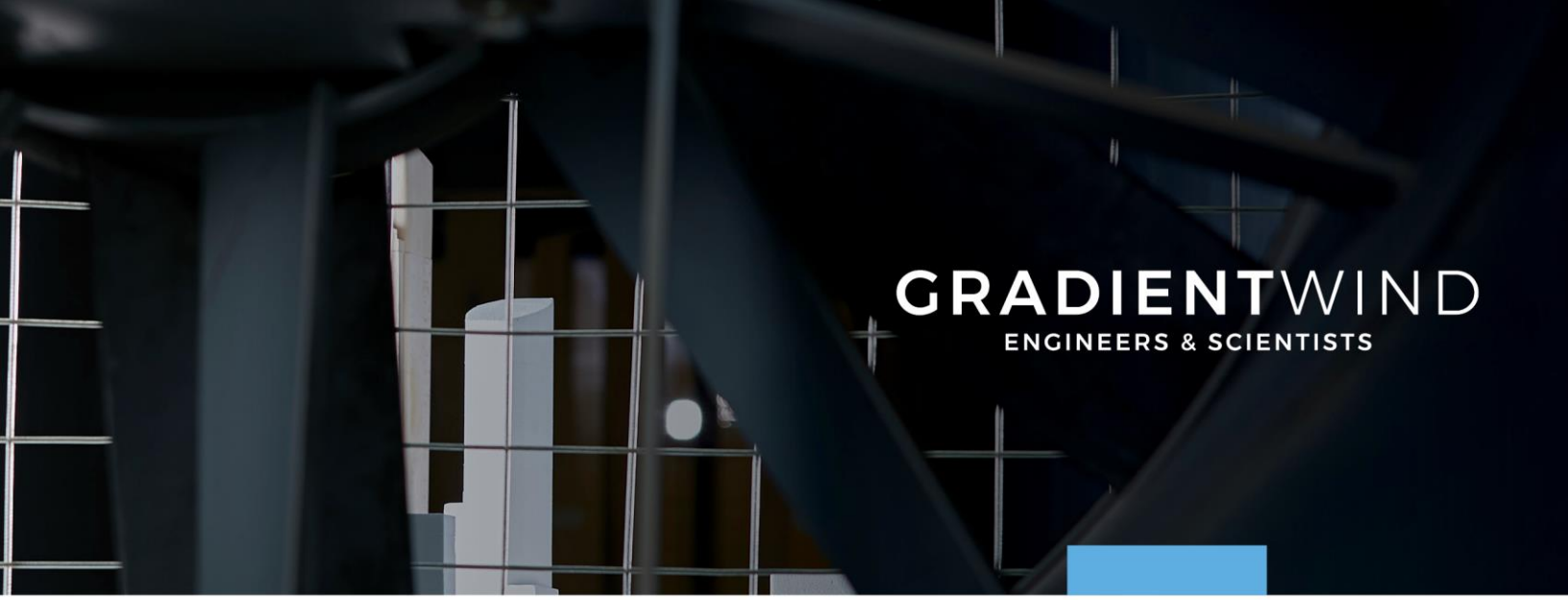
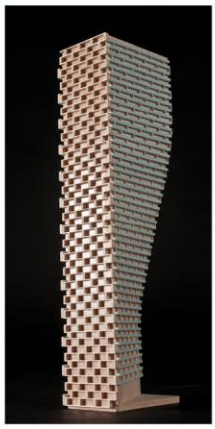


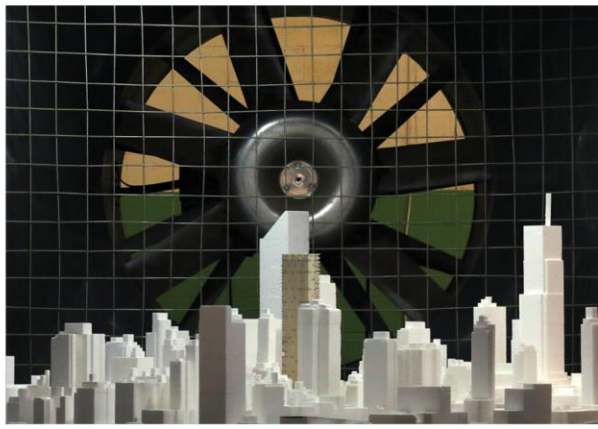
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

Ottawa Korean Community Church
3555 Borrisokane Road
Ottawa, Ontario

REPORT: 22-327 – Traffic Noise





June 12th, 2023

PREPARED FOR

Parker Architects Inc.
156 St. Paul Street
St. Catherines, ON L2R 3M2

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 in support of a Site Plan Control (SPC) application for a proposed development, known as the Ottawa Korean Community Church, located at 3555 Borrisokane Road in Ottawa, Ontario. The primary sources of roadway traffic noise include Borrisokane Road, Cambrian Road, Veterans Memorial Highway, and Flagstaff Drive. 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 Parker Architects Inc. in September 2022.

The results of the current analysis indicate that noise levels will range between 52 and 67 dBA during the daytime period (07:00-23:00) and between 44 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the west façade, which is nearest and most exposed to Borrisokane 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 5. 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 stationary noise assessment will not be required as the church is located in a light industrial zone and is further than 100m away from any zoned noise-sensitive area. Noise impacts from the church are expected to be minimal as mechanical equipment servicing the facility tend to be small.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Parker Architects Inc. to undertake a roadway traffic noise assessment for a proposed place of worship development, known as the Ottawa Korean Community Church, located at 3555 Borrisokane 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 Parker Architects Inc. in September 2022, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is the proposed Ottawa Korean Community Church, located at 3555 Borrisokane Street, in Ottawa, Ontario. The site is surrounded by Borrisokane Street to the west, Flagstaff drive to the north, Cambrian Road to the south, and vacant land to the east. The development comprises a single-storey facility with an auditorium, office spaces, and board room situated to the west of the floorplan, fellowship foyer and a library to the center, and classrooms, nursery, kitchen, chapel, multi-purpose room and gymnasium to the east. The development also includes a patio along the south façade of the fellowship foyer. A parking lot is located north of the structure.

The church is located in a light industrial zoned area, and the site is more than 100m from any zoned noise sensitive area. Furthermore, the mechanical systems associated with the church facility tend to be small. As such, no significant stationary noise impacts from the church are anticipated.

[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

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 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 for places of worship 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 for the building should consider the need for having windows and doors closed, which triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

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

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

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, 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 absorptive due to the presence of soft 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 Figures 3 and 4.

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
Borrisokane Road	2-Lane Urban Arterial Undivided (2-UAU)	80	**15,000**
Cambrian Road	2-Lane Urban Arterial Undivided (2-UAU)	70	**15,000**
Veterans Memorial Highway (416)	4-Lane Highway	100	**73,332**
Flagstaff Drive	Future 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 (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

[7] City of Ottawa Transportation Master Plan, November 2013

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

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

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. 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).

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[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	1.5	POW – West Façade	67	59
2	1.5	POW – South Façade	62	55
3	1.5	POW – South Façade	59	52
4	1.5	POW – South Façade	60	52
5	1.5	POW – North Façade	54	47
6	1.5	POW – North Façade	52	44
7	1.5	POW – North Façade	60	53

The results of the current analysis indicate that noise levels will range between 52 and 67 dBA during the daytime period (07:00-23:00) and between 44 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the west façade, which is nearest and most exposed to Borrisokane 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 5):

- **Places of Worship**

(i) Windows facing west will require a minimum STC of 25.

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

- **Exterior Walls**

(i) West Exterior wall components will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[10].

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.

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

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 52 and 67 dBA during the daytime period (07:00-23:00) and between 44 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the west façade, which is nearest and most exposed to Borrisokane 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 stationary noise assessment will not be required as the church is located in a light industrial zone and is further than 100m away from any zoned noise-sensitive area. Noise impacts from the church are expected to be minimal as mechanical equipment servicing the facility tend to be small.

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.

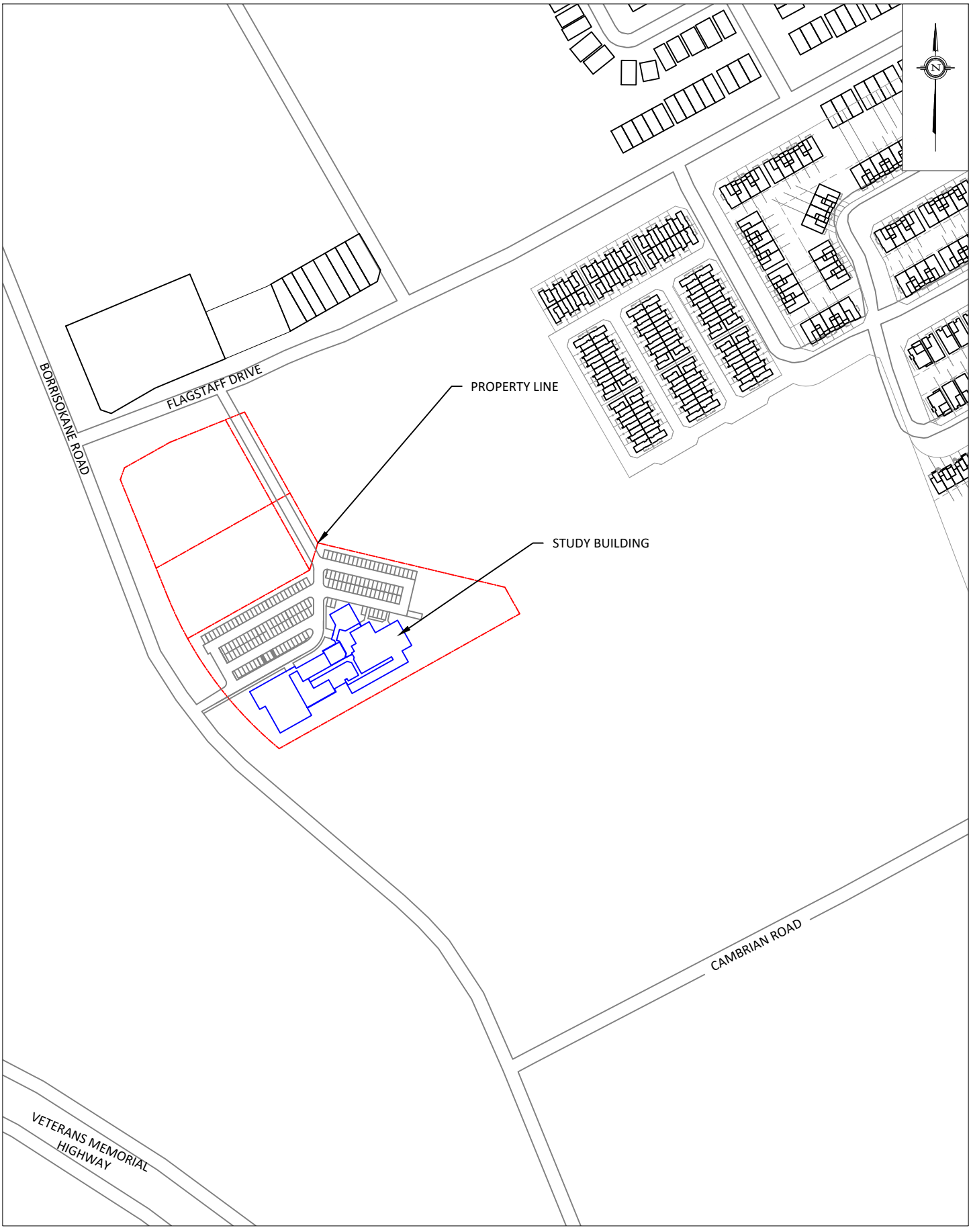
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-327-Traffic Noise



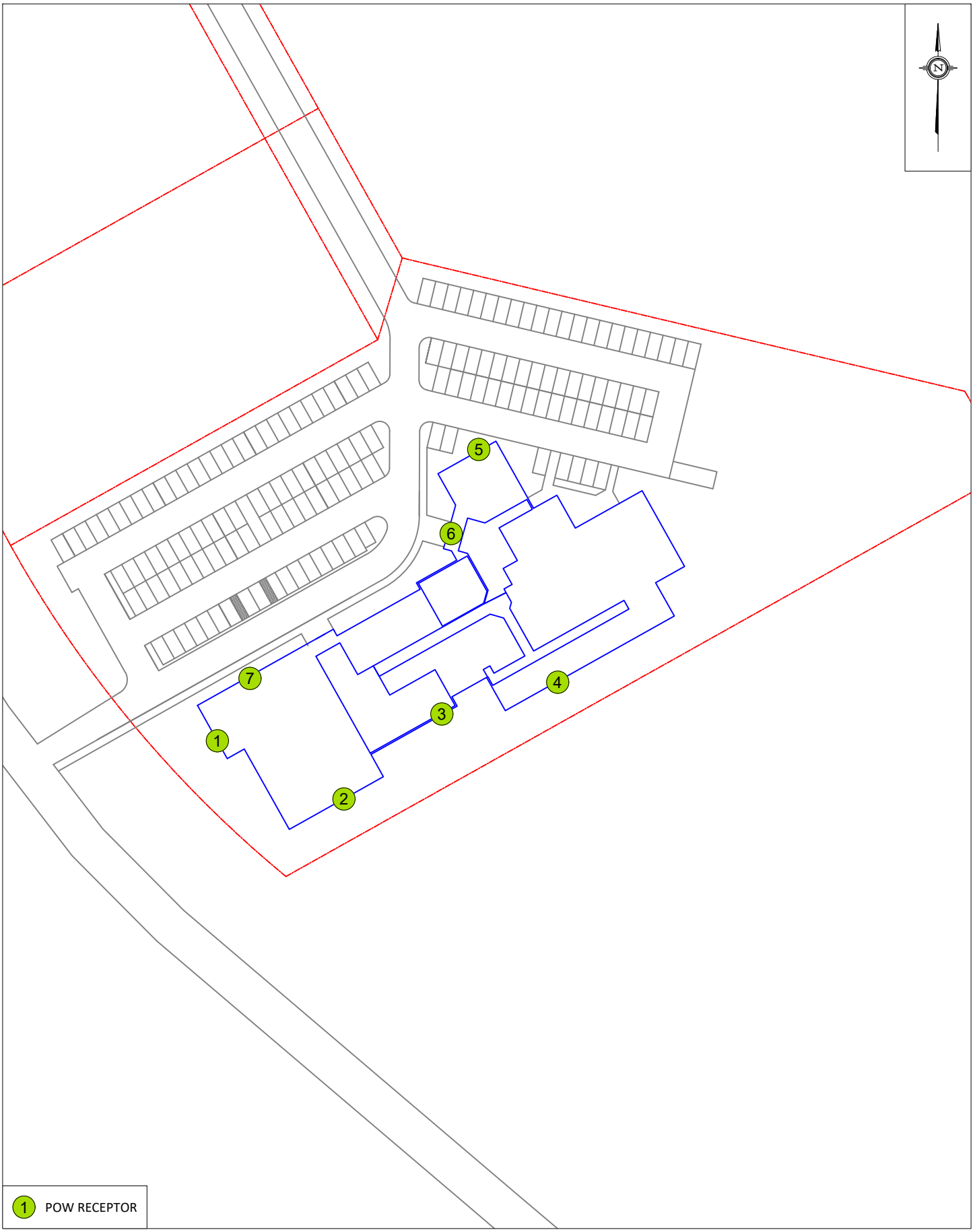
GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	3555 BORRISOKANE ROAD, OTTAWA ROADWAY TRAFFIC ASSESSMENT
SCALE	1:3000 (APPROX.)
DRAWING NO.	GW22-327-1
DATE	NOVEMBER 7, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

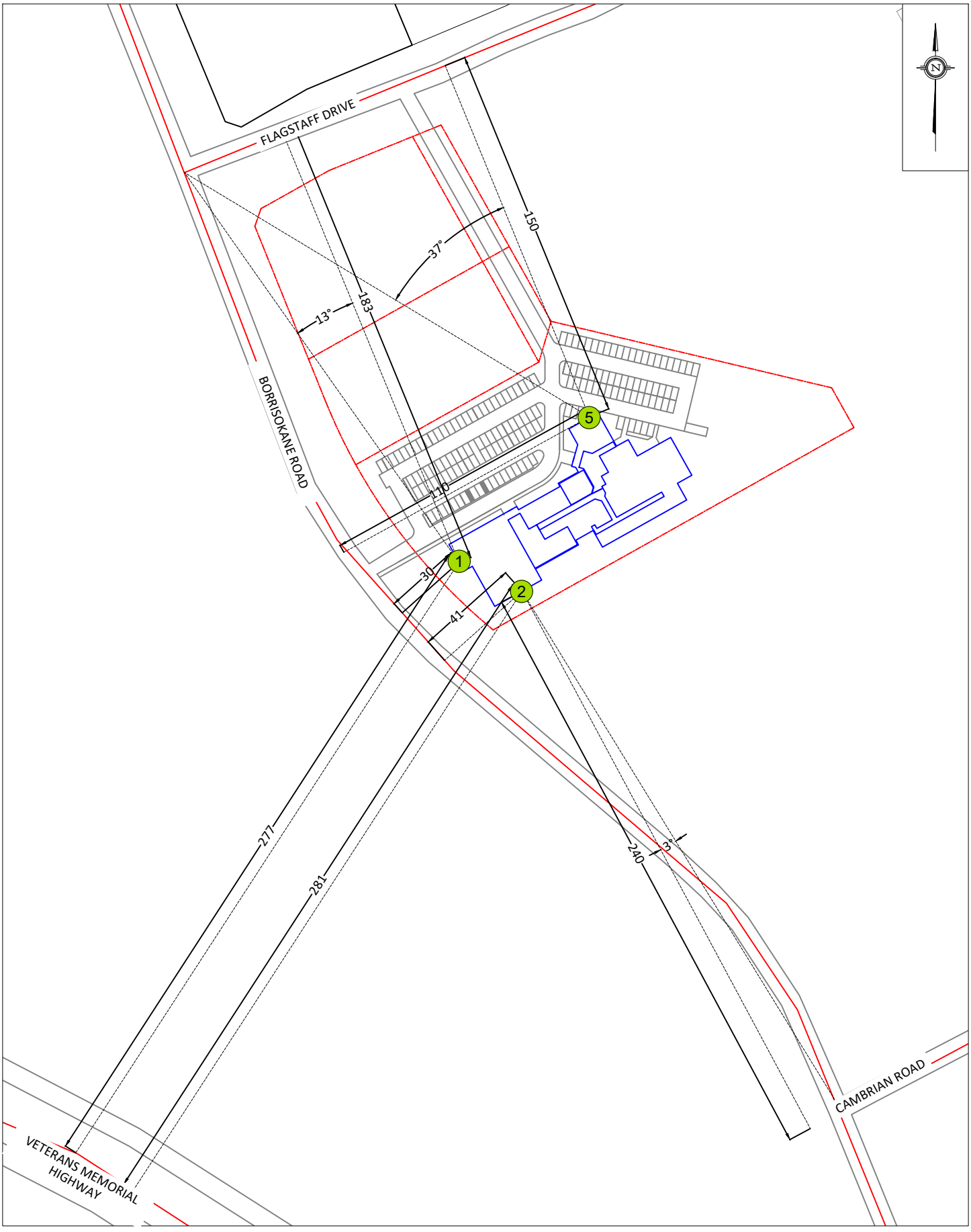


GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	3555 BORRISOKANE ROAD, OTTAWA ROADWAY TRAFFIC ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW22-327-2
DATE	NOVEMBER 7, 2022	DRAWN BY	E.A.

FIGURE 2:
RECEPTOR LOCATIONS

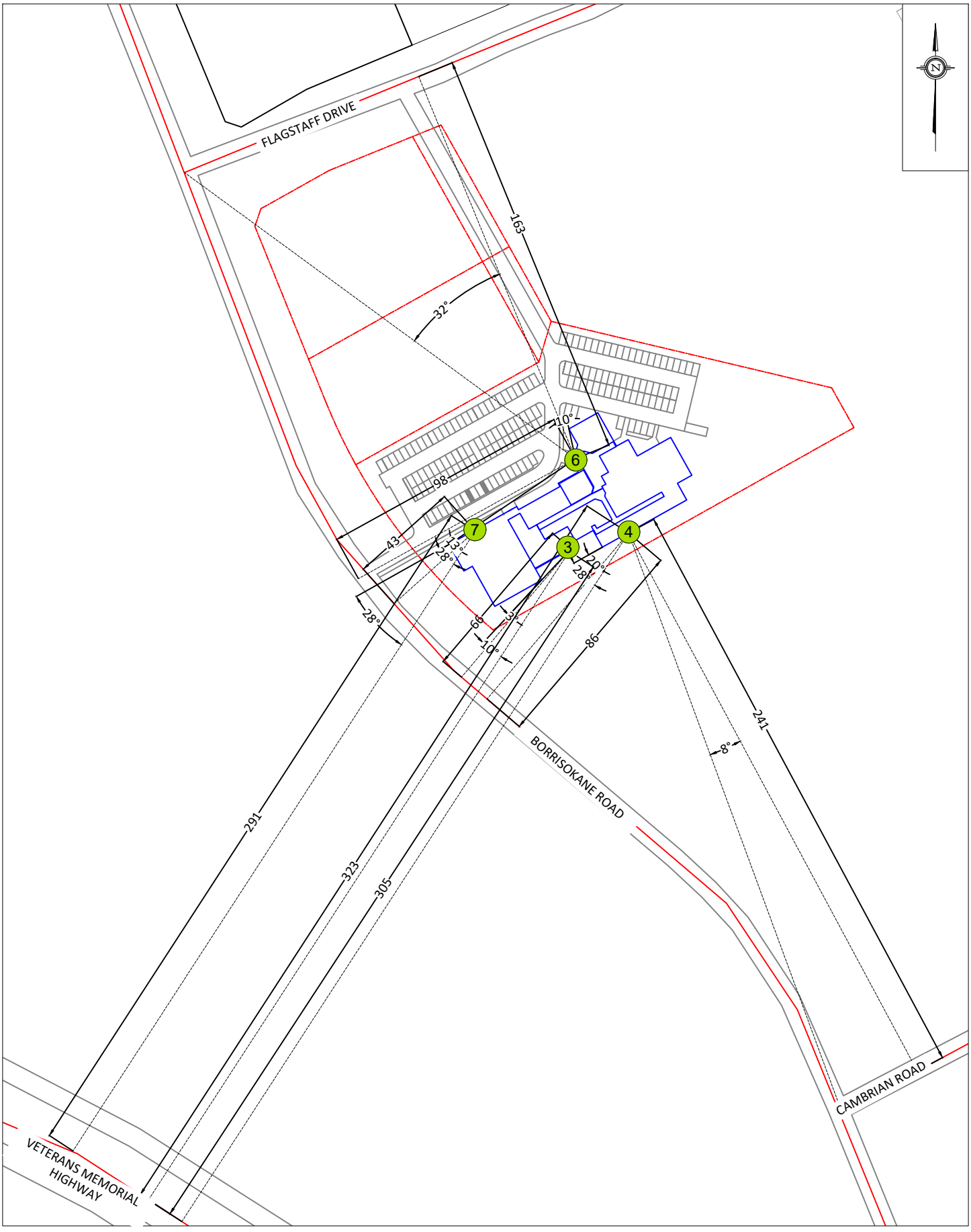


GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	3555 BORRISOKANE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW22-327-3
DATE	NOVEMBER 7, 2022	DRAWN BY	E.A.

FIGURE 3:
STAMSON PAREMETERS (1)



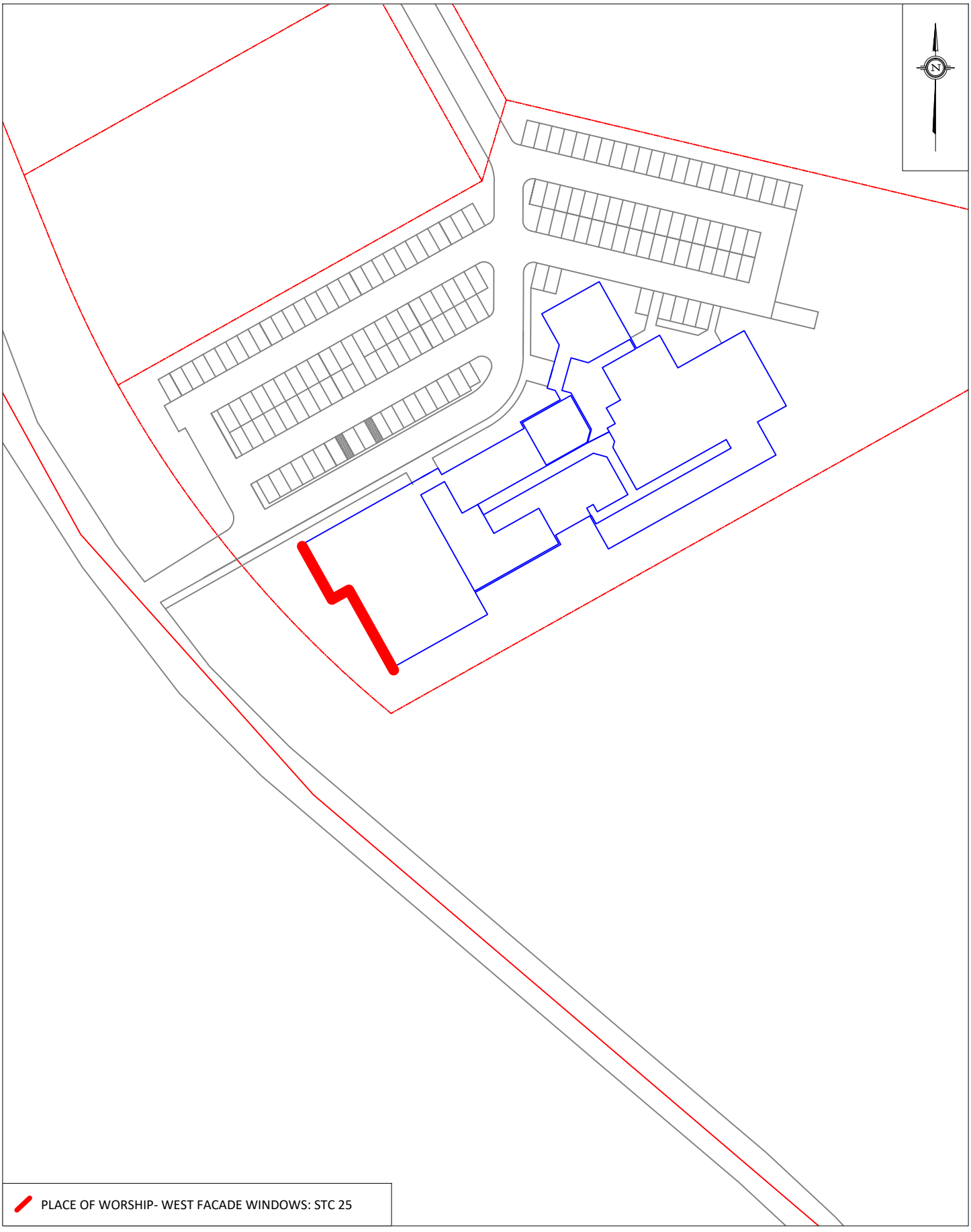
GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	3555 BORRISOKANE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-327-4
DATE	NOVEMBER 7, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 4:
STAMSON PARAMETERS (2)



GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	3555 BORRISOKANE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-327-5
DATE	NOVEMBER 7, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 5:
WINDOW STC RECOMMENDATIONS

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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

```
STAMSON 5.0        NORMAL REPORT        Date: 05-11-2022 19:32:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Borrisokane (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  :    80 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: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.00 / 30.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Flagstaff (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 # 2: Flagstaff (day/night)
--------------------------------------------
Angle1   Angle2           : -13.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 183.00 / 183.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: Veterans HWY (day/night)
-------------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 3: Veterans HWY (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 277.00 / 277.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 66.03 + 0.00) = 66.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  72.49   0.00  -5.00  -1.46   0.00   0.00   0.00  66.03
-------------------------------------------------------------------------------
```

```
Segment Leq : 66.03 dBA


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

Source height = 1.50 m

ROAD (0.00 + 36.28 + 0.00) = 36.28 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -13      0   0.66  65.75   0.00 -18.03 -11.44   0.00   0.00   0.00  36.28
-------------------------------------------------------------------------------

Segment Leq : 36.28 dBA


Results segment # 3: Veterans HWY (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.92 + 0.00) = 58.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  81.40   0.00 -21.02  -1.46   0.00   0.00   0.00  58.92
-------------------------------------------------------------------------------

Segment Leq : 58.92 dBA

Total Leq All Segments: 66.81 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.44 + 0.00) = 58.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  64.89   0.00  -5.00  -1.46   0.00   0.00   0.00  58.44
-------------------------------------------------------------------------------

Segment Leq : 58.44 dBA


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

Source height = 1.50 m

ROAD (0.00 + 28.69 + 0.00) = 28.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------------
   -13       0    0.66  58.16    0.00 -18.03 -11.44    0.00    0.00    0.00  28.69
-------------------------------------------------------------------------------

Segment Leq : 28.69 dBA


Results segment # 3: Veterans HWY (night)
----------------------------------------

Source height = 1.49 m

ROAD (0.00 + 51.32 + 0.00) = 51.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      90    0.66  73.80    0.00 -21.02  -1.46    0.00    0.00    0.00  51.32
-------------------------------------------------------------------------------

Segment Leq : 51.32 dBA

Total Leq All Segments: 59.21 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 66.81
                           (NIGHT): 59.21
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-11-2022 19:32:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Borrisokane (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  :    80 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: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  41.00 / 41.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Veterans HWY (day/night)
------------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 2: Veterans HWY (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 281.00 / 281.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: Cambriane (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  :    70 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 # 3: Cambriane (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   -3.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 240.00 / 240.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 60.77 + 0.00) = 60.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.66  72.49   0.00  -7.25  -4.47   0.00   0.00   0.00  60.77
-------------------------------------------------------------------------------
```

```
Segment Leq : 60.77 dBA


Results segment # 2: Veterans HWY (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.80 + 0.00) = 55.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.66  81.40   0.00 -21.13  -4.47   0.00   0.00   0.00  55.80
-------------------------------------------------------------------------------

Segment Leq : 55.80 dBA


Results segment # 3: Cambriane (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.65 + 0.00) = 46.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -3   0.66  71.32   0.00 -19.99  -4.67   0.00   0.00   0.00  46.65
-------------------------------------------------------------------------------

Segment Leq : 46.65 dBA

Total Leq All Segments: 62.10 dBA


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

Source height = 1.50 m

ROAD (0.00 + 53.17 + 0.00) = 53.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.66  64.89   0.00  -7.25  -4.47   0.00   0.00   0.00  53.17
-------------------------------------------------------------------------------

Segment Leq : 53.17 dBA


Results segment # 2: Veterans HWY (night)
-----------------------------------------

Source height = 1.49 m

ROAD (0.00 + 48.21 + 0.00) = 48.21 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------------
   -90      0    0.66  73.80    0.00 -21.13  -4.47    0.00    0.00    0.00  48.21
-------------------------------------------------------------------------------

Segment Leq : 48.21 dBA


Results segment # 3: Cambriane (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 39.06 + 0.00) = 39.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -3    0.66  63.72    0.00 -19.99  -4.67    0.00    0.00    0.00  39.06
-------------------------------------------------------------------------------

Segment Leq : 39.06 dBA

Total Leq All Segments: 54.50 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.10
                           (NIGHT): 54.50
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-11-2022 19:33:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Borrisokane (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  :    80 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: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -3.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  66.00 / 66.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Veterans HWY (day/night)
------------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 2: Veterans HWY (day/night)
-----------------------------------------------
Angle1   Angle2           : -90.00 deg   -10.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 306.00 / 306.00 m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 57.13 + 0.00) = 57.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -3   0.66  72.49   0.00 -10.68  -4.67   0.00   0.00   0.00  57.13
-------------------------------------------------------------------------------

Segment Leq : 57.13 dBA


Results segment # 2: Veterans HWY (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.46 + 0.00) = 54.46 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -10   0.66  81.40   0.00 -21.74  -5.20   0.00   0.00   0.00  54.46
-------------------------------------------------------------------------------

Segment Leq : 54.46 dBA

Total Leq All Segments: 59.01 dBA


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

Source height = 1.50 m

ROAD (0.00 + 49.53 + 0.00) = 49.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -3   0.66  64.89   0.00 -10.68  -4.67   0.00   0.00   0.00  49.53
-------------------------------------------------------------------------------
```

```
Segment Leq : 49.53 dBA


Results segment # 2: Veterans HWY (night)
------------------------------------------

Source height = 1.49 m

ROAD (0.00 + 48.22 + 0.00) = 48.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -10   0.57  73.80   0.00 -20.56  -5.02   0.00   0.00   0.00  48.22
-------------------------------------------------------------------------------

Segment Leq : 48.22 dBA

Total Leq All Segments: 51.93 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 59.01
                           (NIGHT): 51.93
```

```
STAMSON 5.0         NORMAL REPORT         Date: 05-11-2022 19:34:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Veterans HWY (day/night)
-----------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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: Veterans HWY (day/night)
----------------------------------------------
Angle1   Angle2           : -90.00 deg   28.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 323.00 / 323.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Borrisokane (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  :    80 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 # 2: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  86.00 / 86.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 3: Cambrian (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  :    70 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 # 3: Cambrian (day/night)
------------------------------------------
Angle1   Angle2           : -90.00 deg   8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 241.00 / 241.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Veterans HWY (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.33 + 0.00) = 56.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     28   0.66  81.40   0.00 -22.13  -2.93   0.00   0.00   0.00  56.33
-------------------------------------------------------------------------------
```

```
Segment Leq : 56.33 dBA


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

Source height = 1.50 m

ROAD (0.00 + 56.59 + 0.00) = 56.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     20   0.66  72.49   0.00 -12.59  -3.31   0.00   0.00   0.00  56.59
-------------------------------------------------------------------------------

Segment Leq : 56.59 dBA


Results segment # 3: Cambrian (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.34 + 0.00) = 47.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      8   0.66  71.32   0.00 -20.02  -3.96   0.00   0.00   0.00  47.34
-------------------------------------------------------------------------------

Segment Leq : 47.34 dBA

Total Leq All Segments: 59.73 dBA


Results segment # 1: Veterans HWY (night)
-----------------------------------------

Source height = 1.49 m

ROAD (0.00 + 48.74 + 0.00) = 48.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     28   0.66  73.80   0.00 -22.13  -2.93   0.00   0.00   0.00  48.74
-------------------------------------------------------------------------------

Segment Leq : 48.74 dBA


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

Source height = 1.50 m

ROAD (0.00 + 48.99 + 0.00) = 48.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------------
   -90      20    0.66  64.89    0.00 -12.59  -3.31    0.00    0.00    0.00  48.99
-------------------------------------------------------------------------------

Segment Leq : 48.99 dBA


Results segment # 3: Cambrian (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 39.74 + 0.00) = 39.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90       8    0.66  63.72    0.00 -20.02  -3.96    0.00    0.00    0.00  39.74
-------------------------------------------------------------------------------

Segment Leq : 39.74 dBA

Total Leq All Segments: 52.13 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 59.73
                           (NIGHT): 52.13
```

```
STAMSON 5.0         NORMAL REPORT         Date: 05-11-2022 19:34:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Flagstaff (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: Flagstaff (day/night)
--------------------------------------------
Angle1   Angle2           : -37.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 150.00 / 150.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Borrisokane (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  :    80 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 # 2: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 110.00 / 110.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 46.58 + 0.00) = 46.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -37     90   0.66  65.75   0.00 -16.60  -2.57   0.00   0.00   0.00  46.58
-------------------------------------------------------------------------------

Segment Leq : 46.58 dBA


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

Source height = 1.50 m

ROAD (0.00 + 53.66 + 0.00) = 53.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.66  72.49   0.00 -14.36  -4.47   0.00   0.00   0.00  53.66
-------------------------------------------------------------------------------

Segment Leq : 53.66 dBA

Total Leq All Segments: 54.44 dBA


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

Source height = 1.50 m

ROAD (0.00 + 38.99 + 0.00) = 38.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -37     90   0.66  58.16   0.00 -16.60  -2.57   0.00   0.00   0.00  38.99
-------------------------------------------------------------------------------
```

```
Segment Leq : 38.99 dBA


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

Source height = 1.50 m

ROAD (0.00 + 46.06 + 0.00) = 46.06 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.66  64.89   0.00 -14.36  -4.47   0.00   0.00   0.00  46.06
-------------------------------------------------------------------------------

Segment Leq : 46.06 dBA

Total Leq All Segments: 46.84 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 54.44
                           (NIGHT): 46.84
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-11-2022 19:34:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Borrisokane (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  :    80 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: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           :  -5.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 163.00 / 163.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Flagstaff (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 # 2: Flagstaff (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   10.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 163.00 / 163.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 51.15 + 0.00) = 51.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -5     90   0.66  72.49   0.00 -17.20  -4.14   0.00   0.00   0.00  51.15
-------------------------------------------------------------------------------

Segment Leq : 51.15 dBA


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

Source height = 1.50 m

ROAD (0.00 + 44.71 + 0.00) = 44.71 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     10   0.66  65.75   0.00 -17.20  -3.84   0.00   0.00   0.00  44.71
-------------------------------------------------------------------------------

Segment Leq : 44.71 dBA

Total Leq All Segments: 52.04 dBA


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

Source height = 1.50 m

ROAD (0.00 + 43.55 + 0.00) = 43.55 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -5     90   0.66  64.89   0.00 -17.20  -4.14   0.00   0.00   0.00  43.55
-------------------------------------------------------------------------------
```

```
Segment Leq : 43.55 dBA


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

Source height = 1.50 m

ROAD (0.00 + 37.12 + 0.00) = 37.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     10   0.66  58.16   0.00 -17.20  -3.84   0.00   0.00   0.00  37.12
-------------------------------------------------------------------------------

Segment Leq : 37.12 dBA

Total Leq All Segments: 44.44 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 52.04
                           (NIGHT): 44.44
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-11-2022 19:35:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Borrisokane (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  :    80 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: Borrisokane (day/night)
---------------------------------------------
Angle1   Angle2           :  13.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  43.00 / 43.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: Veterans HWY (day/night)
------------------------------------------------
Car traffic volume  : 59370/5163  veh/TimePeriod  *
Medium truck volume :  4723/411   veh/TimePeriod  *
Heavy truck volume  :  3373/293   veh/TimePeriod  *
Posted speed limit  :   100 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):  73332
    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 # 2: Veterans HWY (day/night)
-----------------------------------------------
Angle1   Angle2           :  28.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 291.00 / 291.00 m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 59.45 + 0.00) = 59.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    13     90   0.66  72.49   0.00  -7.59  -5.44   0.00   0.00   0.00  59.45
-------------------------------------------------------------------------------

Segment Leq : 59.45 dBA


Results segment # 2: Veterans HWY (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.16 + 0.00) = 53.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.66  81.40   0.00 -21.38  -6.86   0.00   0.00   0.00  53.16
-------------------------------------------------------------------------------

Segment Leq : 53.16 dBA

Total Leq All Segments: 60.37 dBA


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

Source height = 1.50 m

ROAD (0.00 + 51.86 + 0.00) = 51.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    13     90   0.66  64.89   0.00  -7.59  -5.44   0.00   0.00   0.00  51.86
-------------------------------------------------------------------------------
```

```
Segment Leq : 51.86 dBA


Results segment # 2: Veterans HWY (night)
------------------------------------------

Source height = 1.49 m

ROAD (0.00 + 45.56 + 0.00) = 45.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    28     90   0.66  73.80   0.00 -21.38  -6.86   0.00   0.00   0.00  45.56
-------------------------------------------------------------------------------

Segment Leq : 45.56 dBA

Total Leq All Segments: 52.77 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 60.37
                           (NIGHT): 52.77
```