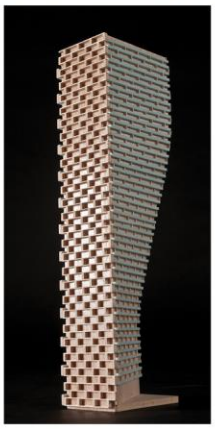
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

200-201 Friel Street
Ottawa, Ontario

REPORT: 23-008 – Traffic Noise



March 22, 2023

PREPARED FOR

Ottawa Community Housing Corporation
39 Auriga Drive
Ottawa, ON K2E 7Y8

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 concurrent Zoning By-law Amendment and Site Plan Control (SPC) application requirements for a proposed development located at 200-201 Friel Street in Ottawa, Ontario. The proposed development comprises a 20-storey residential building topped with a mechanical penthouse. The primary sources of roadway traffic noise include Beausoliel Drive and Rideau Street. 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 by Diamond Schmitt Architects provided in January 2023.

The results of the current analysis indicate that noise levels will range between 49 and 68 dBA during the daytime period (07:00-23:00) and between 41 and 58 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 Beausoleil Drive. 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. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6 of this report.

Furthermore, as noise levels do not exceed the NPC-300/ENCG OLA criteria of 55 dBA, acoustic mitigation for the outdoor amenity areas associated with this development will not be required.

Stationary noise impacts from the environment onto the development are expected to be minimal as the site is not in close proximity to any large mechanical equipment or industrial site. The setback distance from the rooftop equipment at the adjacent residential buildings is expected to be sufficient to attenuate

noise impacts. The O-Train Line 1 underground LRT is further than 75 m south of the site; therefore, ground vibration impacts are considered negligible.

With regard to stationary noise impacts from the building onto the surroundings, a stationary noise study is recommended for the site during the detailed design once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise sensitive areas. 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.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Ottawa Community Housing Corporation to undertake a roadway traffic noise assessment to satisfy the requirements for a concurrent Zoning By-law Amendment and Site Plan Control (SPC) application submission for a proposed development located at 200-201 Friel Street 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 by Diamond Schmitt Architects provided in January 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 200-201 Friel Street in Ottawa; situated at the north corner on a parcel of land bounded by Beausoleil Drive to the northwest, Chapel Street to the northeast, Rideau Street to the southeast, and Friel Street to the southwest. Throughout the report, Beausoleil Drive is referred to as project north. The proposed development shares the civic addresses of the existing 11-storey residential building at 200 Friel Street, approximately 110 m to the southwest, and an existing 13-storey residential building at 201 Friel Street, to the immediate southwest.

The proposed development comprises a nominally rectangular 20-storey residential building, topped with a mechanical penthouse (MPH). Above below-grade parking, the ground floor includes building access along the north, east, and south elevations. A Privately-Owned Publicly Accessible Space (P.O.P.S.) is situated to the northwest of the proposed development, to the immediate north of 201 Friel Street. An outdoor amenity comprising a private garden, outdoor seating areas, and a front garden is situated along the south elevation. Access to below-grade parking is provided by a ramp along the west elevation of the

[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

proposed development via the existing laneway from Friel Street, situated to the southwest. The building steps back from the west elevation at Level 7 to accommodate an amenity terrace and at the MPH level.

The development is surrounded by a school to the north, and mid-rise and high-rise buildings in all other compass directions. These buildings are serviced by standard HVAC equipment and are expected to be in compliance with noise guidelines. 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 45 and 40 dBA for 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 6 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figure A1.
- Distance adjustment used for R1, since source-receiver distance is less than 15 m.

In the case of the R1 (North Façade) receptor, the source-receiver distance was less than 15 m, which is the minimum distance entry limitation in STAMSON. A distance adjustment calculation shown in Equation

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

1 from ORNAMENT was used to calculate the adjustment value, which was added to the calculated noise level from STAMSON[7]. The equation is as follows:

$$Distance\ Adjustment\ Value = 10\ (1+\propto) \log(\frac{D_{ref}}{D}) \quad \textbf{(1)}$$

Where the parameters are:

- D_{ref}= Distance used in STAMSON, 15 metres
- D= Actual distance of source-receiver, 9 meters
- α= Ground Absorption Factor (Hard Ground = 0, Soft Ground =1)

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[8] 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
Rideau Street	2-Lane Urban Arterial Undivided (2-UAU)	50	**15,000**
Beausoliel Drive	2-Lane Urban Collector	50	**8,000**

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

[7] ORNAMENT Technical Document, October 1989, Section 4
[8] City of Ottawa Transportation Master Plan, November 2013

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[9] 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

Based on published research[10], 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] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[10] 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	58.5	POW – North Façade	68	58
2	58.5	POW – West Façade	63	55
3	16.5	POW – West Façade, Level 6	62	54
4	58.5	POW – South Façade, Level 20	49	41
5	1.5	OLA – Ground Level Amenity	44	N/A*
6	19.5	OLA – Level 7 Outdoor Amenity	46	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 49 and 68 dBA during the daytime period (07:00-23:00) and between 41 and 58 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 Beausoleil Drive.

As noise levels do not exceed the NPC-300/ENCG criteria of 55 dBA, acoustic mitigation for the outdoor amenity areas will not be required.

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):

- **Bedroom Windows**

(i) Bedroom windows facing north will require a minimum STC of 31.

(ii) All other bedroom windows are to satisfy Ontario Building Code (2020) requirements.

- **Living Room Windows**

(i) Living room windows facing north will require a minimum STC of 26.

(ii) All other living room windows are to satisfy Ontario Building Code (2020) requirements.

- **Exterior Walls**

(i) Exterior wall components on the north façade will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[11].

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 punch window and wall system may be 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

[11] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 49 and 68 dBA during the daytime period (07:00-23:00) and between 41 and 58 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 Beausoleil Drive. 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[12] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized:

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."*

Furthermore, as noise levels do not exceed the NPC-300/ENCG OLA criteria of 55 dBA, acoustic mitigation for the outdoor amenity areas will not be required.

Stationary noise impacts from the environment onto the development are expected to be minimal as the site is not in close proximity to any large mechanical equipment or industrial site. The setback distance from the rooftop equipment at the adjacent residential buildings is expected to be sufficient to attenuate noise impacts. The O-Train Line 1 underground LRT is further than 75 m south of the site; therefore, ground vibration impacts are considered negligible.

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

With regard to stationary noise impacts from the building onto the surroundings, a stationary noise study is recommended for the site during the detailed design once mechanical plans for the proposed building become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise sensitive areas. 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. In the event that noise levels exceed the ENCG criteria, noise impacts can generally be minimized by judicious selection and placement of the equipment.

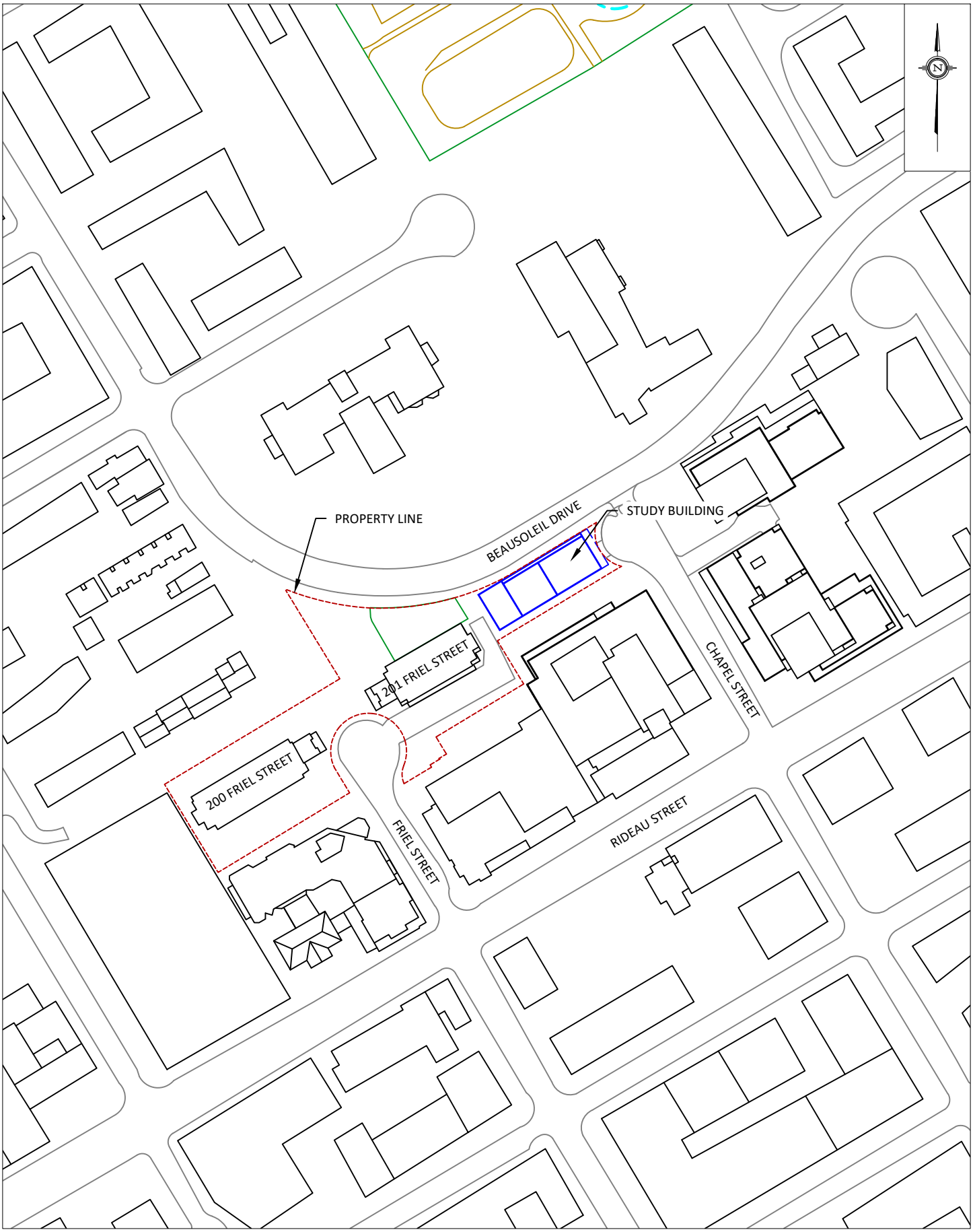
This concludes our traffic noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc.
Junior Environmental Scientist
Gradient Wind File #23-008-Traffic Noise

Joshua Foster, P.Eng.
Lead Engineer

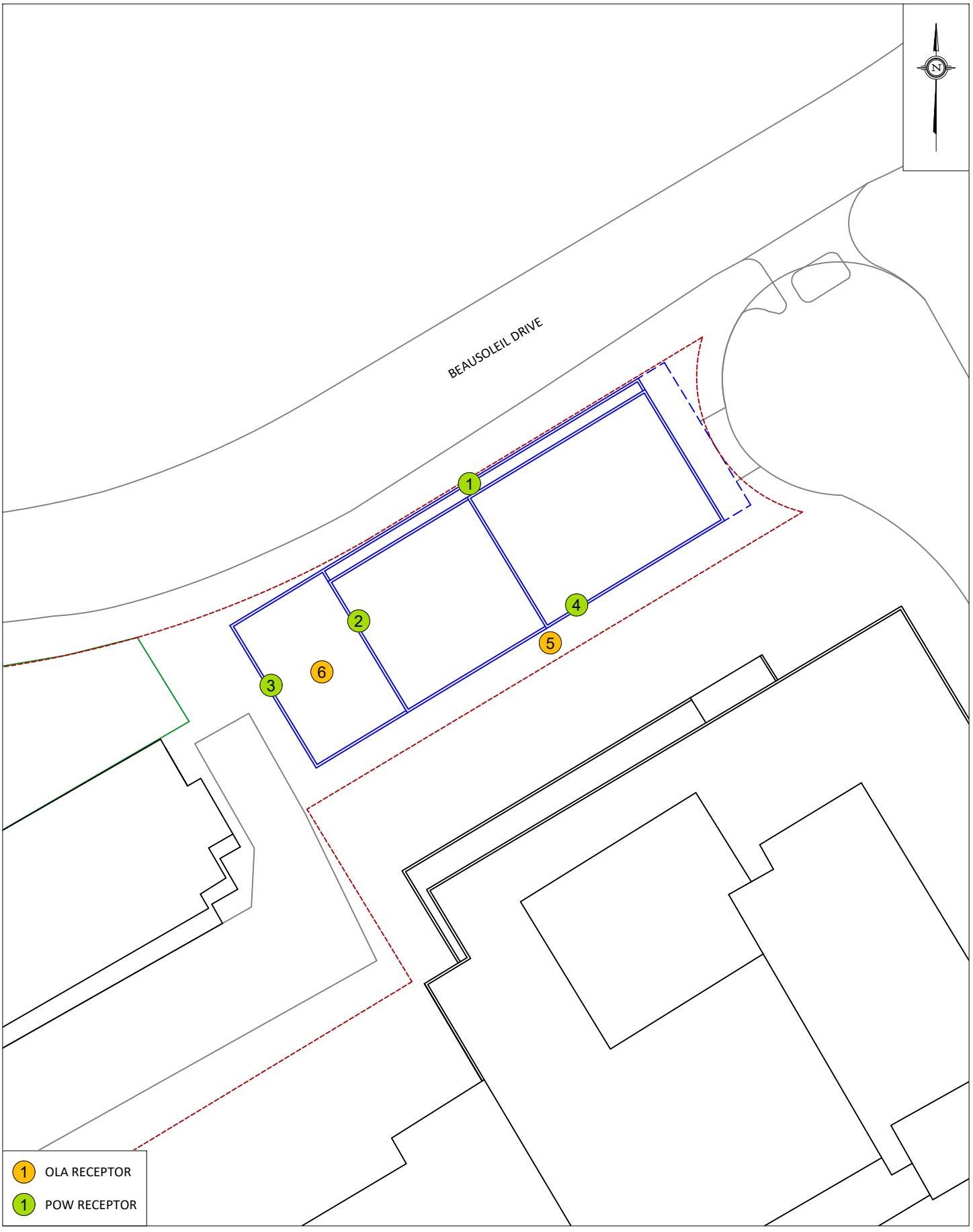


GRADIENTWIND
ENGINEERS & SCIENTISTS
127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	200-201 FRIEL STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-008-1
DATE	MARCH 14, 2023
DRAWN BY	E.A.

DESCRIPTION

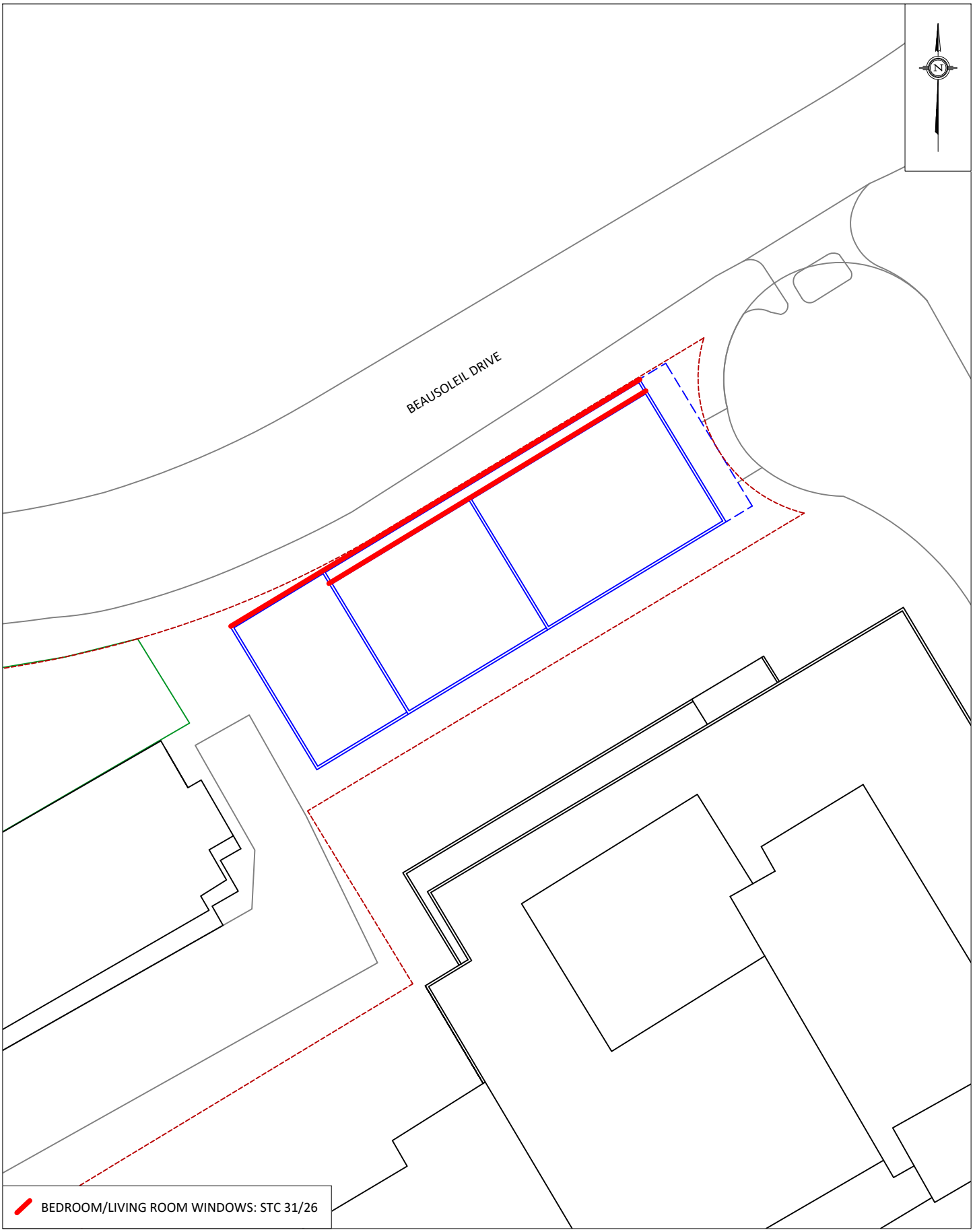
FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	200-201 FRIEL STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:200 (APPROX.)	DRAWING NO. GW23-008-2	FIGURE 2: RECEPTOR LOCATIONS
DATE	MARCH 14, 2023	DRAWN BY E.A.	



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

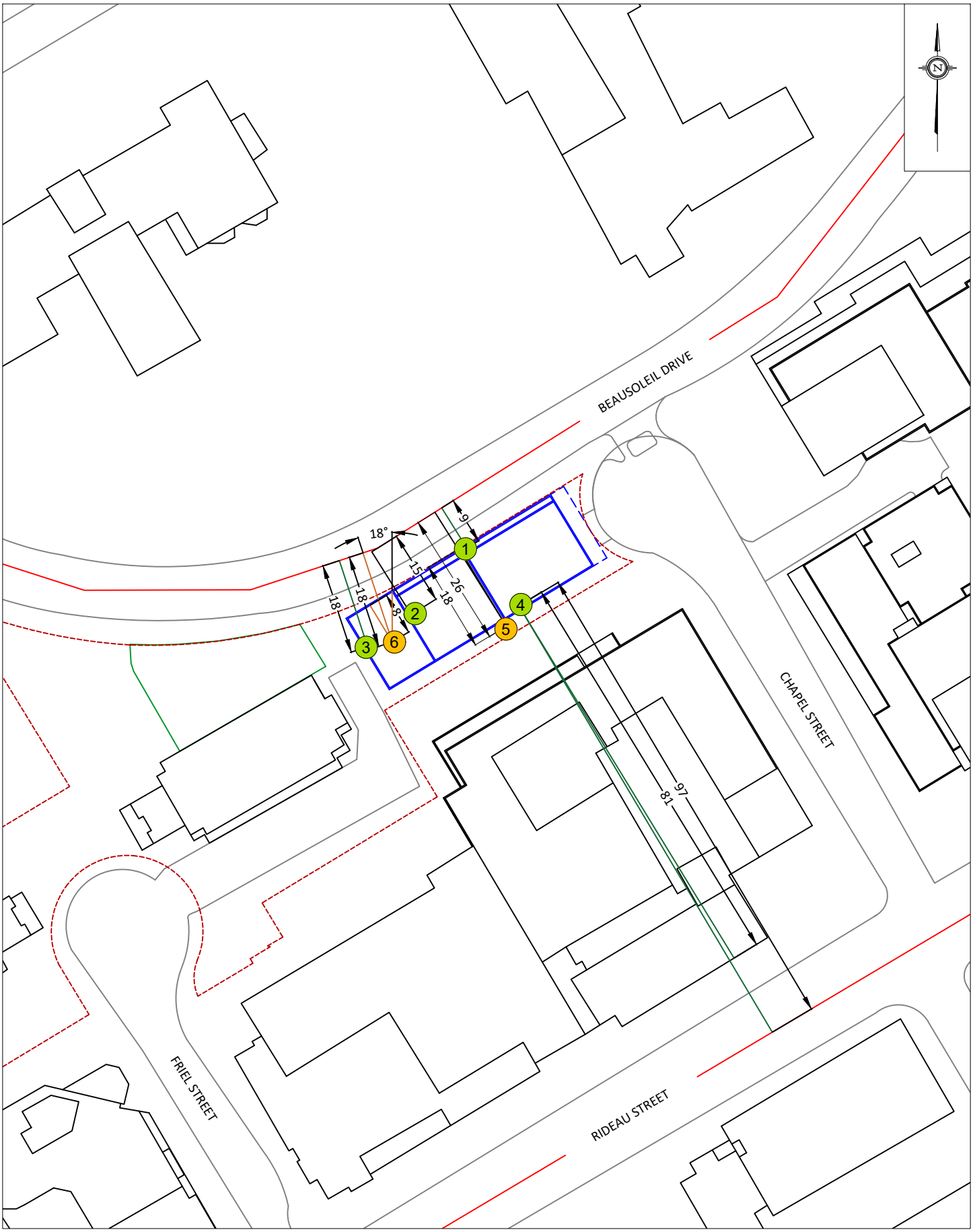
PROJECT	200-201 FRIEL STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:200 (APPROX.)	DRAWING NO.	GW23-008-3
DATE	MARCH 14, 2023	DRAWN BY	E.A.

FIGURE 3:
STC RECOMMENDATIONS

GRADIENTWIND
ENGINEERS & SCIENTISTS

APPENDIX A
STAMSON CALCULATIONS

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



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	200-201 FRIEL STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-008-A1
DATE	MARCH 14, 2023
DRAWN BY	E.A.
DESCRIPTION	FIGURE A1: STAMSON PARAMETERS

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 13:16:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Beausoliel (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 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):   8000
    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: Beausoliel (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           :  58.50 / 58.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 65.75 + 0.00) = 65.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  65.75   0.00   0.00   0.00   0.00   0.00   0.00
65.75
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 65.75 dBA

Total Leq All Segments: 65.75 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.16 + 0.00) = 58.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  58.16   0.00   0.00   0.00   0.00   0.00   0.00
58.16
-------------------------------------------------------------------------
--

Segment Leq : 58.16 dBA

Total Leq All Segments: 58.16 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.75
                           (NIGHT): 58.16
```

```
STAMSON 5.0         NORMAL REPORT         Date: 15-03-2023 13:15:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Beausoliel (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 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):   8000
    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: Beausoliel (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           :  58.50 / 58.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 62.74 + 0.00) = 62.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0    0.00  65.75   0.00   0.00  -3.01   0.00   0.00   0.00
62.74
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 62.74 dBA

Total Leq All Segments: 62.74 dBA


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

Source height = 1.50 m

ROAD (0.00 + 55.15 + 0.00) = 55.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.16   0.00   0.00  -3.01   0.00   0.00   0.00
55.15
-------------------------------------------------------------------------
--

Segment Leq : 55.15 dBA

Total Leq All Segments: 55.15 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.74
                           (NIGHT): 55.15
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 13:16:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Beausoliel (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 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):   8000
    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: Beausoliel (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  :  18.00 / 18.00  m
Receiver height           :  16.50 / 16.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 61.95 + 0.00) = 61.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  65.75   0.00  -0.79  -3.01   0.00   0.00   0.00
61.95
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 61.95 dBA

Total Leq All Segments: 61.95 dBA


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

Source height = 1.50 m

ROAD (0.00 + 54.35 + 0.00) = 54.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  58.16   0.00  -0.79  -3.01   0.00   0.00   0.00
54.35
-------------------------------------------------------------------------
--

Segment Leq : 54.35 dBA

Total Leq All Segments: 54.35 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 61.95
                           (NIGHT): 54.35
```

```
STAMSON 5.0        NORMAL REPORT        Date: 14-03-2023 14:08:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 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     :  92.00

Data for Segment # 1: Rideau (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  :  97.00 / 97.00  m
Receiver height           :  58.50 / 58.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :  81.00 / 81.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Rideau (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 !       58.50 !       10.90 !        10.90

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
-------------------------------------------------------------------------------
--
   -90     90   0.00  68.48   0.00  -8.11   0.00   0.00   0.00 -11.72
48.65
-------------------------------------------------------------------------------
--

Segment Leq : 48.65 dBA

Total Leq All Segments: 48.65 dBA


Results segment # 1: Rideau (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 !       58.50 !       10.90 !        10.90

ROAD (0.00 + 41.06 + 0.00) = 41.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00  -8.11   0.00   0.00   0.00 -11.72
41.06
-------------------------------------------------------------------------------
--

Segment Leq : 41.06 dBA

Total Leq All Segments: 41.06 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 48.65
                           (NIGHT): 41.06
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-03-2023 09:49:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Beausoliel (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 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):   8000
    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: Beausoliel (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  60.00 m
Barrier receiver distance :  18.00 / 18.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Beausoliel (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 !         1.50 !         1.50 !          1.50

ROAD (0.00 + 43.50 + 0.00) = 43.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  65.75   0.00  -2.39   0.00   0.00   0.00 -19.86
43.50
-------------------------------------------------------------------------------
--

Segment Leq : 43.50 dBA

Total Leq All Segments: 43.50 dBA


Results segment # 1: Beausoliel (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 !         1.50 !         1.50 !          1.50

ROAD (0.00 + 35.91 + 0.00) = 35.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  58.16   0.00  -2.39   0.00   0.00   0.00 -19.86
35.91
-------------------------------------------------------------------------------
--

Segment Leq : 35.91 dBA

Total Leq All Segments: 35.91 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 43.50
                           (NIGHT): 35.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 13:19:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Beausoliel (day/night)
----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 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):   8000
    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: Beausoliel (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   18.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  18.00 / 18.00  m
Receiver height           :  19.50 / 19.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 18.00 deg
Barrier height            :  18.00 m
Barrier receiver distance :   8.00 / 8.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Beausoliel (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 !       19.50 !       11.50 !        11.50

ROAD (0.00 + 46.47 + 0.00) = 46.47 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     18   0.00  65.75   0.00  -0.79  -2.22   0.00   0.00 -16.27
46.47
-------------------------------------------------------------------------------
--

Segment Leq : 46.47 dBA

Total Leq All Segments: 46.47 dBA


Results segment # 1: Beausoliel (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 !       19.50 !       11.50 !        11.50

ROAD (0.00 + 38.88 + 0.00) = 38.88 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     18   0.00  58.16   0.00  -0.79  -2.22   0.00   0.00 -16.27
38.88
-------------------------------------------------------------------------------
--

Segment Leq : 38.88 dBA

Total Leq All Segments: 38.88 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 46.47
                           (NIGHT): 38.88
```