10.60 !        10.60

ROAD (0.00 + 66.59 + 0.00) = 66.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.59   0.00   0.00   0.00   0.00   0.00  -4.95
61.64*
   -90     90   0.00  66.59   0.00   0.00   0.00   0.00   0.00   0.00
66.59
-------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 66.59 dBA

Total Leq All Segments: 66.59 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       12.00 !       10.60 !        10.60

ROAD (0.00 + 60.06 + 0.00) = 60.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.06   0.00   0.00   0.00   0.00   0.00  -4.95
55.11*
   -90     90   0.00  60.06   0.00   0.00   0.00   0.00   0.00   0.00
60.06
-------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 60.06 dBA

Total Leq All Segments: 60.06 dBA
```

```
RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  12.00 / 12.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       12.00 !       10.47 !        10.47

RT/Custom (0.00 + 58.35 + 0.00) = 58.35 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.36   0.00   0.00   0.00   0.00  -5.01  58.35
-------------------------------------------------------------------------

Segment Leq : 58.35 dBA

Total Leq All Segments: 58.35 dBA

Results segment # 1: SC501 (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 !       12.00 !       10.47 !        10.47

RT/Custom (0.00 + 54.51 + 0.00) = 54.51 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.52   0.00   0.00   0.00   0.00  -5.01  54.51
-------------------------------------------------------------------------

Segment Leq : 54.51 dBA

Total Leq All Segments: 54.51 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 67.20
                           (NIGHT): 61.13
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:15:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8b1.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  12.00 / 12.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  11.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       12.00 !       10.60 !        10.60

ROAD (0.00 + 57.80 + 0.00) = 57.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.59   0.00   0.00   0.00   0.00   0.00  -8.79
57.80
-------------------------------------------------------------------------
--

Segment Leq : 57.80 dBA

Total Leq All Segments: 57.80 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       12.00 !       10.60 !        10.60

ROAD (0.00 + 51.27 + 0.00) = 51.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.06   0.00   0.00   0.00   0.00   0.00  -8.79
51.27
-------------------------------------------------------------------------
--

Segment Leq : 51.27 dBA

Total Leq All Segments: 51.27 dBA

RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  12.00 / 12.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  11.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       12.00 !       10.47 !        10.47

RT/Custom (0.00 + 54.10 + 0.00) = 54.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.36   0.00   0.00   0.00   0.00  -9.26  54.10
-------------------------------------------------------------------------

Segment Leq : 54.10 dBA

Total Leq All Segments: 54.10 dBA

Results segment # 1: SC501 (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 !       12.00 !       10.47 !        10.47

RT/Custom (0.00 + 50.26 + 0.00) = 50.26 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90      90    0.00  59.52   0.00   0.00   0.00   0.00  -9.26  50.26
-------------------------------------------------------------------------

Segment Leq : 50.26 dBA

Total Leq All Segments: 50.26 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 59.34
                           (NIGHT): 53.80
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:15:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  33.85 / 33.85  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  32.35 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
```

```
------------+-------------+-------------+--------------
       1.50 !       33.85 !       30.04 !        30.04

ROAD (0.00 + 56.52 + 0.00) = 56.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.59   0.00  -0.54   0.00   0.00   0.00  -9.53
56.52
-------------------------------------------------------------------------
--

Segment Leq : 56.52 dBA

Total Leq All Segments: 56.52 dBA

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       33.85 !       30.04 !        30.04

ROAD (0.00 + 49.99 + 0.00) = 49.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.06   0.00  -0.54   0.00   0.00   0.00  -9.53
49.99
-------------------------------------------------------------------------
--

Segment Leq : 49.99 dBA

Total Leq All Segments: 49.99 dBA

RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  33.85 / 33.85  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  32.35 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       33.85 !       29.93 !        29.93

RT/Custom (0.00 + 53.15 + 0.00) = 53.15 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.36  -0.54   0.00   0.00   0.00  -9.67  53.15
-------------------------------------------------------------------------

Segment Leq : 53.15 dBA

Total Leq All Segments: 53.15 dBA

Results segment # 1: SC501 (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 !       33.85 !       29.93 !        29.93

RT/Custom (0.00 + 49.31 + 0.00) = 49.31 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90      90    0.00  59.52  -0.54    0.00    0.00    0.00  -9.67  49.31
-------------------------------------------------------------------------

Segment Leq : 49.31 dBA

Total Leq All Segments: 49.31 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 58.16
                           (NIGHT): 52.67
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:16:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9b1.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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 / 17.00  m
Receiver height           :  33.85 / 33.85  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  33.45 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

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

```
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       33.85 !       30.04 !        30.04

ROAD (0.00 + 53.23 + 0.00) = 53.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  66.59   0.00  -0.54   0.00   0.00   0.00 -12.82
53.23
-------------------------------------------------------------------------------
--

Segment Leq : 53.23 dBA

Total Leq All Segments: 53.23 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       33.85 !       30.04 !        30.04

ROAD (0.00 + 46.70 + 0.00) = 46.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  60.06   0.00  -0.54   0.00   0.00   0.00 -12.82
46.70
-------------------------------------------------------------------------------
--

Segment Leq : 46.70 dBA

Total Leq All Segments: 46.70 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h
```

```
Data for Segment # 1: SC501 (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 / 17.00  m
Receiver height           :  33.85 / 33.85  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  33.45 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       33.85 !       29.93 !        29.93

RT/Custom (0.00 + 49.92 + 0.00) = 49.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  63.36  -0.54   0.00   0.00   0.00 -12.89  49.92
-------------------------------------------------------------------------

Segment Leq : 49.92 dBA

Total Leq All Segments: 49.92 dBA


Results segment # 1: SC501 (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 !       33.85 !       29.93 !        29.93

RT/Custom (0.00 + 46.08 + 0.00) = 46.08 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.00  59.52  -0.54   0.00   0.00   0.00 -12.89  46.08
-------------------------------------------------------------------------

Segment Leq : 46.08 dBA

Total Leq All Segments: 46.08 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 54.89
                           (NIGHT): 49.41
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:16:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  16.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
---------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  16.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 59.15 + 59.09) = 62.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58    0.00  66.59   0.00   0.00  -0.85   0.00   0.00  -6.59
59.15
-------------------------------------------------------------------------
--
    58     90    0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 62.13 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 62.08 + 0.00) = 62.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00  65.62   0.00  -1.86  -1.69   0.00   0.00  -4.98
57.10*
   -32     90    0.00  65.62   0.00  -1.86  -1.69   0.00   0.00   0.00
62.08
-------------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 62.08 dBA

Total Leq All Segments: 65.12 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 52.61 + 52.56) = 55.60 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58   0.00  60.06   0.00   0.00  -0.85   0.00   0.00  -6.59
52.61
-------------------------------------------------------------------------
--
    58     90   0.00  60.06   0.00   0.00  -7.50   0.00   0.00   0.00
52.56
-------------------------------------------------------------------------
--

Segment Leq : 55.60 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 55.54 + 0.00) = 55.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -32     90   0.00  59.09   0.00  -1.86  -1.69   0.00   0.00  -4.98
50.57*
   -32     90   0.00  59.09   0.00  -1.86  -1.69   0.00   0.00   0.00
55.54
-------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 55.54 dBA

Total Leq All Segments: 58.58 dBA
```

```
RT/Custom data, segment # 1: SC501 (day/night)
-----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  16.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 55.50 + 55.86) = 58.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00  -7.00  55.50
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 58.69 dBA

Total Leq All Segments: 58.69 dBA


Results segment # 1: SC501 (night)
----------------------------------
```

Source height = 0.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
0.50	18.00	15.67	15.67

RT/Custom (0.00 + 51.66 + 52.01) = 54.85 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	58	0.00	59.52	0.00	-0.85	0.00	0.00	-7.00	51.66
58	90	0.00	59.52	0.00	-7.50	0.00	0.00	0.00	52.01

Segment Leq : 54.85 dBA

Total Leq All Segments: 54.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.01
(NIGHT): 60.11

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10b1.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  17.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
---------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  17.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 54.03 + 59.09) = 60.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58    0.00  66.59   0.00   0.00  -0.85   0.00   0.00 -11.71
54.03
-------------------------------------------------------------------------
--
    58     90    0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 60.27 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 52.83 + 0.00) = 52.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -32     90   0.00  65.62   0.00  -1.86  -1.69   0.00   0.00  -9.25
52.83
-------------------------------------------------------------------------
--

Segment Leq : 52.83 dBA

Total Leq All Segments: 60.99 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 47.50 + 52.56) = 53.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
```

```
   -90     58    0.00   60.06    0.00    0.00   -0.85    0.00    0.00 -11.71
47.50
-------------------------------------------------------------------------------
--
    58     90    0.00   60.06    0.00    0.00   -7.50    0.00    0.00    0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 53.74 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 46.30 + 0.00) = 46.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00   59.09    0.00   -1.86   -1.69    0.00    0.00   -9.25
46.30
-------------------------------------------------------------------------------
--

Segment Leq : 46.30 dBA

Total Leq All Segments: 54.46 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  17.60 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 50.53 + 55.86) = 56.97 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00 -11.98  50.53
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 56.97 dBA

Total Leq All Segments: 56.97 dBA


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 46.68 + 52.01) = 53.13 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90      58    0.00   59.52    0.00   -0.85    0.00    0.00  -11.98   46.68
-------------------------------------------------------------------------
    58      90    0.00   59.52    0.00   -7.50    0.00    0.00    0.00   52.01
-------------------------------------------------------------------------

Segment Leq : 53.13 dBA

Total Leq All Segments: 53.13 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 62.44
                           (NIGHT): 56.86
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10b2.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.00 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
---------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  18.00 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 52.40 + 59.09) = 59.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58   0.00  66.59   0.00   0.00  -0.85   0.00   0.00 -13.34
52.40
-------------------------------------------------------------------------
--
    58     90   0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 59.93 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 50.77 + 0.00) = 50.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90   0.00  65.62   0.00  -1.86  -1.69   0.00   0.00 -11.30
50.77
-------------------------------------------------------------------------------
--

Segment Leq : 50.77 dBA

Total Leq All Segments: 60.43 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 45.86 + 52.56) = 53.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
```

```
   -90     58    0.00   60.06    0.00    0.00   -0.85    0.00    0.00 -13.34
45.86
-------------------------------------------------------------------------------
--
    58     90    0.00   60.06    0.00    0.00   -7.50    0.00    0.00    0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 53.40 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 44.24 + 0.00) = 44.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00   59.09    0.00   -1.86   -1.69    0.00    0.00 -11.30
44.24
-------------------------------------------------------------------------------
--

Segment Leq : 44.24 dBA

Total Leq All Segments: 53.90 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.00 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 48.96 + 55.86) = 56.66 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00 -13.55  48.96
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 56.66 dBA

Total Leq All Segments: 56.66 dBA


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 45.11 + 52.01) = 52.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------------
   -90      58    0.00   59.52    0.00   -0.85    0.00    0.00  -13.55   45.11
-------------------------------------------------------------------------------
    58      90    0.00   59.52    0.00   -7.50    0.00    0.00    0.00   52.01
-------------------------------------------------------------------------------

Segment Leq : 52.82 dBA

Total Leq All Segments: 52.82 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 61.95
                           (NIGHT): 56.40
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10b3.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.20 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
---------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  18.20 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 51.66 + 59.09) = 59.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58   0.00  66.59   0.00   0.00  -0.85   0.00   0.00 -14.08
51.66
-------------------------------------------------------------------------
--
    58     90   0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 59.81 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 49.86 + 0.00) = 49.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90   0.00  65.62   0.00  -1.86  -1.69   0.00   0.00 -12.21
49.86
-------------------------------------------------------------------------------
--

Segment Leq : 49.86 dBA

Total Leq All Segments: 60.23 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 45.13 + 52.56) = 53.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
```

```
   -90     58    0.00   60.06    0.00    0.00   -0.85    0.00    0.00 -14.08
45.13
-------------------------------------------------------------------------------
--
    58     90    0.00   60.06    0.00    0.00   -7.50    0.00    0.00    0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 53.28 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 43.33 + 0.00) = 43.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00   59.09    0.00   -1.86   -1.69    0.00    0.00 -12.21
43.33
-------------------------------------------------------------------------------
--

Segment Leq : 43.33 dBA

Total Leq All Segments: 53.70 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.20 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 48.24 + 55.86) = 56.55 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00 -14.27  48.24
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 56.55 dBA

Total Leq All Segments: 56.55 dBA


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 44.40 + 52.01) = 52.71 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
```

-90	58	0.00	59.52	0.00	-0.85	0.00	0.00	-14.27	44.40
58	90	0.00	59.52	0.00	-7.50	0.00	0.00	0.00	52.01

Segment Leq : 52.71 dBA

Total Leq All Segments: 52.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.78
(NIGHT): 56.24

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10b4.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
--------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  18.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 50.65 + 59.09) = 59.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58   0.00  66.59   0.00   0.00  -0.85   0.00   0.00 -15.10
50.65
-------------------------------------------------------------------------
--
    58     90   0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 59.67 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 48.65 + 0.00) = 48.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90   0.00  65.62   0.00  -1.86  -1.69   0.00   0.00 -13.42
48.65
-------------------------------------------------------------------------------
--

Segment Leq : 48.65 dBA

Total Leq All Segments: 60.00 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 44.11 + 52.56) = 53.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
```

```
   -90     58    0.00   60.06    0.00    0.00   -0.85    0.00    0.00 -15.10
44.11
-------------------------------------------------------------------------------
--
    58     90    0.00   60.06    0.00    0.00   -7.50    0.00    0.00    0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 53.14 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 42.12 + 0.00) = 42.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00   59.09    0.00   -1.86   -1.69    0.00    0.00 -13.42
42.12
-------------------------------------------------------------------------------
--

Segment Leq : 42.12 dBA

Total Leq All Segments: 53.47 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  18.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 47.25 + 55.86) = 56.42 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00 -15.25  47.25
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 56.42 dBA

Total Leq All Segments: 56.42 dBA


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 43.41 + 52.01) = 52.58 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------------
   -90      58    0.00   59.52    0.00   -0.85    0.00    0.00  -15.25   43.41
-------------------------------------------------------------------------------
    58      90    0.00   59.52    0.00   -7.50    0.00    0.00    0.00   52.01
-------------------------------------------------------------------------------

Segment Leq : 52.58 dBA

Total Leq All Segments: 52.58 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 61.58
                           (NIGHT): 56.06
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10b5.te             Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: QSW (day/night)
---------------------------------------
Car traffic volume  : 11880/1320  veh/TimePeriod  *
Medium truck volume :   945/105   veh/TimePeriod  *
Heavy truck volume  :   675/75    veh/TimePeriod  *
Posted speed limit  :    40 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):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: QSW (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  19.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Road data, segment # 2: JA (day/night)
---------------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 2: JA (day/night)
------------------------------------
Angle1   Angle2           : -32.00 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 / 23.00  m
Receiver height           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : 90.00 deg
Barrier height            :  19.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 48.35 + 59.09) = 59.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     58   0.00  66.59   0.00   0.00  -0.85   0.00   0.00 -17.39
48.35
-------------------------------------------------------------------------
--
    58     90   0.00  66.59   0.00   0.00  -7.50   0.00   0.00   0.00
59.09
```

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

Segment Leq : 59.44 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 45.69 + 0.00) = 45.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90   0.00  65.62   0.00  -1.86  -1.69   0.00   0.00 -16.39
45.69
-------------------------------------------------------------------------------
--

Segment Leq : 45.69 dBA

Total Leq All Segments: 59.62 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       15.80 !        15.80

ROAD (0.00 + 41.82 + 52.56) = 52.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
```

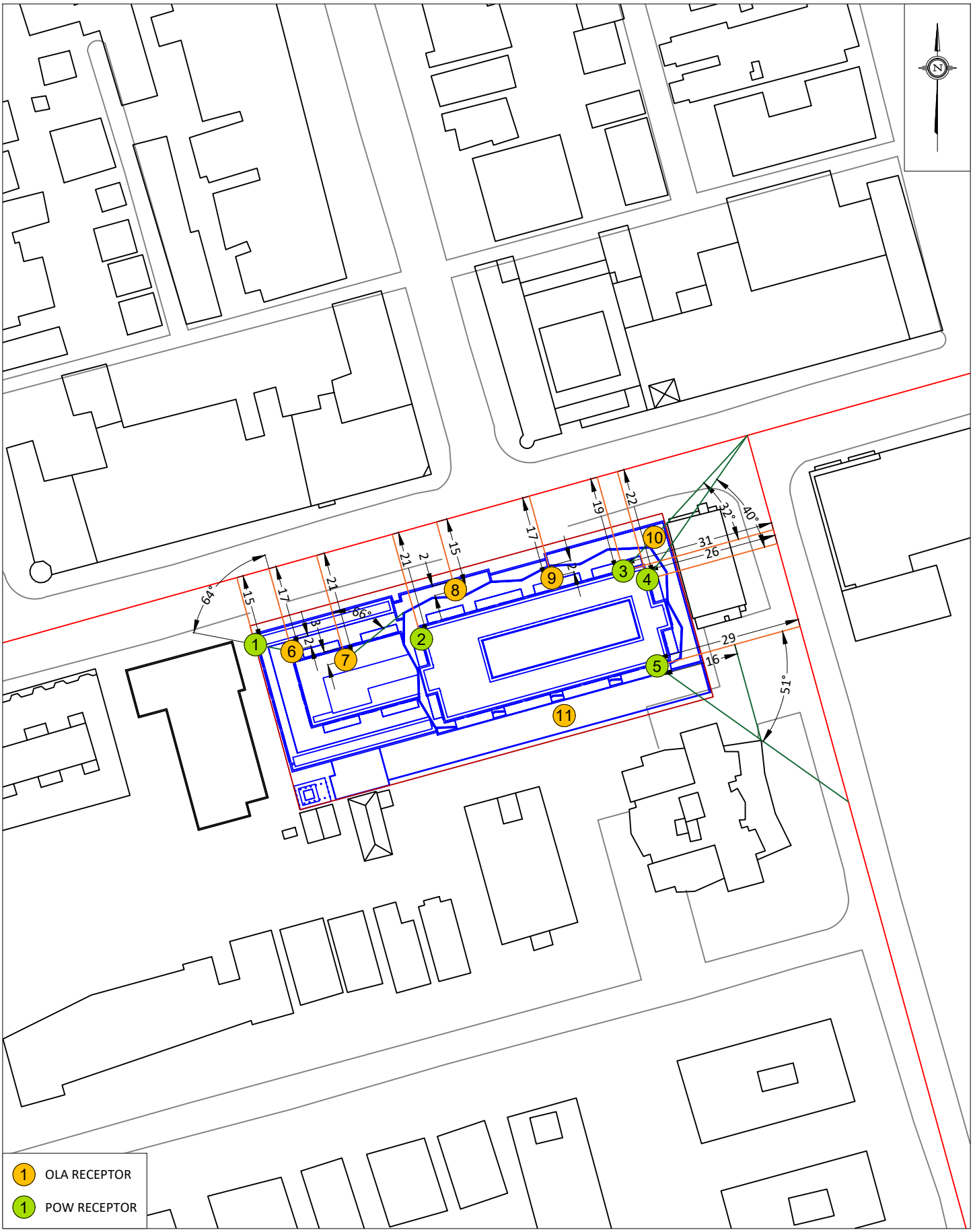
```
   -90     58    0.00   60.06    0.00    0.00   -0.85    0.00    0.00 -17.39
41.82
-------------------------------------------------------------------------------
--
    58     90    0.00   60.06    0.00    0.00   -7.50    0.00    0.00    0.00
52.56
-------------------------------------------------------------------------------
--

Segment Leq : 52.91 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       18.00 !       16.56 !        16.56

ROAD (0.00 + 39.16 + 0.00) = 39.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -32     90    0.00   59.09    0.00   -1.86   -1.69    0.00    0.00 -16.39
39.16
-------------------------------------------------------------------------------
--

Segment Leq : 39.16 dBA

Total Leq All Segments: 53.09 dBA


RT/Custom data, segment # 1: SC501 (day/night)
----------------------------------------------
1 - ALRV:
Traffic volume    :   470/97    veh/TimePeriod
Speed             :    40 km/h

Data for Segment # 1: SC501 (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           :  18.00 / 18.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 58.00 deg
Barrier height            :  19.50 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 45.06 + 55.86) = 56.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     58   0.00  63.36   0.00  -0.85   0.00   0.00 -17.45  45.06
-------------------------------------------------------------------------
    58     90   0.00  63.36   0.00  -7.50   0.00   0.00   0.00  55.86
-------------------------------------------------------------------------

Segment Leq : 56.20 dBA

Total Leq All Segments: 56.20 dBA


Results segment # 1: SC501 (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 !       18.00 !       15.67 !        15.67

RT/Custom (0.00 + 41.22 + 52.01) = 52.36 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -90      58    0.00   59.52    0.00   -0.85    0.00    0.00 -17.45   41.22
-------------------------------------------------------------------------
    58      90    0.00   59.52    0.00   -7.50    0.00    0.00    0.00   52.01
-------------------------------------------------------------------------

Segment Leq : 52.36 dBA

Total Leq All Segments: 52.36 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 61.25
                           (NIGHT): 55.75
```

```
STAMSON 5.0        NORMAL REPORT        Date: 03-04-2023 15:17:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: JA (day/night)
----------------------------------
Car traffic volume  :  9504/1056  veh/TimePeriod  *
Medium truck volume :   756/84    veh/TimePeriod  *
Heavy truck volume  :   540/60    veh/TimePeriod  *
Posted speed limit  :    40 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):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  90.00

Data for Segment # 1: JA (day/night)
------------------------------------
Angle1   Angle2           :  -6.00 deg   18.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  49.00 / 49.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 51.73 + 0.00) = 51.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    -6     18   0.00  65.62   0.00  -5.14  -8.75   0.00   0.00   0.00
51.73
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 51.73 dBA

Total Leq All Segments: 51.73 dBA


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

Source height = 1.50 m

ROAD (0.00 + 45.20 + 0.00) = 45.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -6     18   0.00  59.09   0.00  -5.14  -8.75   0.00   0.00   0.00
45.20
-------------------------------------------------------------------------
--

Segment Leq : 45.20 dBA

Total Leq All Segments: 45.20 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 51.73
                           (NIGHT): 45.20
```



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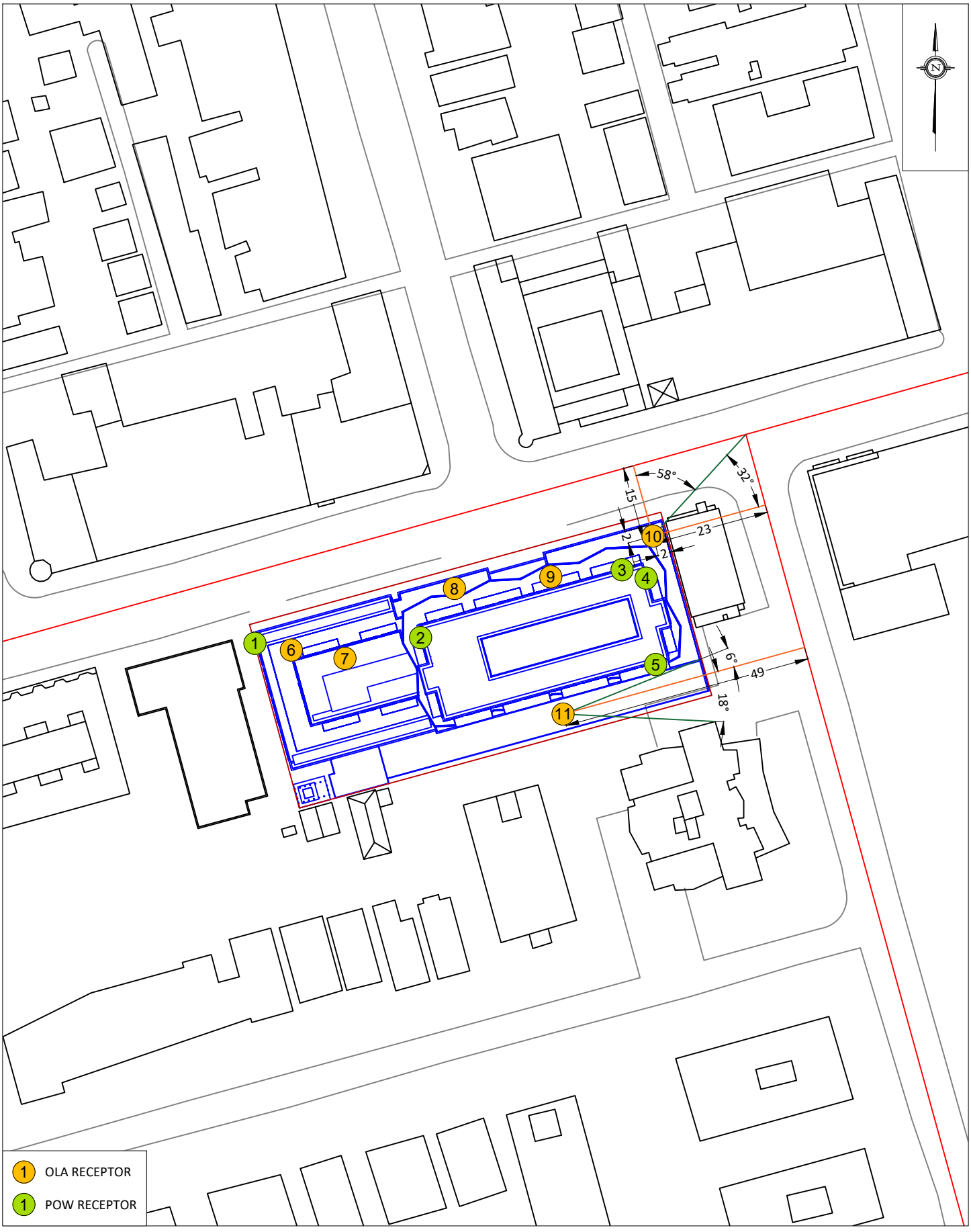
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-A1
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE A1:
STAMSON INPUT PARAMETERS



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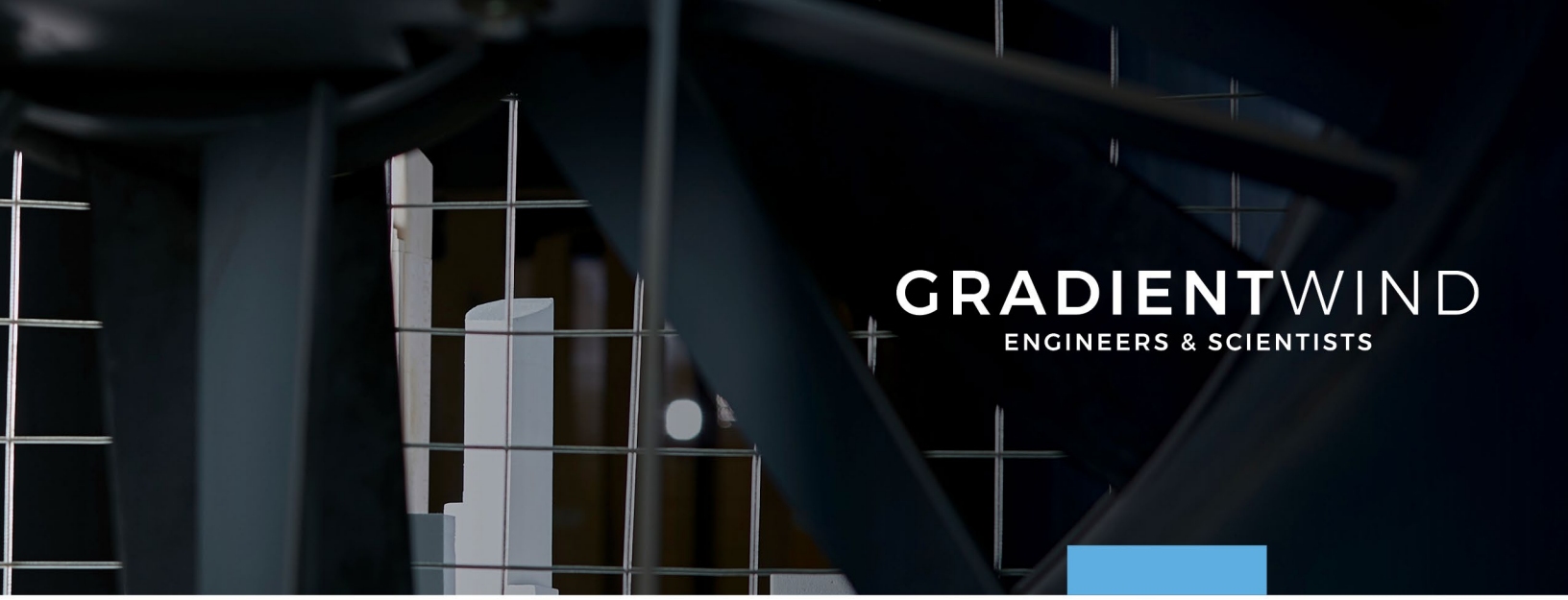
PROJECT	1437-1455 QUEEN STREET WEST, TORONTO TRANSPORTATION NOISE & VIBRATION ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-029-A2
DATE	APRIL 3, 2023	DRAWN BY	G.G.

DESCRIPTION

FIGURE A2:
STAMSON INPUT PARAMETERS



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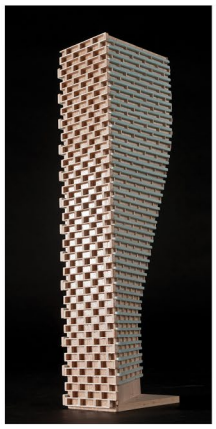

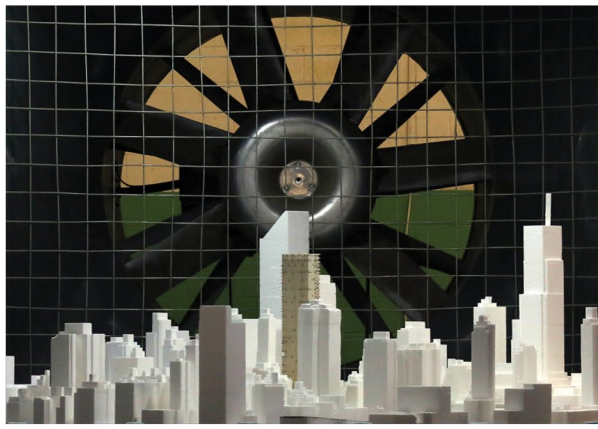

APPENDIX B

FTA VIBRATION CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

GWE23-029 04-Apr-23

Possible Vibration Impacts on 1455 Queen Street West
Predicted using FTA General Assessment

Train Speed 40 km/h 25 mph

	Distance from C/L of track to Edge of Fdn	
	(m)	(ft)
Streetcar	5.0	16.4

Vibration

From FTA Manual Fig 10-1

Vibration Levels at distance from track	79	dBV re 1 micro in/sec	
Adjustment Factors FTA Table 10-1			
Speed reference 50 mph	-6	Speed Limit of 40 km/h (25 mph)	
Vehicle Parameters	0	Assume Soft Primary suspension, Wheels run true	
Track Condition	0	None	
Track Treatments	0	None	
Type of Transit Structure	0	None	
Efficient vibration Propagation	0	Propagation through rock	
Vibration Levels at Fdn	73		0.113
Coupling to Building Foundation	-10	Large Masonry on Piles	
Floor to Floor Attenuation	0.0	Ground Floor Occupied	
Amplification of Floor and Walls	6		
Total Vibration Level	68.9794	dBV or	0.071 mm/s
Noise Level in dBA	33.9794	dBA	

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise

Factors Affecting Vibration Source

Source Factor	Adjustment to Propagation Curve			Comment
Speed		Reference Speed		Vibration level is approximately proportional to 20*log(speed/speed$_{ref}$). Sometimes the variation with speed has been observed to be as low as 10 to 15 log(speed/speed$_{ref}$).
	Vehicle Speed	50 mph	30 mph	
	60 mph	+1.6 dB	+6.0 dB	
	50 mph	0.0 dB	+4.4 dB	
	40 mph	-1.9 dB	+2.5 dB	
	30 mph	-4.4 dB	0.0 dB	
	20 mph	-8.0 dB	-3.5 dB	
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			If both the wheels and the track are worn, only one adjustment should be used. Corrugated track is a common problem. Mill scale on new rail can cause higher vibration levels until the rail has been in use for some time.
Special Trackwork	+10 dB			Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.
Jointed Track or Uneven Road Surfaces	+5 dB			Jointed track can cause higher vibration levels than welded track. Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise (Continued)

Factors Affecting Vibration Path

Path Factor	Adjustment to Propagation Curve	Comment
Resiliently Supported Ties	-10 dB	Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Configuration (not additive, apply greatest value only)		
Type of Transit Structure	Relative to at-grade tie & ballast: Elevated structure -10 dB Open cut 0 dB	The general rule is the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Relative to bored subway tunnel in soil: Station -5 dB Cut and cover -3 dB Rock-based - 15 dB	
Ground-borne Propagation Effects		
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil +10 dB	Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer: Dist. / Adjust. 50 ft +2 dB 100 ft +4 dB 150 ft +6 dB 200 ft +9 dB	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
Coupling to building foundation	Wood Frame Houses -5 dB 1-2 Story Masonry -7 dB 3-4 Story Masonry -10 dB Large Masonry on Piles -10 dB Large Masonry on Spread Footings -13 dB Foundation in Rock 0 dB	The general rule is the heavier the building construction, the greater the coupling loss.

Factors Affecting Vibration Receiver

Receiver Factor	Adjustment to Propagation Curve	Comment
Floor-to-floor attenuation	1 to 5 floors above grade: -2 dB/floor 5 to 10 floors above grade: -1 dB/floor	This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building.
Amplification due to resonances of floors, walls, and ceilings	+6 dB	The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.
Conversion to Ground-borne Noise		
Noise Level in dBA	Peak frequency of ground vibration: Low frequency (<30 Hz): -50 dB Typical (peak 30 to 60 Hz): -35 dB High frequency (>60 Hz): -20 dB	Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low, typical or high frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.