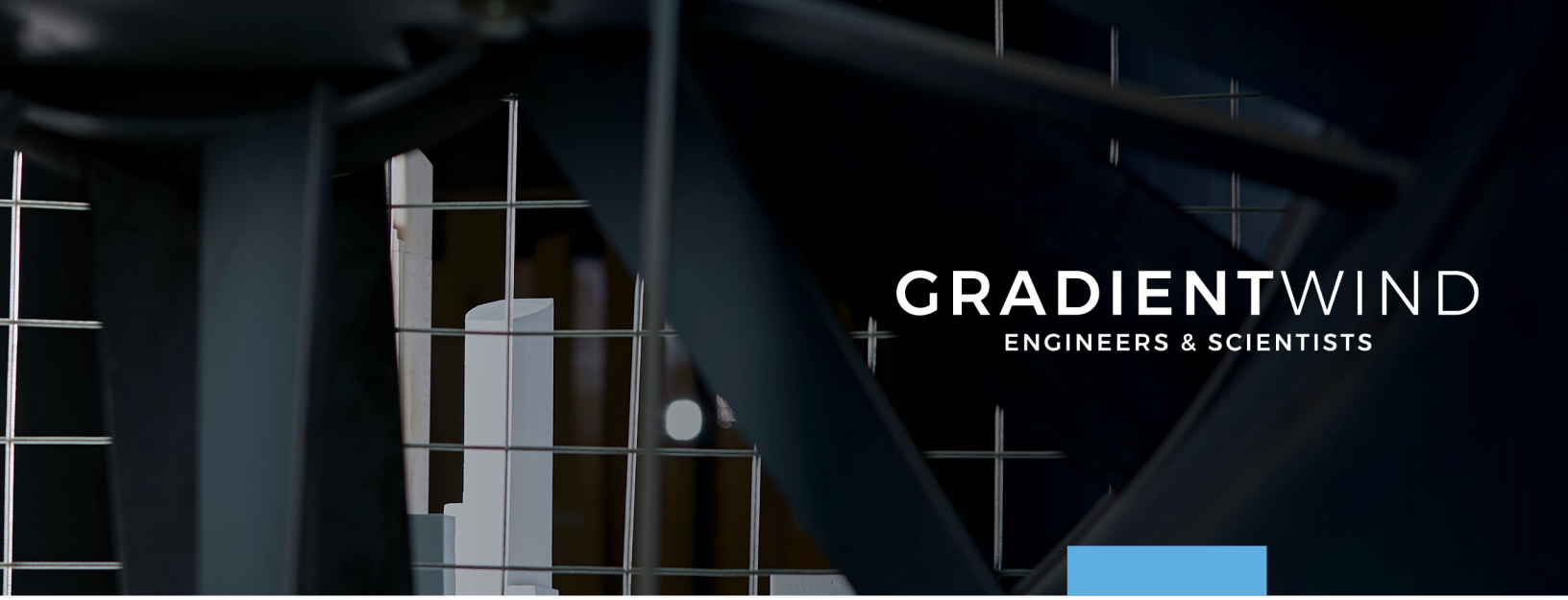

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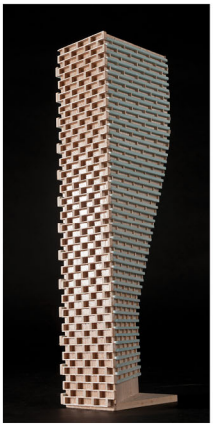
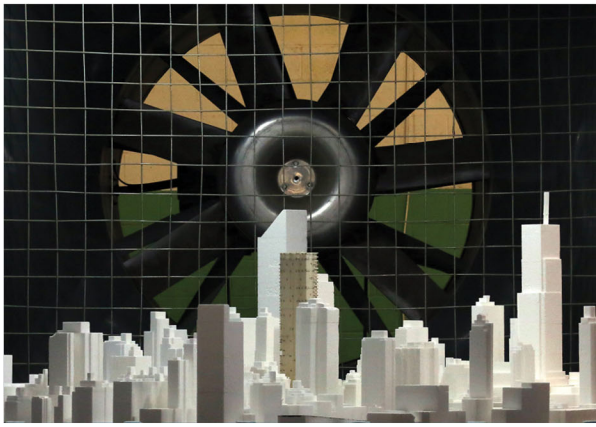
ROADWAY TRAFFIC NOISE ASSESSMENT

1815 Montreal Road
Ottawa, Ontario

REPORT: 23-116 – Traffic Noise





June 5th, 2023

PREPARED FOR
CSV Architects
190 O'Connor Street, Suite 100
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PREPARED BY
Essraa Alqassab, BASc, Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken to satisfy the requirements for a Zoning By-law Amendment (ZBA) and Site Plan Control (SPC) applications submission for a proposed development located at 1815 Montreal Road in Ottawa, Ontario. The proposed development comprises a 9-storey residential building, plus a mechanical level. The primary source of roadway traffic noise is Montreal Road. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings provided by CSV Architects in April 2023.

The results of the current analysis indicate that noise levels will range between 62 and 71 dBA during the daytime period (07:00-23:00) and between 54 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. 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.

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 be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Noise levels exceed 60 dBA at the Level 2 public terrace. As such, a noise barrier is required to reduce noise levels to below 60 dBA, and as close as possible to 55 dBA, keeping in mind architectural, administrative, and economical restrictions. Results indicate that the noise level can be reduced to 55 dBA, with a 2 m high noise barrier, which is the recommended noise mitigation measure.

The development is surrounded by low-rise residential buildings to the north, south, and east and a low-rise institutional building to the west. These buildings are serviced by standard HVAC equipment and are

expected to be in compliance with NPC-300 noise guidelines as they would have required their own stationary noise assessment prior to construction. With that notion, in addition to the set-back distance from the existing nearby HVAC equipment and the proposed development, stationary noise impacts from nearby existing properties are expected to be negligible.

As the mechanical equipment will primarily reside in the mechanical level located on the high roof, noise levels on the surrounding noise sensitive properties are expected to be negligible. Noise impacts can generally be minimized by judicious selection and placement of the equipment. A review of the placement and types of equipment should be reviewed by an acoustic consultation prior to the installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by CSV Architects to undertake a roadway traffic noise assessment to satisfy the requirements for concurrent Zoning By-law Amendment (ZBA) and Site Plan Control (SPC) applications submission for a proposed development located at 1815 Montreal Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings provided by CSV Architect, dated April 2023, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located at 1815 Montréal Road in Ottawa; situated approximately 220 m east of the intersection of Montréal Road and Beckenham Lane, on a parcel of land bounded by Montréal Road to the south, a two-storey office building to the west, and low-rise residential dwellings to the north and east. The proposed development comprises a near rectangular nine-storey residential building, topped with a mechanical penthouse.

Above two below-grade parking levels, the ground floor of the proposed development includes a main entrance to the south, central elevator core, bike storage, theater, and co-working space, and residential units throughout the remainder of the level. Private patios are located along the south and west elevations. Access to underground parking is provided by a ramp at the northeast corner via a laneway from Montréal Road. This noted laneway also provides access to surface parking located near the northeast and southeast corners of the proposed development. Levels 2-6, 8, and 9 are reserved for residential use while Level 7 includes a party room at the northwest corner and residential units throughout the remainder of the level. Private terraces are provided to the north and east at Level 2, to

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

the north at Levels 5 and 8, and to the north and at the northeast and northwest corners at Level 6. Amenity terraces are located near the southeast corner at Level 2 and to the north at Level 7.

The development is surrounded by low-rise residential buildings to the north, south, and east and a mid-rise health care building to the west. These buildings are serviced by standard HVAC equipment and are expected to be in compliance with NPC-300 noise guidelines as they would have required their own stationary noise assessment prior to construction. With that notion, in addition to the set-back distance from the existing nearby HVAC equipment and the proposed development, stationary noise impacts from nearby existing properties are expected to be negligible.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines 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 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic 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 City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 50, 45 and 40 dBA for office and reception areas, living rooms, and sleeping quarters, respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [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

[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] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

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.

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, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, 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.
- Noise receptors were strategically placed at 8 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in A1 and A2.

[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.3 Roadway Traffic Volumes

The ENCG 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 City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Montreal Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**

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 (2012) 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:

[7] City of Ottawa Transportation Master Plan, November 2013
[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

- 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

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, which was prepared for site plan approval, 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).

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

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	27.7	POW / Level 9 South Façade	71	64
2	27.7	POW / Level 9 West Façade	68	60
3	27.7	POW / Level 9 East Façade	68	60
4	21.1	POW / Level 7 East Façade	62	54
5	5.0	POW / Level 2 East Façade	68	60
6	8.2	OLA / Level 2 Public Terrace	67	N/A*
7	24.5	OLA / Level 8 Private Terraces	39	N/A*
8	21.1	OLA / Level 7 Public Terrace	48	N/A*

*Noise levels at an OLA during the nighttime period are not considered as per ENCG

The results of the current analysis indicate that noise levels will range between 62 and 71 dBA during the daytime period (07:00-23:00) and between 54 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road.

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 city of Ottawa 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 below for various units within the development (see Figure 3):

TABLE 4: STC RECOMMENDATIONS

Façade	Window STC (Bedroom/Living Room)	Exterior Wall STC
South	34/29	45
East	31/26	45
West	31/26	45

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 stud 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. 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.

5.2.1 Noise Barrier Investigation

Noise levels exceed 60 dBA at the Level 2 public terrace. As such, a noise barrier is required to reduce noise levels to below 60 dBA, and as close as possible to 55dBA, keeping in mind architectural, administrative, and economical restrictions. Various barrier heights were tested, with the barrier located along the south perimeters of the space, as indicated in Figure 4. Results indicate that the noise level is

reduced to 55 dBA, with a 2 m high noise barrier, which is the recommended noise mitigation measure. The results of the barrier investigation can be seen in Table 5:

TABLE 5: RESULTS OF NOISE BARRIER INVESTIGATION

Receptor ID	Location	Receptor Height Above Grade (m)	Daytime L_{eq} Noise Levels (dBA)			
			No Barrier	With 1.1 m Barrier	With 1.5 m Barrier	With 2.0 m Barrier
6	Level 2 Public Terrace	8.2	67	60	58	**55**

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 62 and 71 dBA during the daytime period (07:00-23:00) and between 54 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. 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.

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. The following Warning Clause[10] will also be required be placed on 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 exceed 60 dBA at the Level 2 public terrace. As such, a noise barrier is required to reduce noise levels to below 60 dBA, and as close as possible to 55dBA, keeping in mind architectural, administrative, and economical restrictions. Results indicate that the noise level can be reduced to 55 dBA, with a 2 m high noise barrier, which is the recommended noise mitigation measure.

[10] City of Ottawa Environmental Noise Control Guidelines, January 2016

The development is surrounded by low-rise residential buildings to the north, south, and east and a low-rise institutional building to the west. These buildings are serviced by standard HVAC equipment and are expected to be in compliance with NPC-300 noise guidelines as they would have required their own stationary noise assessment prior to construction. With that notion, in addition to the set-back distance from the existing nearby HVAC equipment and the proposed development, stationary noise impacts from nearby existing properties are expected to be negligible.

As the mechanical equipment will primarily reside in the mechanical level located on the high roof, noise levels on the surrounding noise sensitive properties are expected to be negligible. Noise impacts can generally be minimized by judicious selection and placement of the equipment. A review of the placement and types of equipment should be reviewed by an acoustic consultation prior to the installation of the equipment.

This concludes our traffic noise 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.

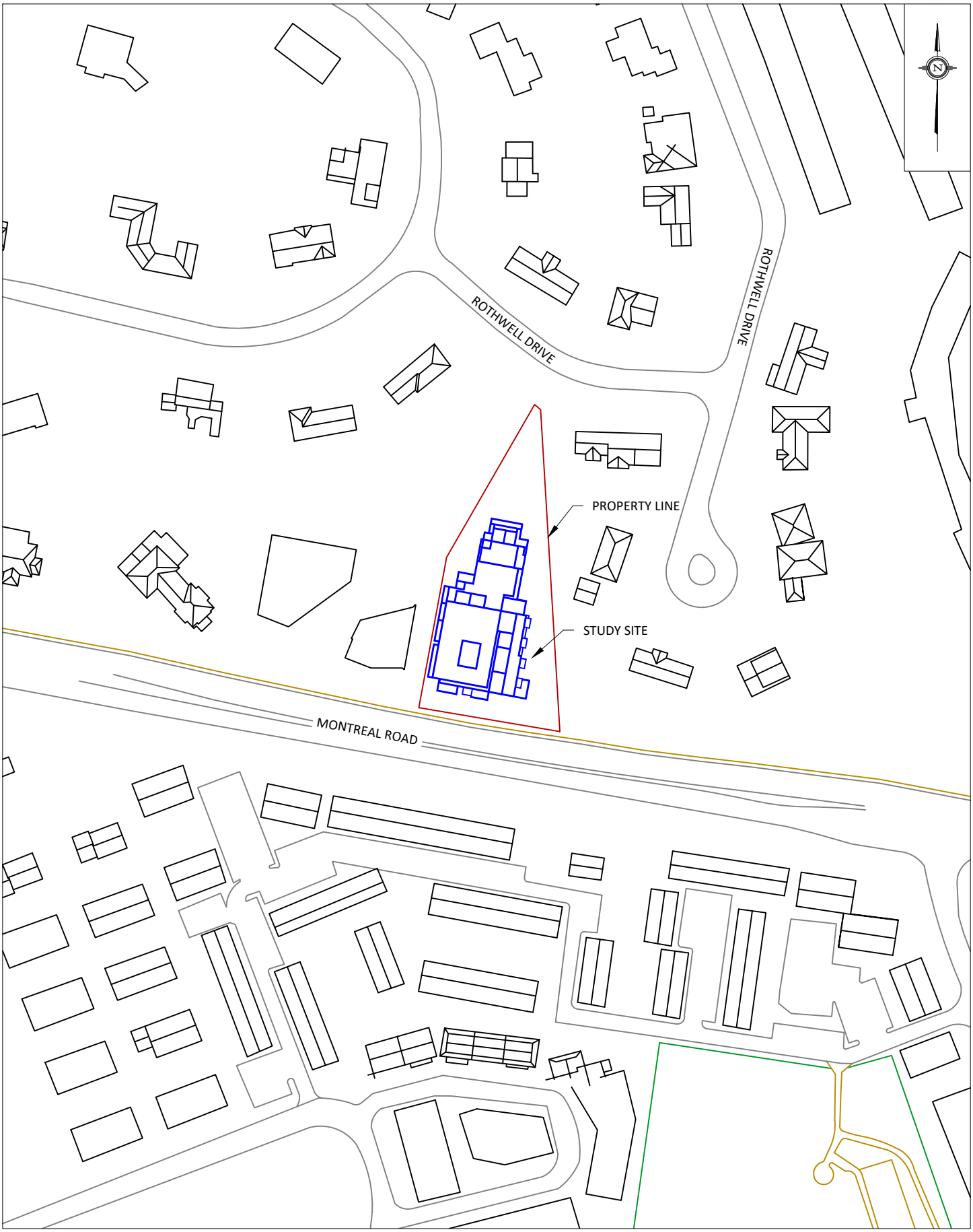
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #23-116-Traffic Noise



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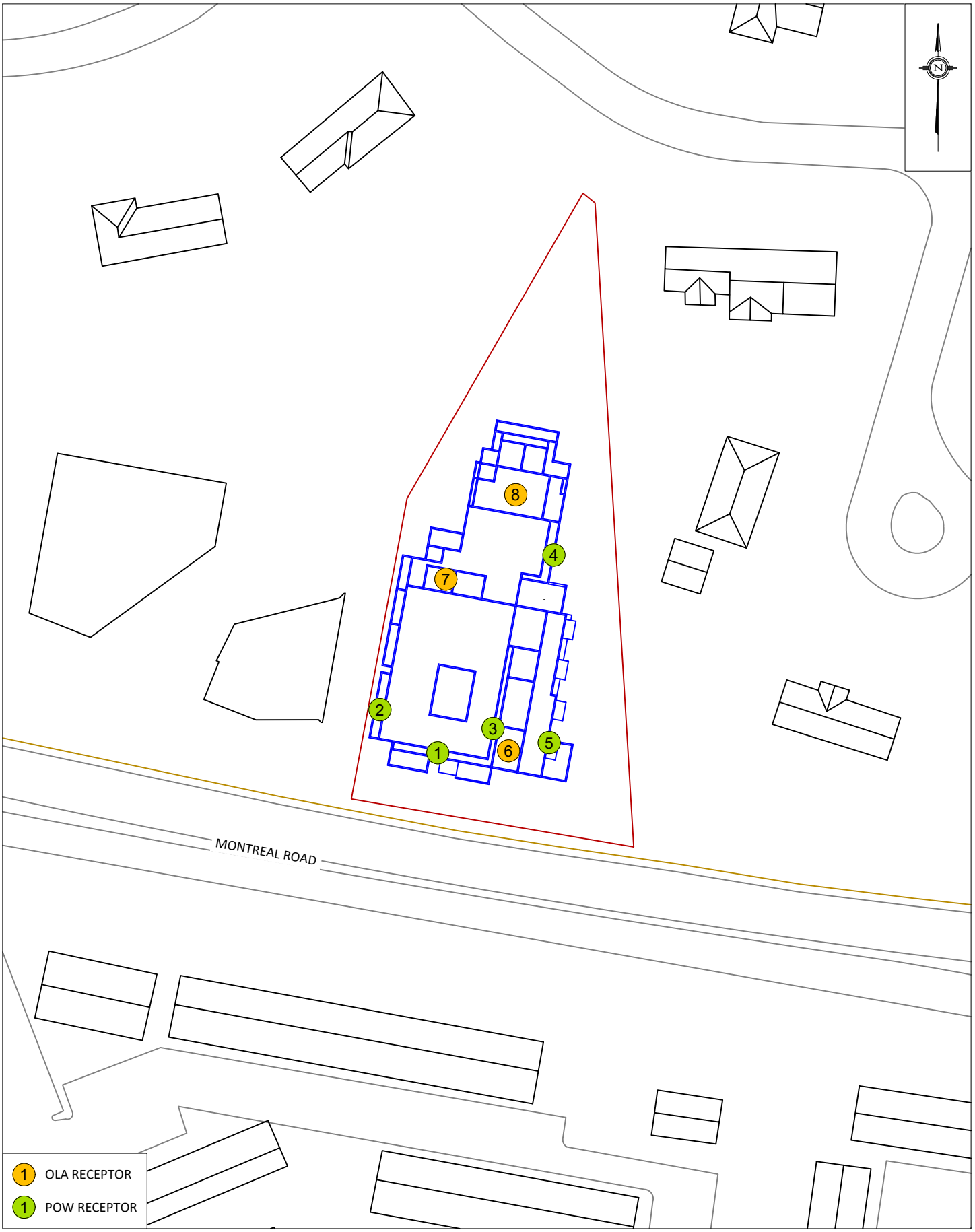
PROJECT	1815 MONTREAL ROAD ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW23-116-1
DATE	MAY 24, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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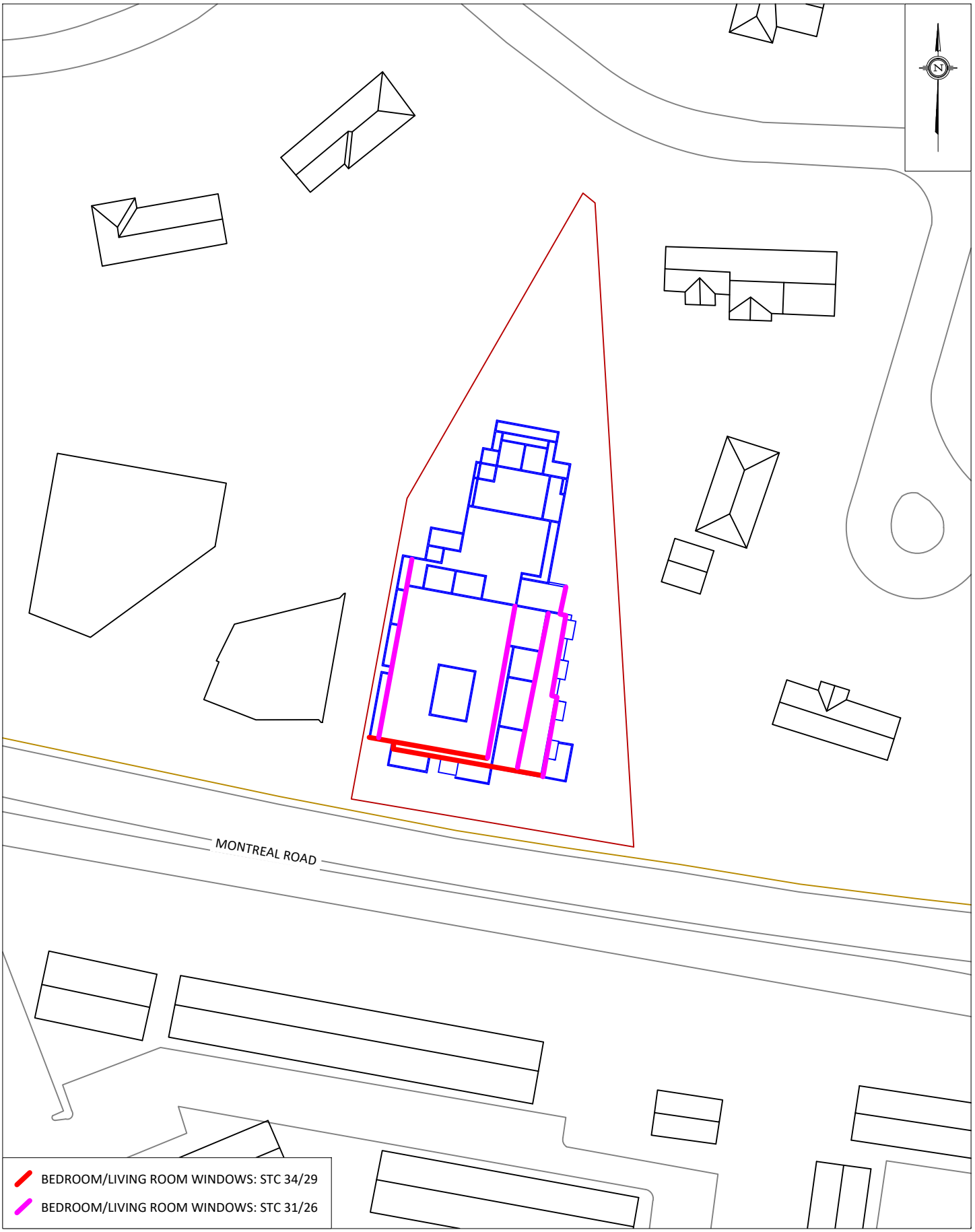
PROJECT	1815 MONTREAL ROAD ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-116-2
DATE	MAY 24, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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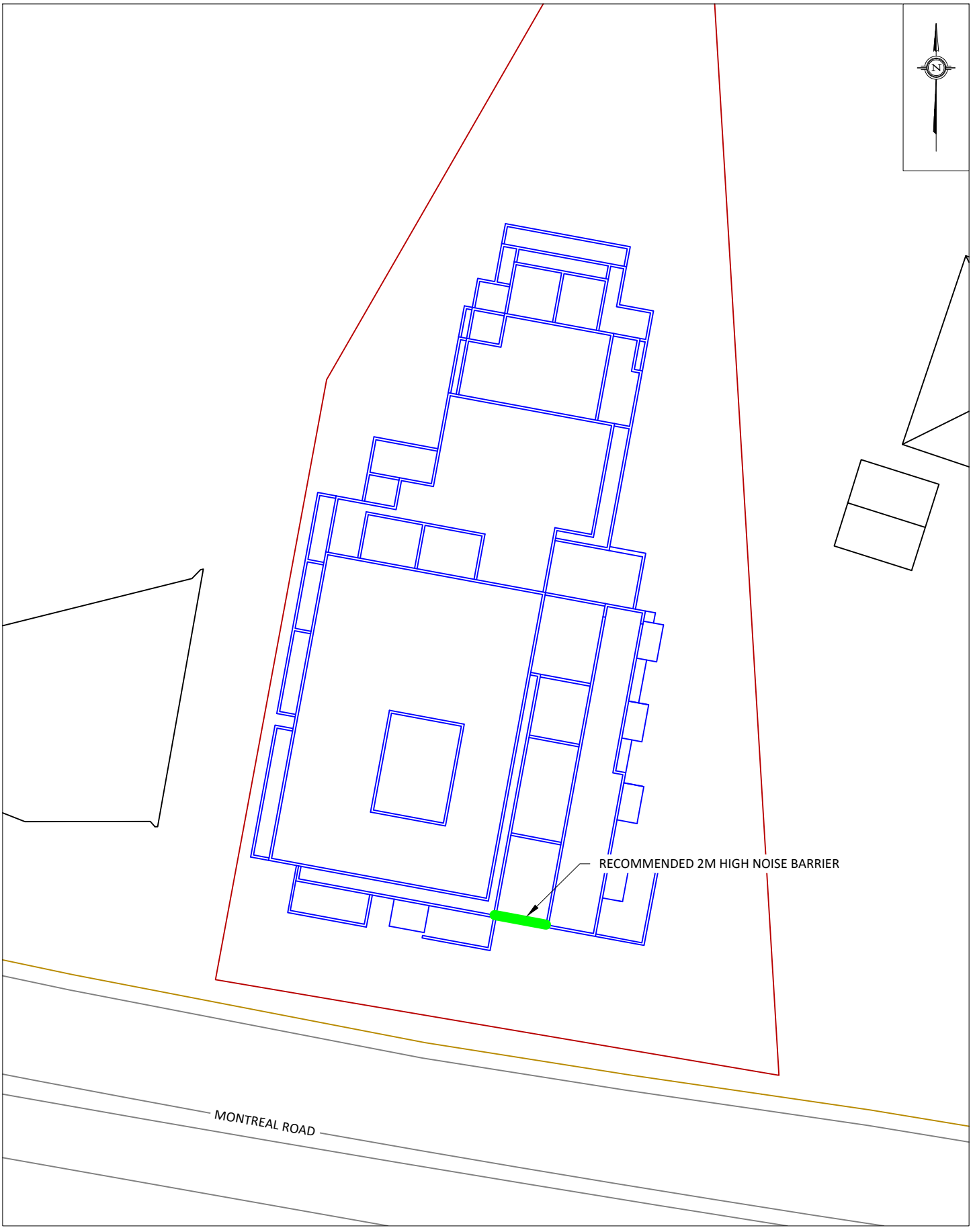
PROJECT	1815 MONTREAL ROAD ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-116-3
DATE	MAY 24, 2023	DRAWN BY	E.A.

FIGURE 3:
STC RECOMMENDATION



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PROJECT	1815 MONTREAL ROAD ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:200 (APPROX.)	DRAWING NO.	GW23-116-4
DATE	MAY 24, 2023	DRAWN BY	E.A.

DESCRIPTION

FIGURE 4:
NOISE BARRIER RECOMMENDATION

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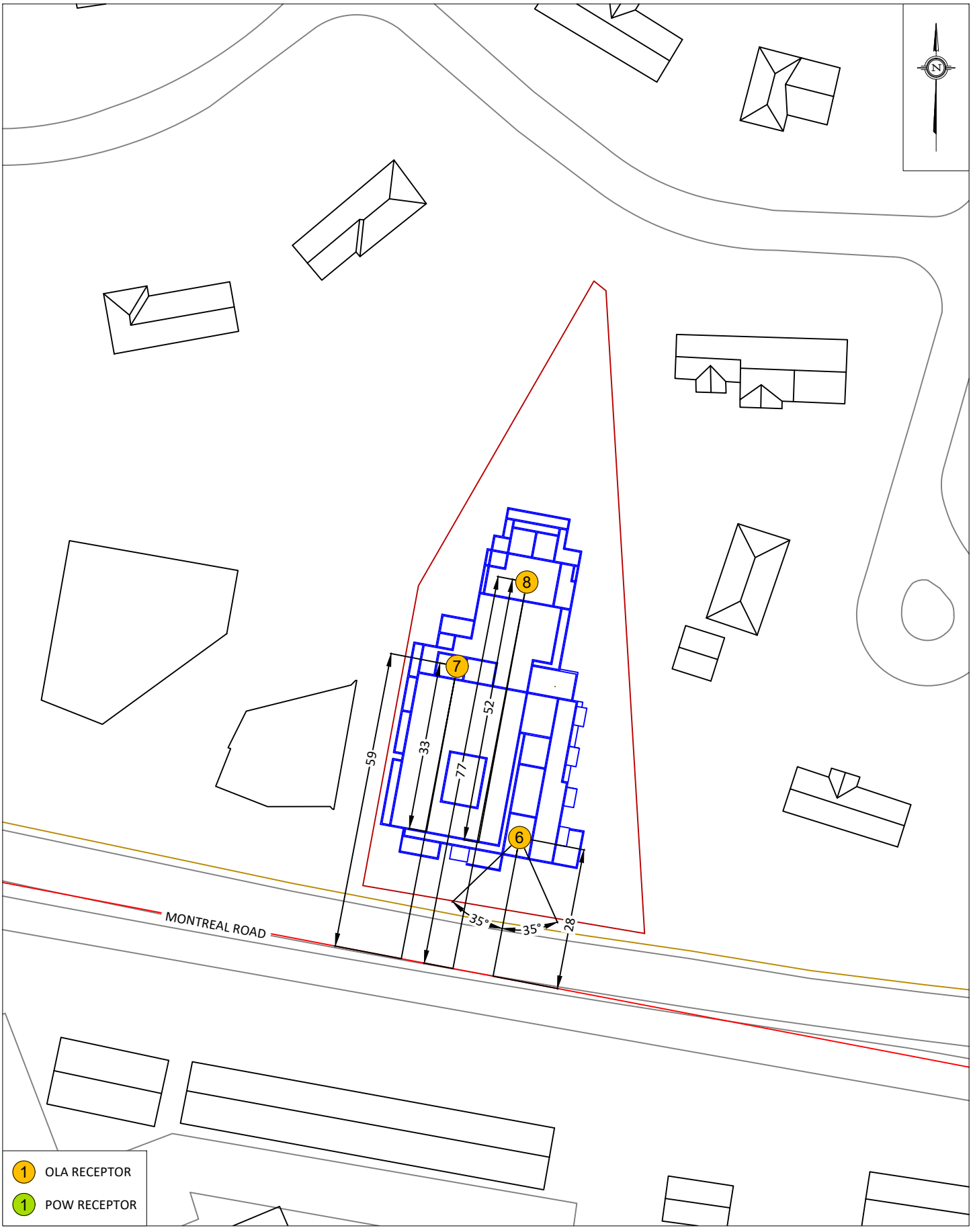
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-116-A1
DATE	MAY 24, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A1:
STAMSON PARAMETERS (1/2)



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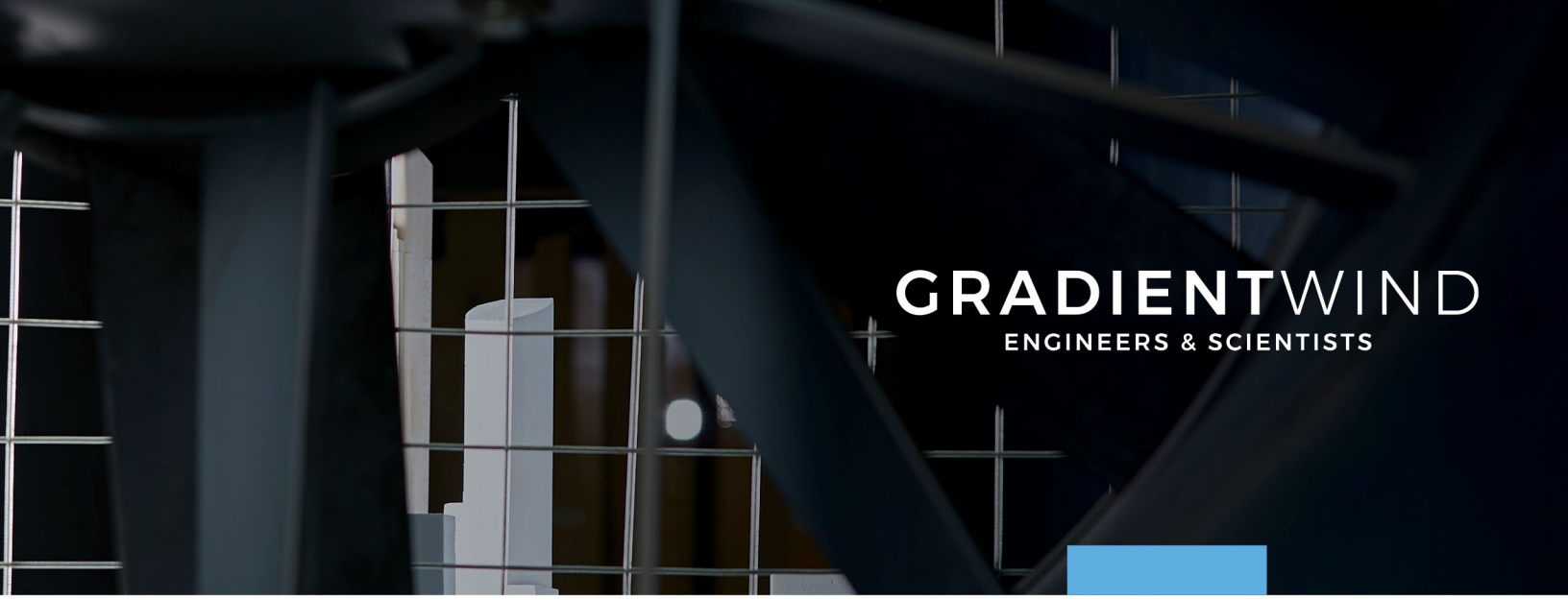
PROJECT	1815 MONTREAL ROAD ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-116-A2
DATE	MAY 24, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE A2:
STAMSON PARAMETERS (2/2)



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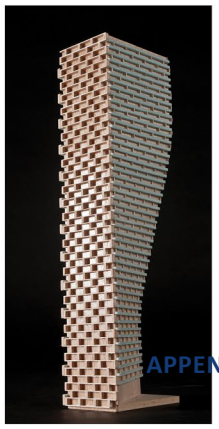

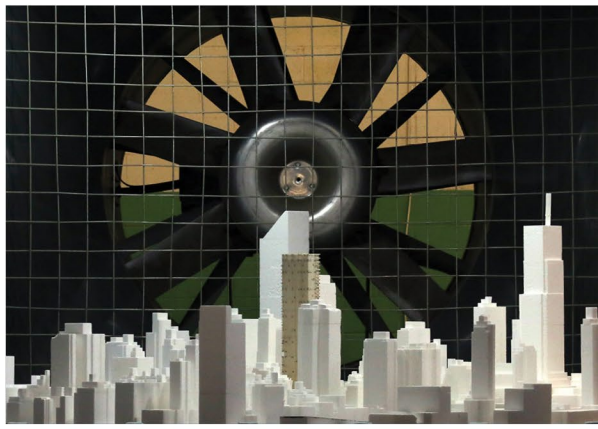

APPENDIX A

STAMSON CALCULATIONS

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```
STAMSON 5.0        NORMAL REPORT        Date: 24-05-2023 15:08:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  25.00 / 25.00  m
Receiver height           :  27.70 / 27.70  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 71.46 + 0.00) = 71.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  73.68   0.00  -2.22   0.00   0.00   0.00   0.00  71.46
-------------------------------------------------------------------------------

Segment Leq : 71.46 dBA

Total Leq All Segments: 71.46 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 63.86 + 0.00) = 63.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  66.08   0.00  -2.22   0.00   0.00   0.00   0.00  63.86
-------------------------------------------------------------------------------

Segment Leq : 63.86 dBA

Total Leq All Segments: 63.86 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 71.46
                           (NIGHT): 63.86
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-05-2023 15:09:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (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  :  31.00 / 31.00  m
Receiver height           :  27.70 / 27.70  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 67.51 + 0.00) = 67.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  73.68   0.00  -3.15  -3.01   0.00   0.00   0.00  67.51
-------------------------------------------------------------------------------

Segment Leq : 67.51 dBA

Total Leq All Segments: 67.51 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 59.92 + 0.00) = 59.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  66.08   0.00  -3.15  -3.01   0.00   0.00   0.00  59.92
-------------------------------------------------------------------------------

Segment Leq : 59.92 dBA

Total Leq All Segments: 59.92 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.51
                           (NIGHT): 59.92
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-05-2023 15:09:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (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  :  31.00 / 31.00  m
Receiver height           :  27.70 / 27.70  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 67.51 + 0.00) = 67.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  73.68   0.00  -3.15  -3.01   0.00   0.00   0.00  67.51
-------------------------------------------------------------------------------

Segment Leq : 67.51 dBA

Total Leq All Segments: 67.51 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 59.92 + 0.00) = 59.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  66.08   0.00  -3.15  -3.01   0.00   0.00   0.00  59.92
-------------------------------------------------------------------------------

Segment Leq : 59.92 dBA

Total Leq All Segments: 59.92 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.51
                           (NIGHT): 59.92
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-05-2023 10:01:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   -21.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  67.00 / 67.00  m
Receiver height           :  27.70 / 27.70  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 63.01 + 0.00) = 63.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -21   0.00  73.68   0.00  -6.50  -4.16   0.00   0.00   0.00  63.01
-------------------------------------------------------------------------------

Segment Leq : 63.01 dBA

Total Leq All Segments: 63.01 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 55.42 + 0.00) = 55.42 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -21   0.00  66.08   0.00  -6.50  -4.16   0.00   0.00   0.00  55.42
-------------------------------------------------------------------------------

Segment Leq : 55.42 dBA

Total Leq All Segments: 55.42 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 63.01
                           (NIGHT): 55.42
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-05-2023 15:10:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (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  :  31.00 / 31.00  m
Receiver height           :  27.70 / 27.70  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 67.51 + 0.00) = 67.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  73.68   0.00  -3.15  -3.01   0.00   0.00   0.00  67.51
-------------------------------------------------------------------------------

Segment Leq : 67.51 dBA

Total Leq All Segments: 67.51 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 59.92 + 0.00) = 59.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  66.08   0.00  -3.15  -3.01   0.00   0.00   0.00  59.92
-------------------------------------------------------------------------------

Segment Leq : 59.92 dBA

Total Leq All Segments: 59.92 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.51
                           (NIGHT): 59.92
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-05-2023 10:02:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (day/night)
----------------------------------------------
Angle1   Angle2           : -35.00 deg   35.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  28.00 / 28.00  m
Receiver height           :   8.24 / 27.70  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -35.00 deg   Angle2 : 35.00 deg
Barrier height            :   6.74 m
Barrier receiver distance :   4.00 / 4.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Montreal (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 !        8.24 !        7.28 !         7.28
```

```
ROAD (0.00 + 66.86 + 0.00) = 66.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -35     35   0.00  73.68   0.00  -2.71  -4.10   0.00   0.00  -2.78  64.08*
   -35     35   0.00  73.68   0.00  -2.71  -4.10   0.00   0.00   0.00  66.86
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 66.86 dBA

Total Leq All Segments: 66.86 dBA


Results segment # 1: Montreal (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 !       27.70 !       23.96 !        23.96

ROAD (0.00 + 59.27 + 0.00) = 59.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -35     35   0.00  66.08   0.00  -2.71  -4.10   0.00   0.00   0.00  59.27*
   -35     35   0.00  66.08   0.00  -2.71  -4.10   0.00   0.00   0.00  59.27
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.27 dBA

Total Leq All Segments: 59.27 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 66.86
                           (NIGHT): 59.27
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-05-2023 10:02:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b.te               Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  35000
    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     :  92.00

Data for Segment # 1: Montreal (day/night)
----------------------------------------------
Angle1   Angle2           : -35.00 deg   35.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  28.00 / 28.00  m
Receiver height           :   8.24 / 27.70  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -35.00 deg   Angle2 : 35.00 deg
Barrier height            :   8.74 m
Barrier receiver distance :   4.00 / 4.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Montreal (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 !        8.24 !        7.28 !         7.28

ROAD (0.00 + 54.57 + 0.00) = 54.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -35     35   0.00  73.68   0.00  -2.71  -4.10   0.00   0.00 -12.30  54.57
-------------------------------------------------------------------------------

Segment Leq : 54.57 dBA

Total Leq All Segments: 54.57 dBA


Results segment # 1: Montreal (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 !       27.70 !       23.96 !        23.96

ROAD (0.00 + 59.27 + 0.00) = 59.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -35     35   0.00  66.08   0.00  -2.71  -4.10   0.00   0.00   0.00  59.27*
   -35     35   0.00  66.08   0.00  -2.71  -4.10   0.00   0.00   0.00  59.27
-------------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.27 dBA

Total Leq All Segments: 59.27 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 54.57
                           (NIGHT): 59.27
```

```
STAMSON 5.0         NORMAL REPORT         Date: 24-05-2023 15:11:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Montreal (day/night)
----------------------------------------------
Car traffic volume  :  1600/800   veh/TimePeriod
Medium truck volume :   320/160   veh/TimePeriod
Heavy truck volume  :   160/80    veh/TimePeriod
Posted speed limit  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Montreal (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  :  77.00 / 77.00  m
Receiver height           :  24.50 / 24.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  29.40 m
Barrier receiver distance :  33.00 / 33.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.67 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.67 !       24.50 !       14.71 !        14.71

ROAD (0.00 + 38.68 + 0.00) = 38.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.68   0.00  -7.10   0.00   0.00   0.00 -17.89  38.68
-------------------------------------------------------------------------------

Segment Leq : 38.68 dBA
```

```
Total Leq All Segments: 38.68 dBA


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

Source height = 1.67 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.67 !       24.50 !       14.71 !        14.71

ROAD (0.00 + 38.68 + 0.00) = 38.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.68   0.00  -7.10   0.00   0.00   0.00 -17.89  38.68
-------------------------------------------------------------------------------

Segment Leq : 38.68 dBA

Total Leq All Segments: 38.68 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 38.68
                           (NIGHT): 38.68
```