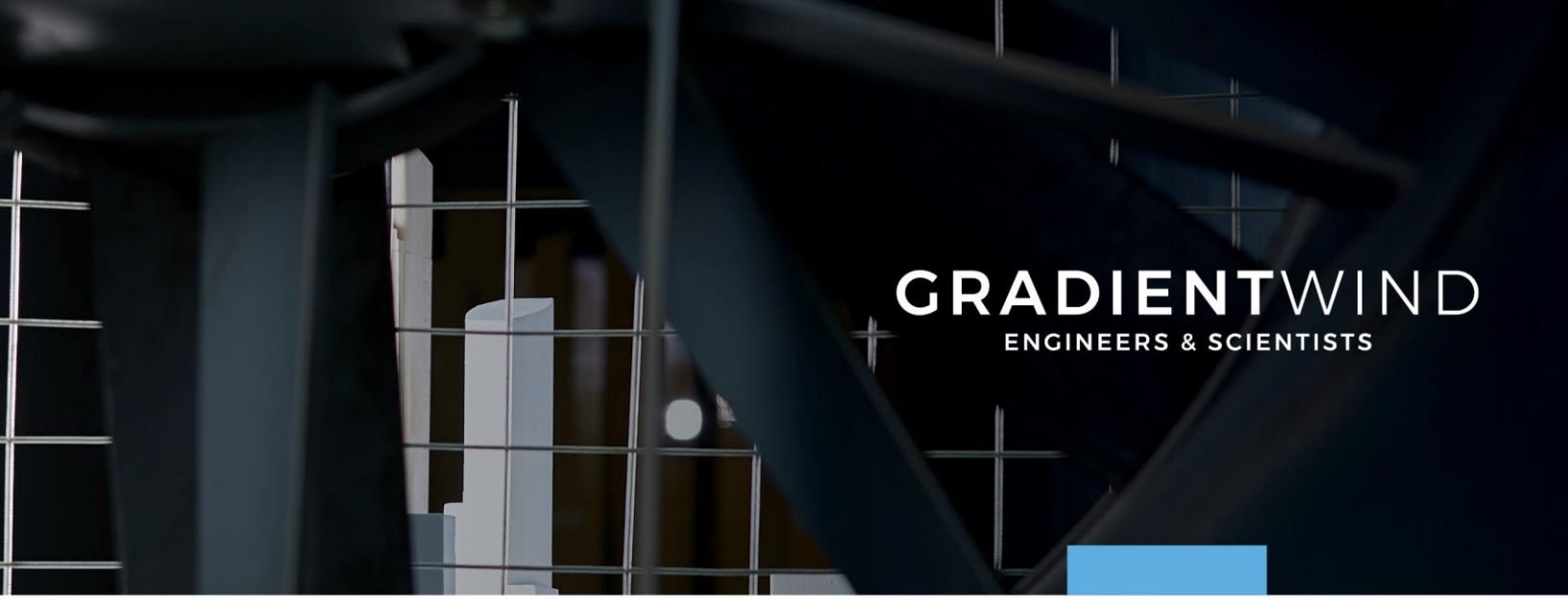

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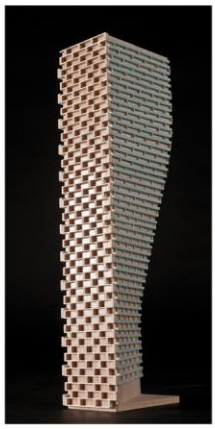
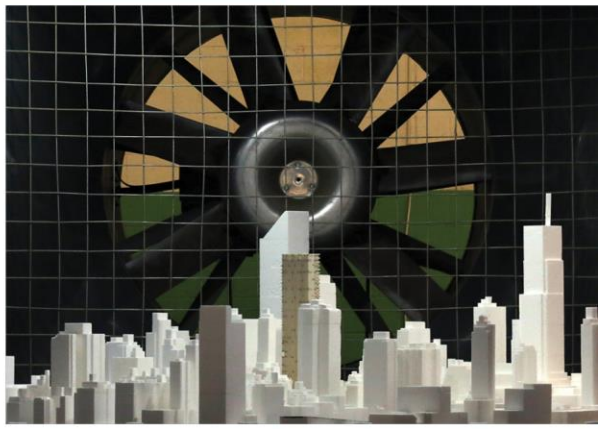
ROADWAY TRAFFIC NOISE ASSESSMENT

1545A Merivale Road
Ottawa, Ontario

REPORT: GW22-277-Traffic Noise





October 18, 2022

PREPARED FOR

1545 Merivale Inc.
1370 Clyde Ave.
Ottawa, ON
K2G 3H8

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist
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EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment in support of site plan application for a proposed medical office development at 1545A Merivale Road in Ottawa, Ontario. The development is a rectangular 27,738 square foot (sq ft) medical imaging building, rising one-storey. The site is surrounded by low-rise residential buildings to the east, and low-rise commercial buildings to the north, south and west, along Merivale Road. The major sources of roadway traffic noise are Merivale Road and Capilano 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 prepared by Lalande + Doyle Architects in August 2022.

As predicted noise levels fall below the ENCG 65 dBA criterion for upgraded building components, standard Ontario Building Code (OBC 2020) compliant windows and glazing elements will be adequate. Results of the calculations also indicate that the development will require forced air heating with provision for central air conditioning. Central air conditioning, if installed, will allow occupants to keep windows closed and maintain a comfortable living environment. However, given the nature of the development it is expected central air conditioning will be incorporated into the design of the building. A Type D Warning Clause will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the north, south and west are at a sufficient setback distance, and smaller units associated with adjacent residential properties are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

Stationary noise impacts from the development on the surroundings can be minimized by judicious placement of mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the

incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings. It is noted the closest point of reception is more than 95 m from the edge of the subject building.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 1

4. METHODOLOGY 2

4.1 Background 2

4.2 Roadway Traffic Noise 2

4.2.1 Criteria for Roadway Traffic Noise 2

4.2.2 Theoretical Roadway Noise Predictions 4

4.2.3 Roadway Traffic Volumes 4

5. RESULTS AND DISCUSSION 5

5.1 Roadway Traffic Noise Levels 5

6. CONCLUSIONS AND RECOMMENDATIONS 5

FIGURES

APPENDICES

Appendix A – STAMSON 5.04 Input and Output Data and Supporting Information

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 1545A Merivale Inc. to undertake a roadway traffic noise assessment in support of site plan application for a proposed medical office development at 1545A Merivale 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 prepared by Lalande + Doyle Architects in August 2022, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed development comprises a rectangular 27,738 square foot (sq ft) medical imaging building, rising one-storey, located to the east of the study site with available parking spaces to the west, south and east of the building. An existing gas station is located west of the site and parking area, overlooking Merivale Road.

The site is surrounded by low-rise residential buildings to the east, and low-rise commercial buildings to the north, south and west, along Merivale Road. The major sources of roadway traffic noise are Merivale Road and Capilano Drive. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings 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.

[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

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 noise-sensitive buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 50 and 45 dBA for general and private offices, respectively, for roadway as listed in Table 1.

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

Type of Space	Time Period	Leq (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 is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion.

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

4.2.2 Theoretical Roadway Noise Predictions

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

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

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, 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.
- A noise receptor was strategically placed at the worst-case location within the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figure 3.

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[7] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Merivale Road	4-Lane Arterial Divided	60	**35,000**
Capilano Drive	2-Lane Urban Collector Undivided	40	**8,000**

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

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	64	57

The results of the current analysis indicate that maximum noise levels on site will be 64 dBA during the daytime period (07:00-23:00) and 57 dBA during the nighttime period (23:00-07:00). The highest noise levels occur at the west façade, which is nearest and most exposed to Merivale Road.

6. CONCLUSIONS AND RECOMMENDATIONS

As predicted, noise levels fall below the ENCG 65 dBA criterion for upgraded building components; therefore, standard Ontario Building Code (OBC 2020) compliant windows and glazing elements will be adequate. Results of the calculations also indicate that the development will require forced air heating with provision for central air conditioning. Central air conditioning, if installed, will allow occupants to keep windows closed and maintain a comfortable living environment. However, given the nature of the development it is expected central air conditioning will be incorporated into the design of the building. However, it is expected due to the nature of the development that air conditioning will be included in the design. The following Type D Warning Clause[8] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

> *"This office 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*

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

levels are within the sound level limits of the City of Ottawa and the Ministry of the Environment, Conservation and Parks"

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with commercial buildings to the north, south and west are at a sufficient setback distance, and smaller units associated with adjacent residential properties are expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

Stationary noise impacts from the development on the surroundings can be minimized by judicious placement of mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. It is recommended that any large pieces of HVAC equipment be placed in the middle of the roof, avoiding line of site with the surrounding residential dwellings. It is noted the closest point of reception is more than 95 m from the edge of the subject building.

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.

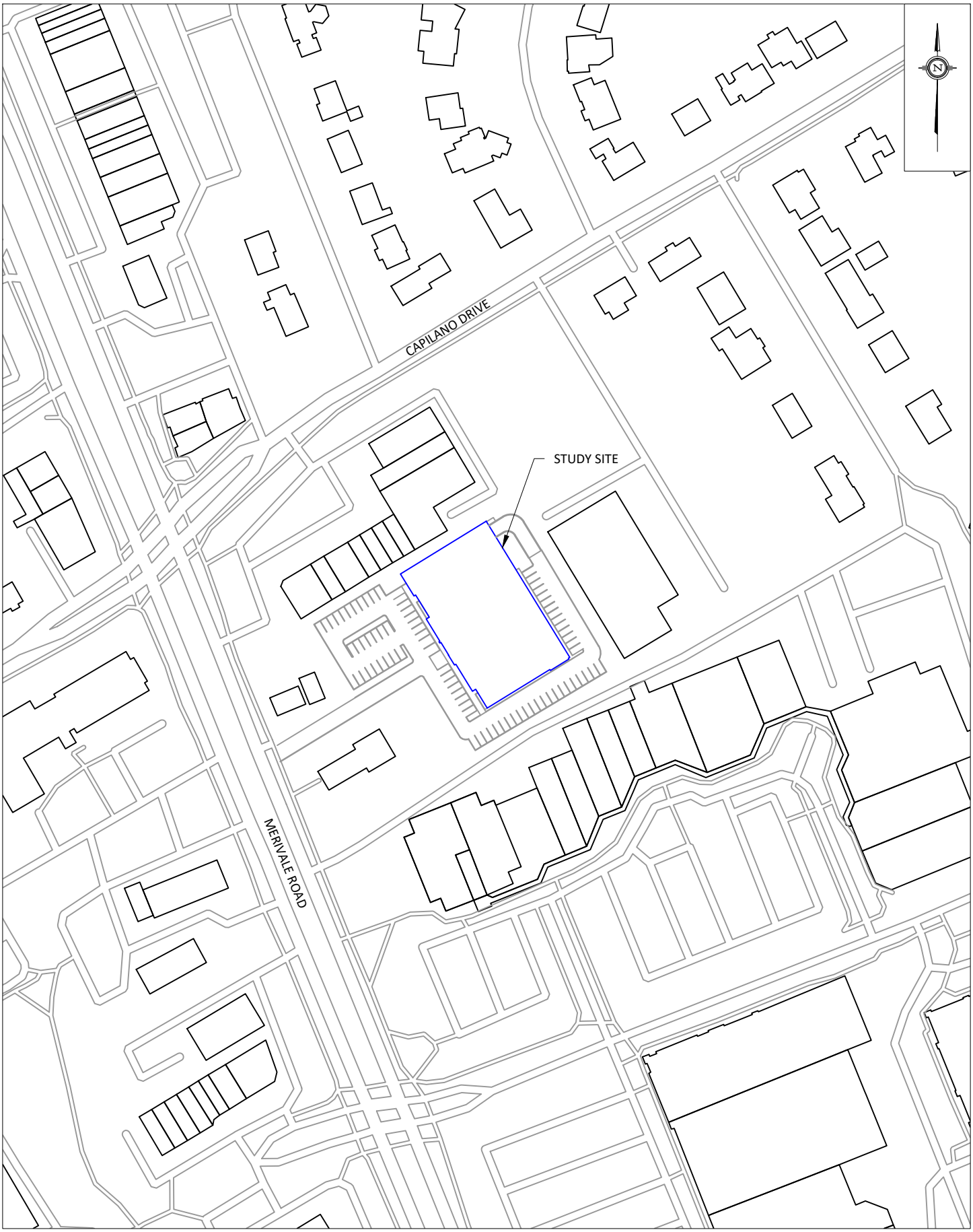
Sincerely,

Gradient Wind Engineering Inc.

Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-277-Traffic Noise



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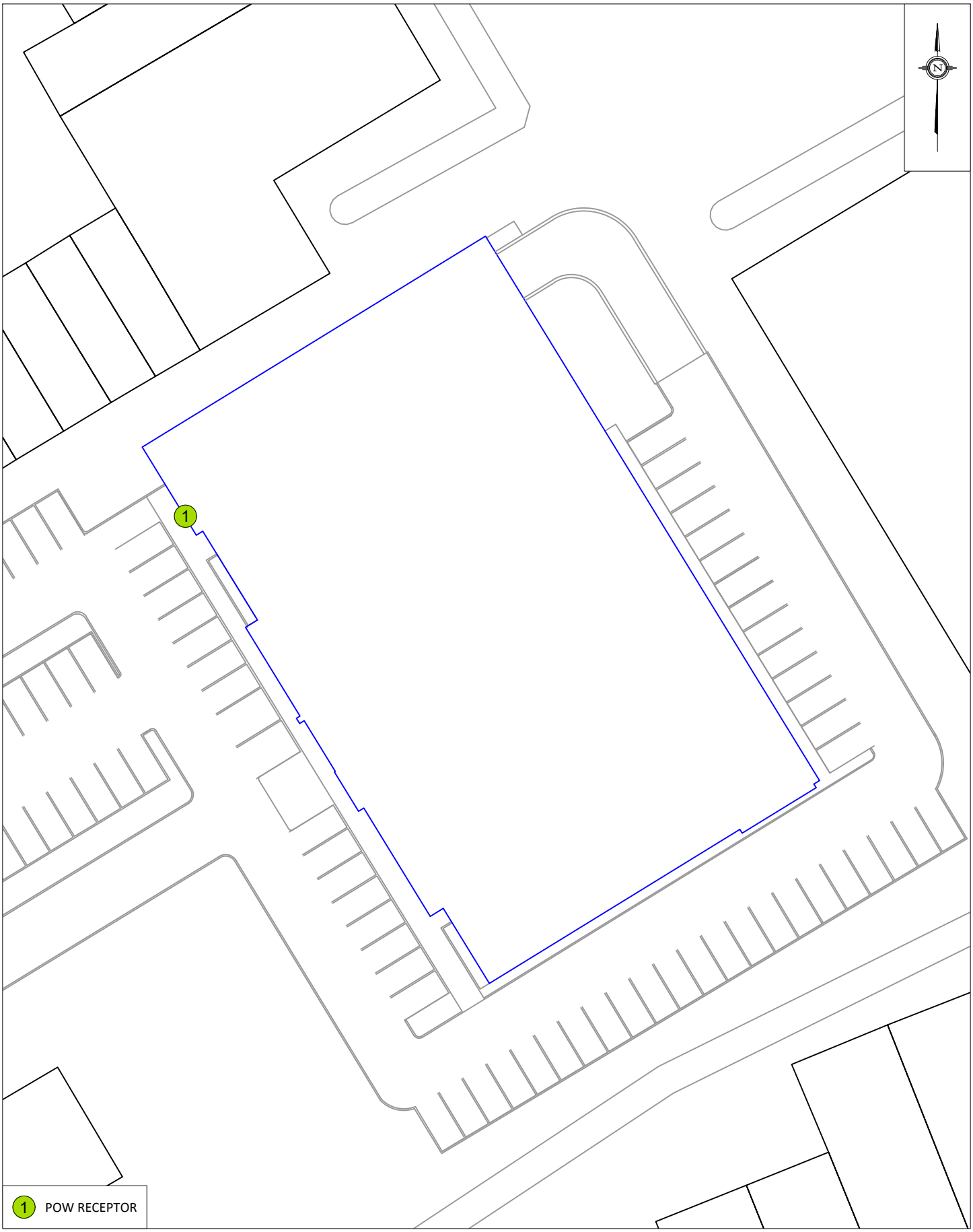
PROJECT	1545A MERIVALE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW22-277-1
DATE	SEPTEMBER 29, 2022	DRAWN BY	M.L.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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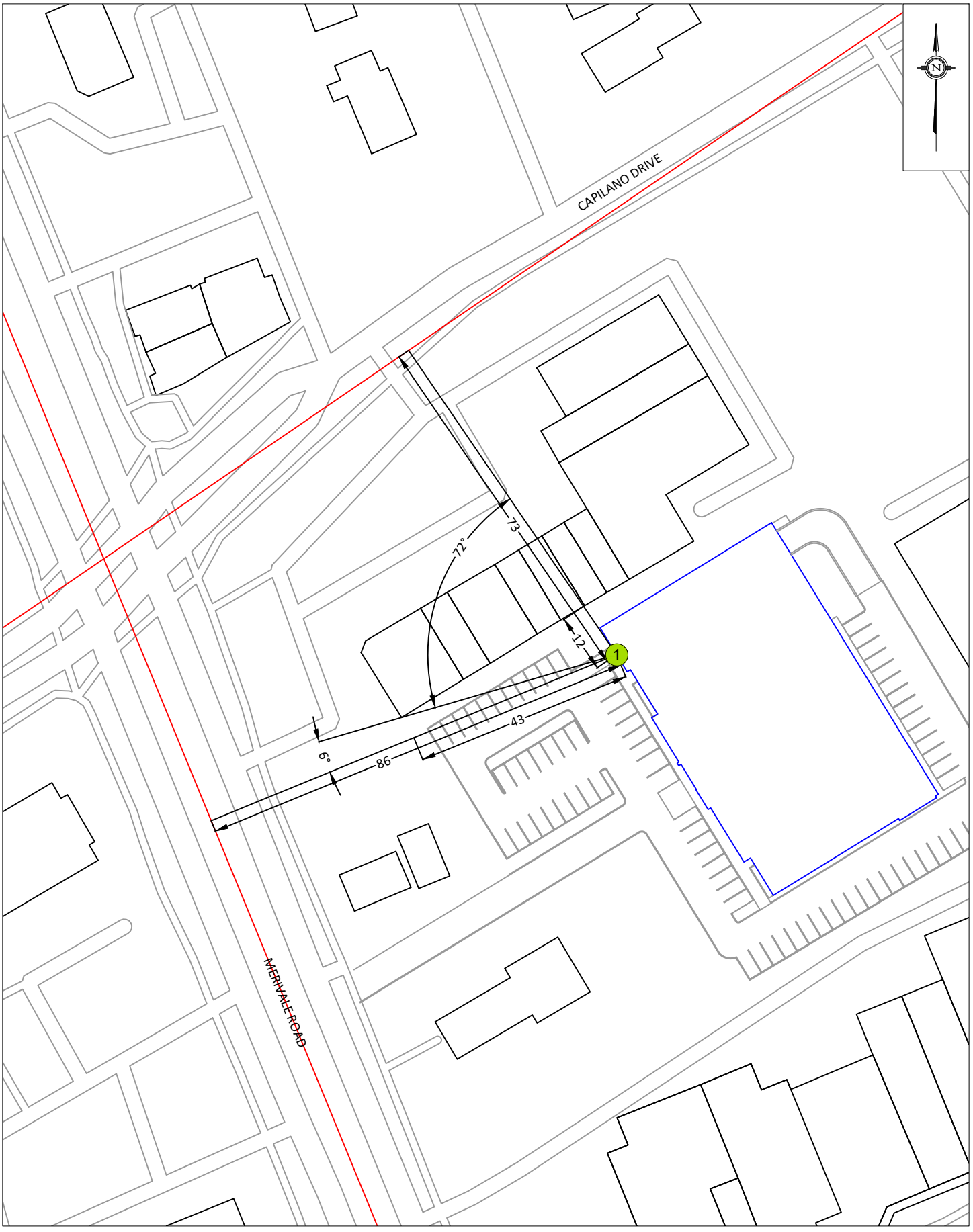
PROJECT	1545A MERIVALE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO. GW22-277-2	FIGURE 2: RECEPTOR LOCATION
DATE	SEPTEMBER 29, 2022	DRAWN BY M.L.	



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PROJECT	1545A MERIVALE ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-277-3
DATE	SEPTEMBER 29, 2022
DRAWN BY	M.L.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS - RECEPTOR 1

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: 29-09-2022 09:35:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

    24 hr Traffic Volume (AADT or SADT):  35000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Merivale (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  :  86.00 / 86.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   6.00 deg   Angle2 : 90.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  43.00 / 43.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Capilano (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  :    40 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   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: Capilano (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  :  73.00 / 73.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -72.00 deg   Angle2 : 0.00 deg
Barrier height            :   3.00 m
Barrier receiver distance :  12.00 / 12.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Merivale (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 (63.36 + 56.37 + 0.00) = 64.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      6   0.00  73.68   0.00  -7.58  -2.73   0.00   0.00   0.00
63.36
-------------------------------------------------------------------------------
--
     6     90   0.00  73.68   0.00  -7.58  -3.31   0.00   0.00  -6.41
56.37
-------------------------------------------------------------------------------
--

Segment Leq : 64.15 dBA
```

```
Results segment # 2: Capilano (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 (47.08 + 44.87 + 0.00) = 49.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -72   0.00  63.96   0.00  -6.87 -10.00   0.00   0.00   0.00
47.08
-------------------------------------------------------------------------------
--
   -72      0   0.00  63.96   0.00  -6.87  -3.98   0.00   0.00  -8.24
44.87
-------------------------------------------------------------------------------
--

Segment Leq : 49.12 dBA

Total Leq All Segments: 64.28 dBA
```

```
Results segment # 1: Merivale (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 (55.77 + 48.78 + 0.00) = 56.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      6   0.00  66.08   0.00  -7.58  -2.73   0.00   0.00   0.00
55.77
-------------------------------------------------------------------------------
--
     6     90   0.00  66.08   0.00  -7.58  -3.31   0.00   0.00  -6.41
48.78
-------------------------------------------------------------------------------
--

Segment Leq : 56.56 dBA
```

```
Results segment # 2: Capilano (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 (39.49 + 37.27 + 0.00) = 41.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -72   0.00  56.36   0.00  -6.87 -10.00   0.00   0.00   0.00
39.49
-------------------------------------------------------------------------------
--
   -72      0   0.00  56.36   0.00  -6.87  -3.98   0.00   0.00  -8.24
37.27
-------------------------------------------------------------------------------
--

Segment Leq : 41.53 dBA

Total Leq All Segments: 56.69 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.28
                           (NIGHT): 56.69
```