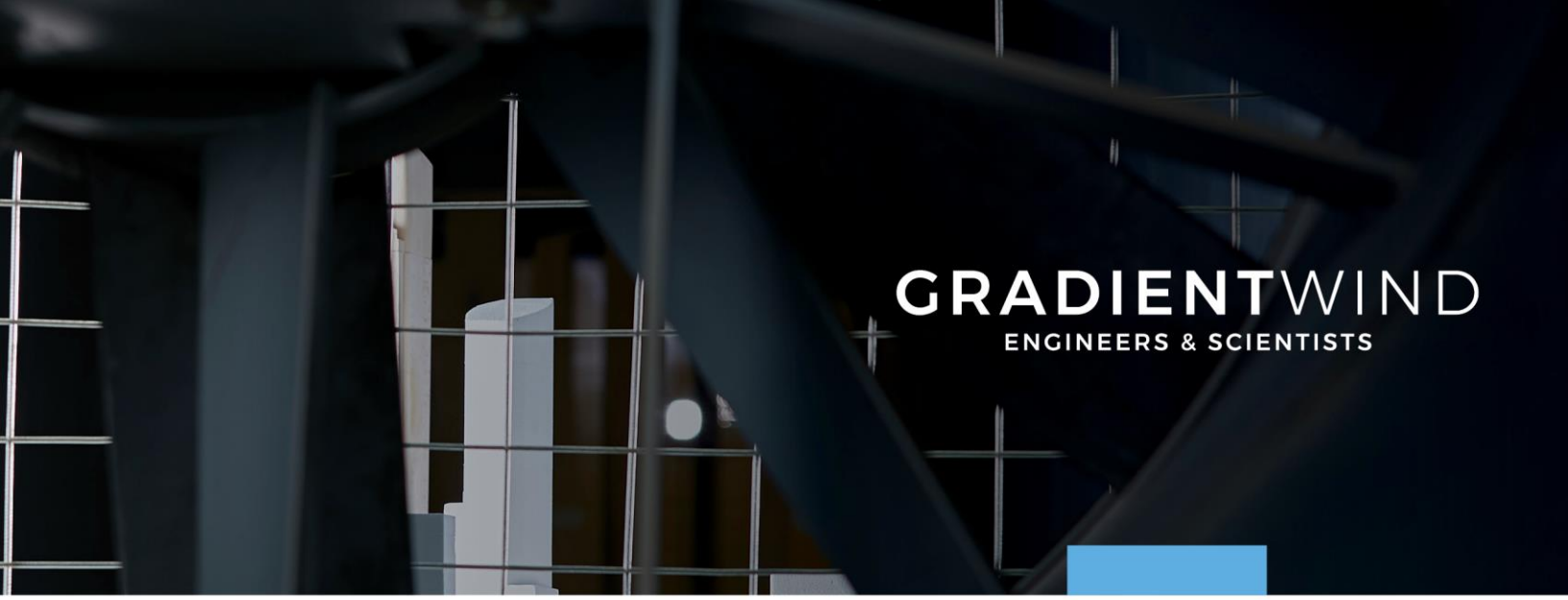
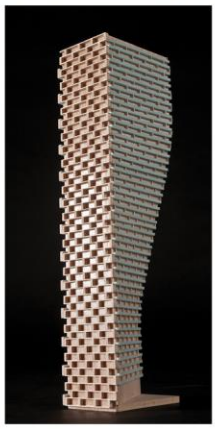


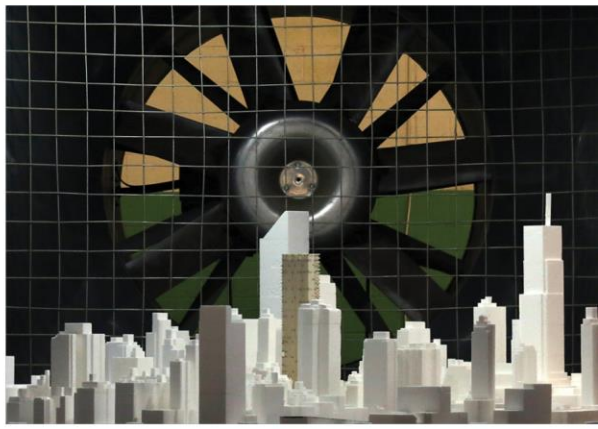
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE ASSESSMENT

1560-1620 Maple Grove Road – Block 29
Ottawa, Ontario

GRADIENT WIND REPORT: 20-182 – Traffic Noise





July 29, 2021

PREPARED FOR
Richcraft
2280 St. Laurent Boulevard, Suite 201
Ottawa, Ontario K1G 4K1

PREPARED BY
Giuseppe Garro, MASc. Junior Environmental Scientist
Joshua Foster, P.Eng., Principal

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EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken in consideration of a Site Plan Control Application (SPA) submission for a proposed residential subdivision block located at 1560 and 1620 Maple Grove Road in Ottawa, Ontario. The study site is identified as Block 29 and is situated in the northwest corner of the subdivision, bounded by Maple Grove Road to the north, Roger Griffith Avenue to the east and Maize Street to the south. The block comprises of four stacked townhomes with surface level parking. The major sources of noise affecting the development include roadway traffic along Maple Grove Road and the proposed Roger Griffith Avenue. Figure 1 illustrates a complete site plan with surrounding context. Gradient Wind has previously performed a roadway traffic noise study for the proposed subdivision development (*ref. Gradient Wind Report #18-072 – Traffic Noise and Vibration R1, dated May 27, 2020*).

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) site plan drawings provided by M. David Blakely Architect Inc. in June of 2021.

The results of the current analysis indicate that noise levels will range between 59 and 67 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the north façade of Block 4, which is nearest and most exposed to Maple Grove Road and Roger Griffiths Avenue. Building components with a higher Sound Transmission Class (STC) rating will be required for Block 4 (North Unit) where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that Block 4 (North Unit) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. Similarly, noise levels at the plane of window for Blocks 1-3 and Block 4 (All Units Excluding the North Unit) are expected to be between 55 dBA and 65 dBA during the daytime period. As such, these dwellings will require forced air heating with provisions for central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation

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

Furthermore, as the development will comprise townhouse buildings, no stationary noise impacts from the development on its surroundings are anticipated.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Richcraft to undertake a roadway traffic noise assessment in support of a Site Plan Control Application (SPA) submission for Block 29 of a proposed residential subdivision located at 1560 and 1620 Maple Grove 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 site plan drawings provided by M. David Blakely Architect Inc. in June of 2021, 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 a proposed residential subdivision block located at 1560 and 1620 Maple Grove Road in Ottawa, Ontario. The study site is identified as Block 29 and is situated in the northwest corner of the subdivision. The block comprises of four stacked townhomes with 12 units each. Two buildings front onto Roger Griffiths Avenue while the remaining units overlook Maize Street. Surface level parking is situated in the center of the block. No outdoor amenity space is provided for the development that meets the minimum requirements for consideration as an Outdoor Living Area (OLA), as defined by the ENCG. The site is bordered by Maple Grove Road to the north, Roger Griffiths Avenue to the east, Maize Street to the south, and Poole Creek to the west.

The major sources of noise affecting the development include roadway traffic along Maple Grove Road and the proposed Roger Griffith Avenue. The proposed arterial and Kanata Light Rail Transit (LRT) line to the west, as well as the proposed transit station to the northwest are not considered significant sources of noise as they are located beyond 100 meters (m) of the study site. Figure 1 illustrates a complete site plan with surrounding context.

[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 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.

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 for roadway 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 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] 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, and by using proposed building locations as noise barriers. 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 (lawn) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Receptor height was taken to be 7.5 meters above grade for the centre of the Plane of Window (POW).
- Noise receptors were strategically placed at 5 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.

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

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Roger Griffith Avenue	2-Lane Urban Collector (2-UCU)	40	**8,000**
Maple Grove Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**

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	7.5	POW – Block 4 – North Façade	67	59
2	7.5	POW – Block 4 – East Façade	65	58
3	7.5	POW – Block 3 – East Façade	63	56
4	7.5	POW – Block 2 – North Façade	59	51
5	7.5	POW – Block 1 – North Façade	60	52

The results of the current analysis indicate that noise levels will range between 59 and 67 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the north façade of Block 4, which is nearest and most exposed to Maple Grove Road and Roger Griffiths Avenue.

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 Block 4 (North Unit) windows are summarized below (see Figure 5):

Block 4 (North Unit)

- **Bedroom Windows**

(i) Bedroom windows facing north will require a minimum STC of 30.

(ii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements.

- **Living Room Windows**

(i) Living room windows facing north will require a minimum STC of 25.

(ii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) 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[8].

The STC requirements apply to window and door elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a 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

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

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 indicate that Block 4 (North Unit) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. Furthermore, noise levels at the plane of window for the other dwellings are expected to be between 55 dBA and 65 dBA during the daytime period. As such, these dwellings will require forced air heating with provisions for central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment. Window STC and ventilation requirements are depicted in Figure 5. In addition 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 59 and 67 dBA during the daytime period (07:00-23:00) and between 51 and 59 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the north façade of Block 4, which is nearest and most exposed to Maple Grove Road and Roger Griffiths Avenue. Building components with a higher Sound Transmission Class (STC) rating will be required for Block 4 (North Unit) where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that Block 4 (North Unit) will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[9] will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

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

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

Conservation and Parks. To help address the need for sound attenuation, this development includes:

- *STC rated multi-pane glazing elements*
- *STC rated exterior walls*

This dwelling unit has also been designed with air conditioning. Air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

Noise levels at the plane of window for the other dwellings are expected to be between 55 dBA and 65 dBA during the daytime period. As such, these dwellings will require forced air heating with provisions for central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment.

The following Warning Clause[10] will also be required on all Lease, Purchase and Sale Agreements of Blocks 1-3 and Block 4 (All Units Excluding the North Unit) where noise levels are expected to be between 55 dBA and 65 dBA, as summarized below.

"Purchasers/tenants are advised that sound levels due to increasing road traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.

This dwelling unit has also been designed with forced air heating with provisions for central air conditioning at the occupant's discretion. These noise measures will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound

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

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

Furthermore, as the development will comprise townhouse buildings, no stationary noise impacts from the development on its surroundings are anticipated.

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.

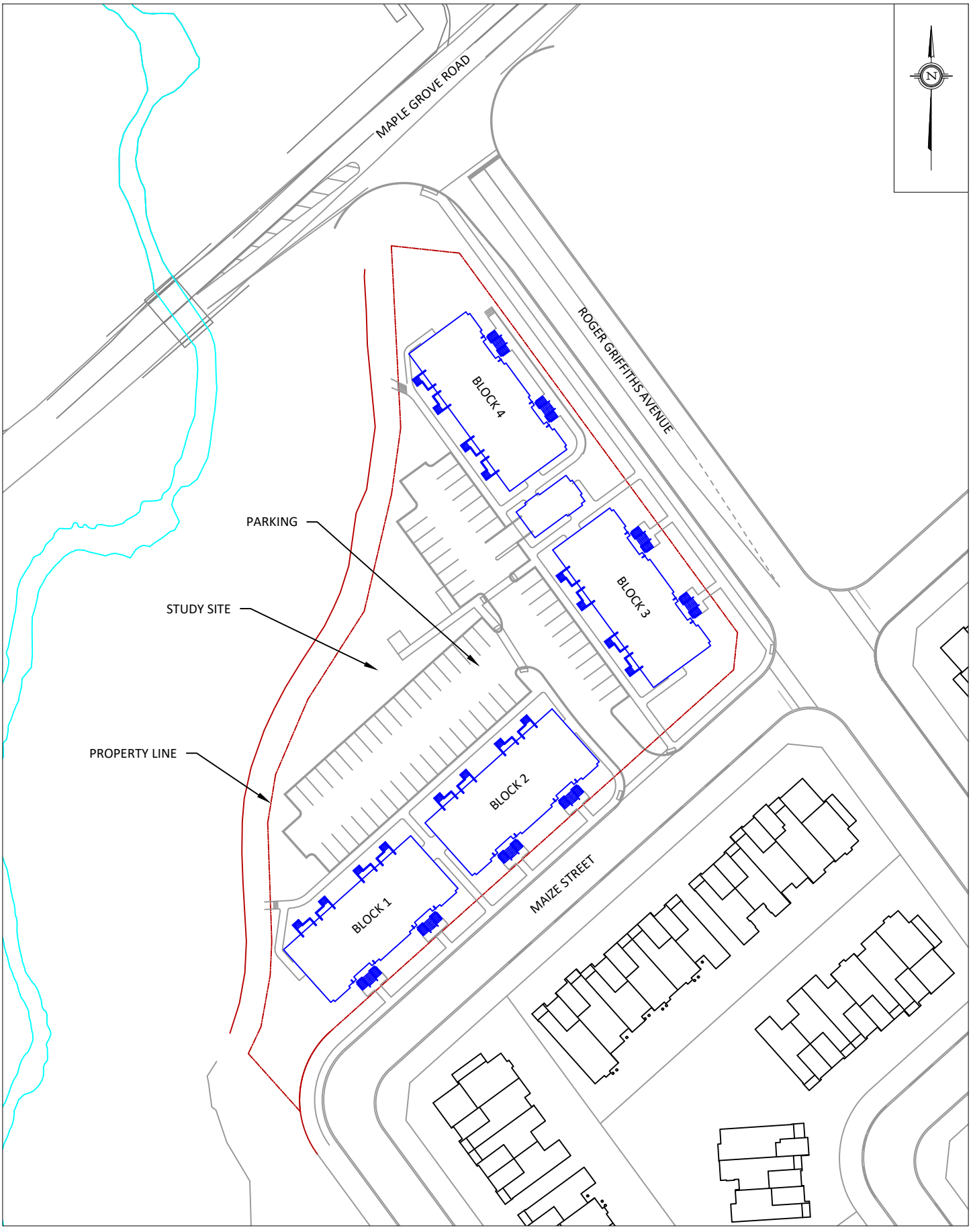
Sincerely,

Gradient Wind Engineering Inc.

Giuseppe Garro, MASc.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-182 – Traffic Noise



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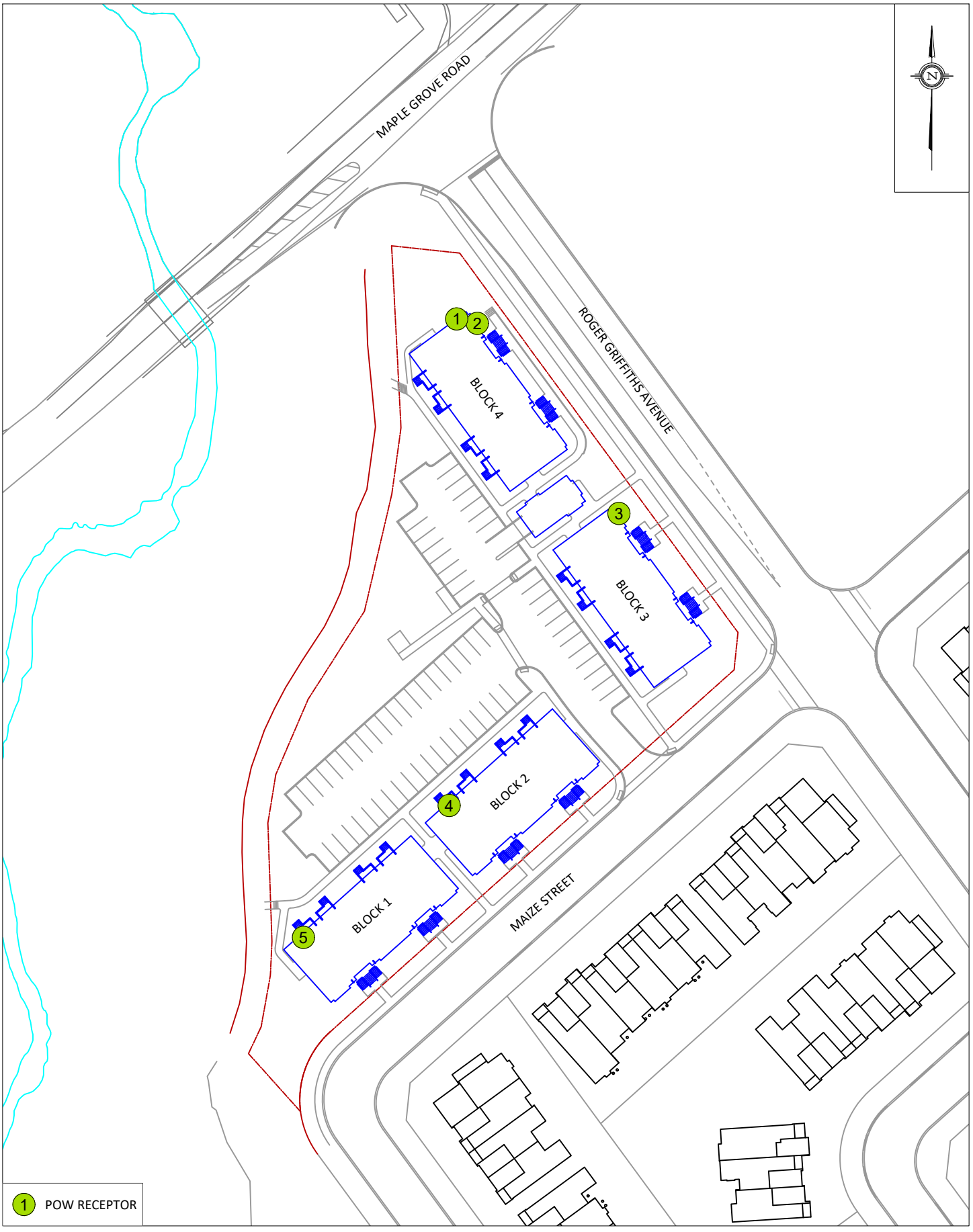
PROJECT	1560-1620 MAPLE GROVE ROAD - BLOCK 29, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-182-1
DATE	JUNE 29, 2021
DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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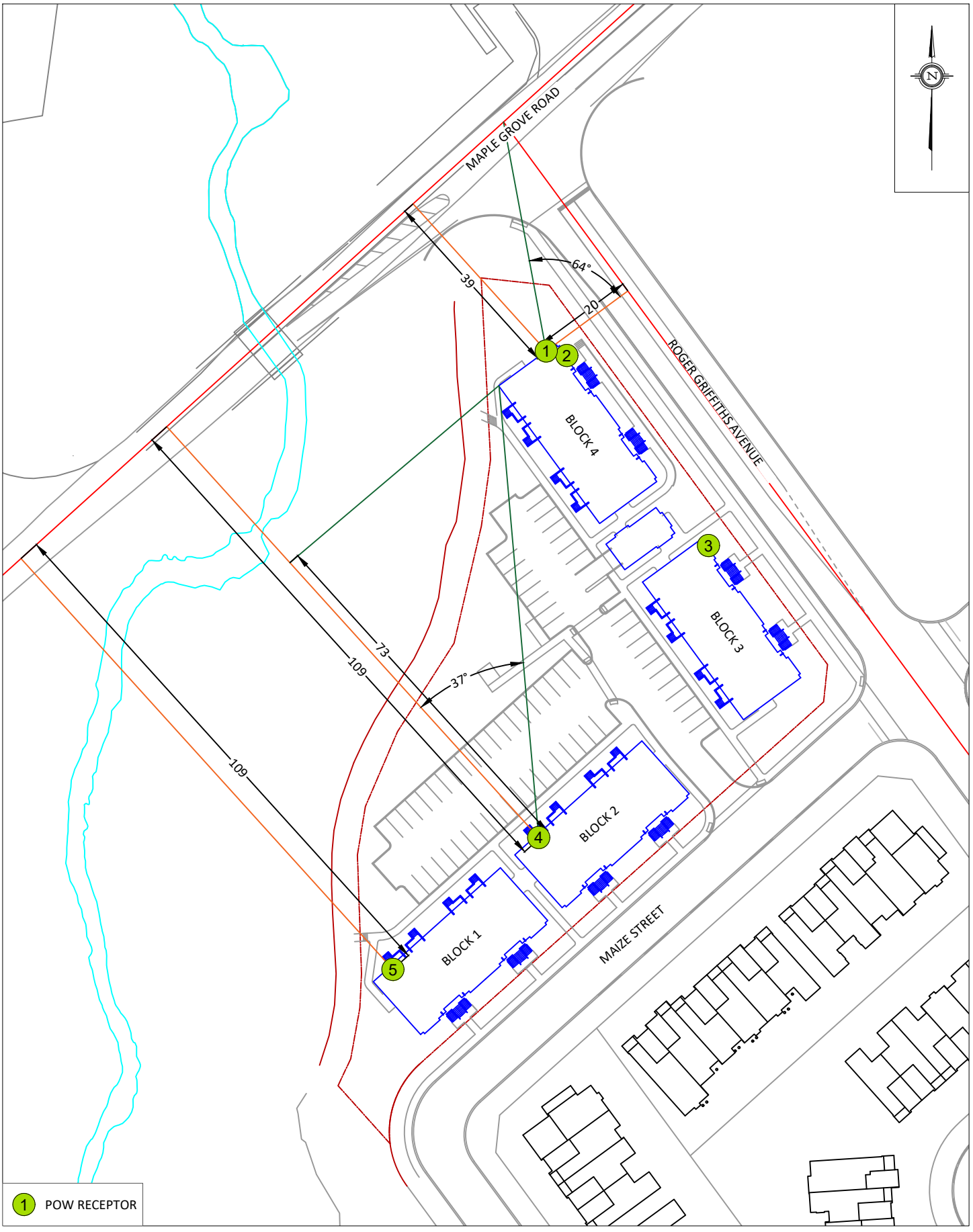
PROJECT	1560-1620 MAPLE GROVE ROAD - BLOCK 29, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-182-2
DATE	JUNE 29, 2021
DRAWN BY	G.G.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATION



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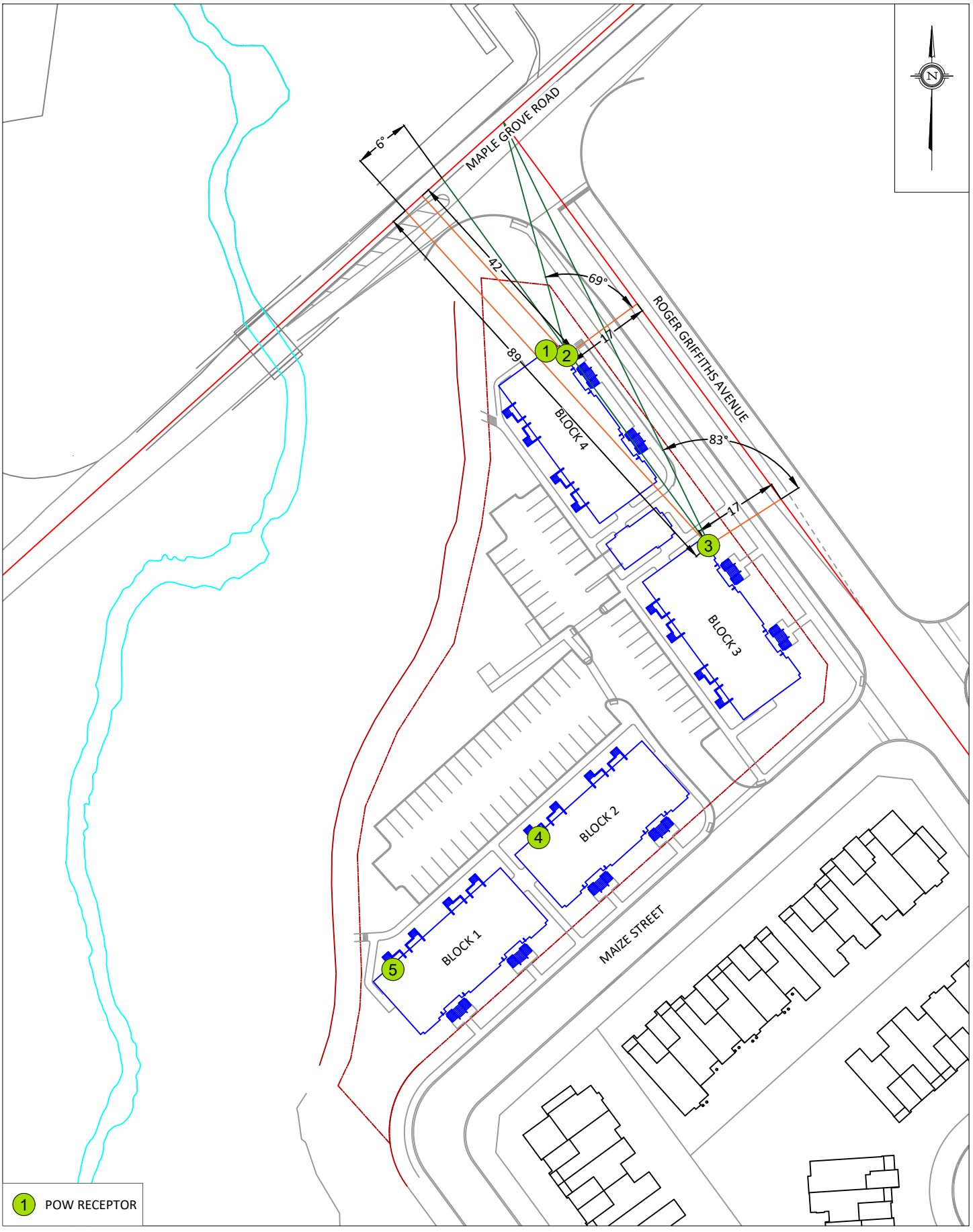
PROJECT	1560-1620 MAPLE GROVE ROAD - BLOCK 29, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO. GW20-182-3	FIGURE 3: RECEPTOR 1, 4, AND 5 STAMSON INPUT PARAMETERS
DATE	JUNE 29, 2021	DRAWN BY G.G.	



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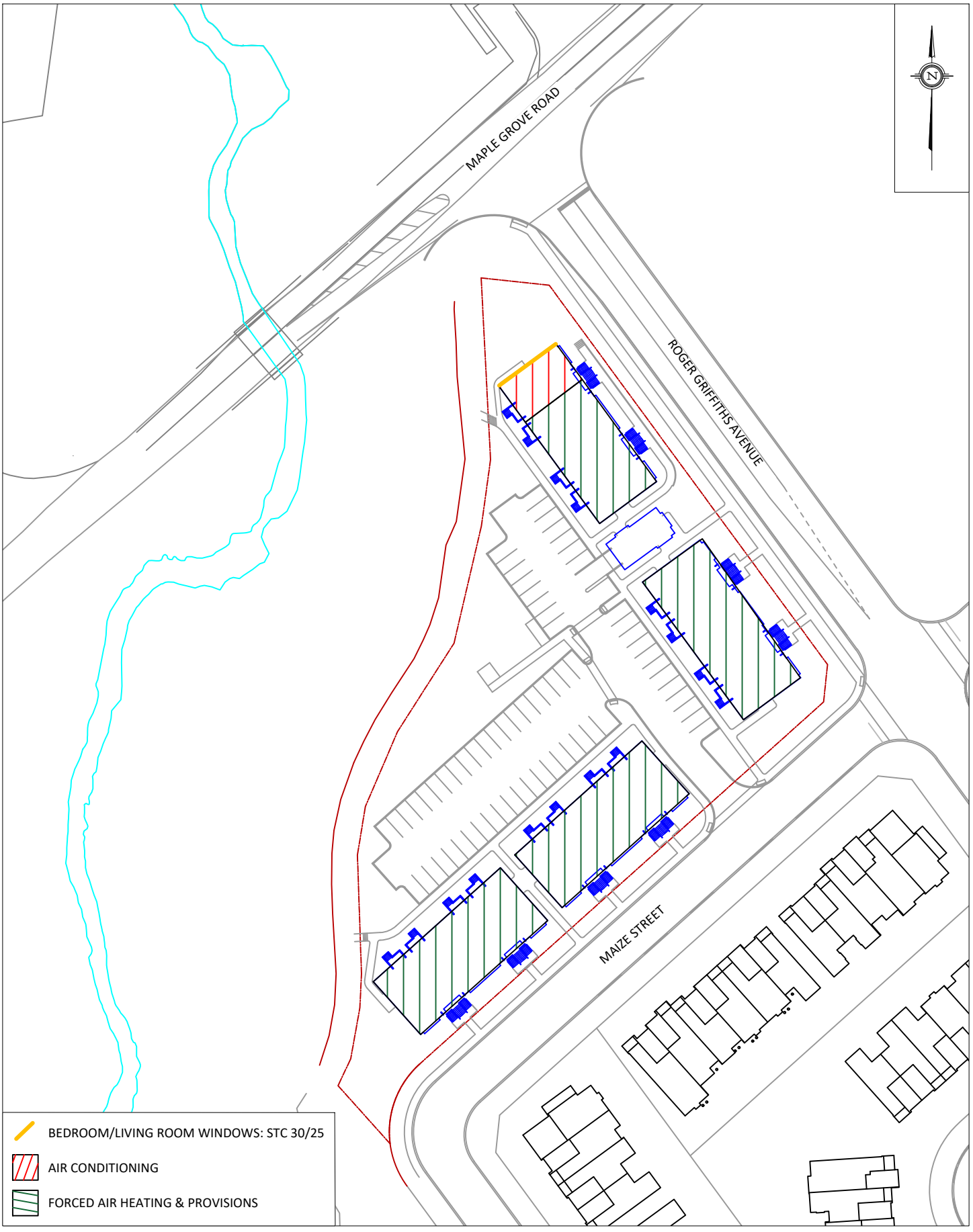
PROJECT	1560-1620 MAPLE GROVE ROAD - BLOCK 29, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-182-4
DATE	JUNE 29, 2021	DRAWN BY	G.G.

FIGURE 4:
RECEPTOR 2 AND 3 STAMSON INPUT PARAMETERS



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PROJECT	1560-1620 MAPLE GROVE ROAD - BLOCK 29, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-182-5
DATE	JUNE 29, 2021
DRAWN BY	G.G.

DESCRIPTION

FIGURE 5:
WINDOW STC AND VENTILATION REQUIREMENTS

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: 29-06-2021 21:20:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Maple Grove (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: Maple Grove (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  :  39.00 / 39.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: RGA (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: RGA (day/night)
-------------------------------------
Angle1   Angle2           : -64.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Maple Grove (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 66.40 + 0.00) = 66.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.48  73.68   0.00  -6.14  -1.14   0.00   0.00   0.00
66.40
-------------------------------------------------------------------------------
--

Segment Leq : 66.40 dBA

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

Source height = 1.50 m

ROAD (0.00 + 57.14 + 0.00) = 57.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -64      0   0.48  63.96   0.00  -1.85  -4.97   0.00   0.00   0.00
57.14
-------------------------------------------------------------------------------
--

Segment Leq : 57.14 dBA

Total Leq All Segments: 66.89 dBA
```

```
Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.80 + 0.00) = 58.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.48  66.08   0.00  -6.14  -1.14   0.00   0.00   0.00
58.80
-------------------------------------------------------------------------
--

Segment Leq : 58.80 dBA

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

Source height = 1.50 m

ROAD (0.00 + 49.54 + 0.00) = 49.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -64      0   0.48  56.36   0.00  -1.85  -4.97   0.00   0.00   0.00
49.54
-------------------------------------------------------------------------
--

Segment Leq : 49.54 dBA

Total Leq All Segments: 59.29 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 66.89
                           (NIGHT): 59.29
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-06-2021 21:20:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Maple Grove (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: Maple Grove (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  :  42.00 / 42.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: RGA (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: RGA (day/night)
-------------------------------------
Angle1   Angle2           : -69.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Maple Grove (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.91 + 0.00) = 62.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     90   0.48  73.68   0.00  -6.62  -4.15   0.00   0.00   0.00
62.91
-------------------------------------------------------------------------------
--

Segment Leq : 62.91 dBA

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

Source height = 1.50 m

ROAD (0.00 + 61.73 + 0.00) = 61.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -69     90   0.48  63.96   0.00  -0.80  -1.42   0.00   0.00   0.00
61.73
-------------------------------------------------------------------------------
--

Segment Leq : 61.73 dBA

Total Leq All Segments: 65.37 dBA
```

```
Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.31 + 0.00) = 55.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.48  66.08   0.00  -6.62  -4.15   0.00   0.00   0.00
55.31
-------------------------------------------------------------------------
--

Segment Leq : 55.31 dBA

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

Source height = 1.50 m

ROAD (0.00 + 54.14 + 0.00) = 54.14 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -69     90   0.48  56.36   0.00  -0.80  -1.42   0.00   0.00   0.00
54.14
-------------------------------------------------------------------------
--

Segment Leq : 54.14 dBA

Total Leq All Segments: 57.77 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.37
                           (NIGHT): 57.77
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-06-2021 21:20:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Maple Grove (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: Maple Grove (day/night)
---------------------------------------------
Angle1   Angle2           :   6.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  89.00 / 89.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: RGA (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: RGA (day/night)
-------------------------------------
Angle1   Angle2           : -83.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Maple Grove (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.69 + 0.00) = 57.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     6     90   0.48  73.68   0.00 -11.45  -4.54   0.00   0.00   0.00
57.69
-------------------------------------------------------------------------------
--

Segment Leq : 57.69 dBA

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

Source height = 1.50 m

ROAD (0.00 + 61.96 + 0.00) = 61.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -83     90   0.48  63.96   0.00  -0.80  -1.19   0.00   0.00   0.00
61.96
-------------------------------------------------------------------------------
--

Segment Leq : 61.96 dBA

Total Leq All Segments: 63.34 dBA
```

```
Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.09 + 0.00) = 50.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     6     90   0.48  66.08   0.00 -11.45  -4.54   0.00   0.00   0.00
50.09
-------------------------------------------------------------------------------
--

Segment Leq : 50.09 dBA

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

Source height = 1.50 m

ROAD (0.00 + 54.37 + 0.00) = 54.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -83     90   0.48  56.36   0.00  -0.80  -1.19   0.00   0.00   0.00
54.37
-------------------------------------------------------------------------------
--

Segment Leq : 54.37 dBA

Total Leq All Segments: 55.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.34
                           (NIGHT): 55.75
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-06-2021 21:20:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Maple Grove (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: Maple Grove (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  : 109.00 / 109.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  37.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance :  73.00 / 73.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Maple Grove (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 !        7.50 !        3.48 !         3.48

ROAD (58.59 + 48.10 + 0.00) = 58.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     37   0.48  73.68   0.00 -12.75  -2.34   0.00   0.00   0.00
58.59
-------------------------------------------------------------------------
--
    37     90   0.00  73.68   0.00  -8.61  -5.31   0.00   0.00 -11.66
48.10
-------------------------------------------------------------------------
--

Segment Leq : 58.96 dBA

Total Leq All Segments: 58.96 dBA

Results segment # 1: Maple Grove (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 !        7.50 !        3.48 !         3.48

ROAD (50.99 + 40.50 + 0.00) = 51.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     37   0.48  66.08   0.00 -12.75  -2.34   0.00   0.00   0.00
50.99
-------------------------------------------------------------------------
    37     90   0.00  66.08   0.00  -8.61  -5.31   0.00   0.00 -11.66
40.50
-------------------------------------------------------------------------

Segment Leq : 51.36 dBA

Total Leq All Segments: 51.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.96
                           (NIGHT): 51.36
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-06-2021 21:20:35
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Maple Grove (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: Maple Grove (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  : 109.00 / 109.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Maple Grove (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.79 + 0.00) = 59.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.48  73.68   0.00 -12.75  -1.14   0.00   0.00   0.00
59.79
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 59.79 dBA

Total Leq All Segments: 59.79 dBA

Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 52.19 + 0.00) = 52.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.48  66.08   0.00 -12.75  -1.14   0.00   0.00   0.00
52.19
-------------------------------------------------------------------------
--

Segment Leq : 52.19 dBA

Total Leq All Segments: 52.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.79
                           (NIGHT): 52.19
```