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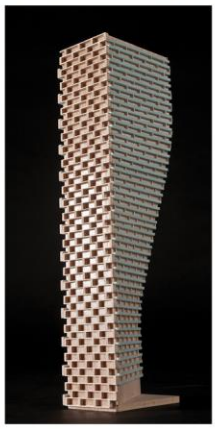
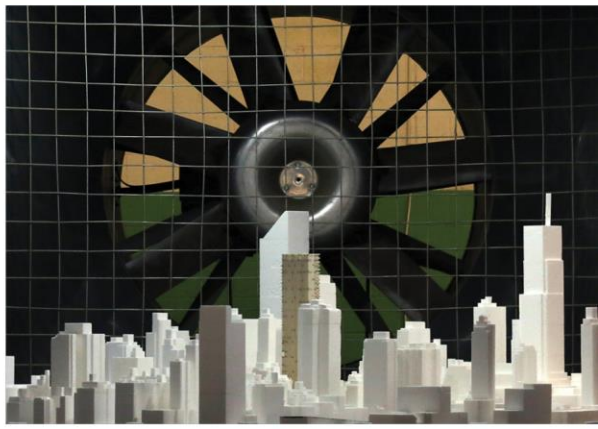
ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

1649 Montreal Road
Ottawa, Ontario

REPORT: 21-088-Traffic Noise





May 11, 2021

PREPARED FOR
Bertone Montreal Road LP
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PREPARED BY
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EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment to satisfy requirements for a Zoning By-law Amendment (ZBA) application submission for the proposed mixed-use development located at 1649 Montreal Road in Ottawa, Ontario. The proposed development comprises a 26-storey mixed-use residential building. Outdoor amenity space is provided at various podium terraces on the north side of the building. The major sources of traffic noise are Montreal Road and Blair Road. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings prepared by Roderick Lahey Architect Inc. in April 2021.

The results of the current analysis indicate that noise levels will range between 52 and 73 dBA during the daytime period (07:00-23:00) and between 52 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (73 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. Noise levels at the 5th Floor terrace fall below the ENCG criterion for outdoor living areas, therefore noise control measures are not expected to be required.

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required where noise levels exceed 65 dBA, as discussed in Section 4.2.1. The results also indicate that the development will require 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 be placed on all Lease, Purchase and Sale Agreements. Specific noise control for the development would be evaluated at the time of site plan control.

Off-site stationary noise impacts can generally be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. It is recommended a stationary noise study be conducted once mechanical plans for the proposed building

become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG limits.

Existing stationary noise sources surrounding the study comprise small rooftop units associated with the commercial properties along Montreal Road, as well as stationary noise sources associated with the NRC facility to the west. A review of satellite imagery does not reveal any sources that would not be mitigated by setback distance to the study site. Furthermore, the study site benefits from elevated background noise levels along Montreal Road and Blair Road, as well as being surrounded by existing residential properties. Further analysis of off-site stationary noise sources will not be required.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Bertone Montreal Road LP to undertake a roadway traffic noise feasibility assessment to satisfy requirements for a Zoning By-law Amendment (ZBA) application submission for the proposed mixed-use development located at 1649 Montreal Road in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). This report summarizes the methodology, results, and recommendations related to the assessment of exterior 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 Roderick Lahey Architect Inc. in April 2021, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The subject site is located at 1649 Montreal Road in Ottawa, on a parcel of land situated at the northeast corner of the intersection of Montreal Road and Blair Road.

Architectural Rendering, Northwest Perspective
(Courtesy of Roderick Lahey Architect Inc.)

The proposed development comprises a 26-storey mixed-use residential building. At Level 1, the floorplan includes commercial space along Montreal Road, as well as lobby, amenity, storage, and building services space. The primary entrance is located on the west elevation. The roof of the 1-storey podium includes amenity space along the north and east elevations of the building. A pool will be located at the north of this outdoor amenity space, while seating will be located at the northeast corner. Levels 2 and above comprise residential units. At Level 5 the building steps back from all elevations, and

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

the tower floorplan remains consistent from Level 5 to Level22. The north end of the floorplan steps back from the west, north, and east elevations at Level 23; the building then steps back from the south elevation at Level 25.

The subject site is surrounded by low-rise residential building to the northeast and southeast, low-rise office/research buildings to the southwest and northwest (operated by the National Research Council of Canada), and low-rise commercial properties toward the east, along Montreal Road. The major sources of traffic noise are Montreal Road and Blair Road. 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 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	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

[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

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.

4.2.2 Theoretical Roadway Noise Predictions

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

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

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 5 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3-5.

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

[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3
[7] City of Ottawa Transportation Master Plan, November 2013

are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Montreal Road	4-Lane Urban Arterial Divided	60	**35,000**
Blair Road North of Montreal Road	2-Lane Major Collector	50	**12,000**
Blair Road South of Montreal Road	2-Lane Urban Arterial	50	**15,000**

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	60.5	POW – 20th Floor – North Façade	59	52
2	60.5	POW – 20th Floor – East Façade	68	60
3	60.5	POW – 20th Floor – South Façade	73	65
4	60.5	POW – 20th Floor – West Façade	71	63
5	15.5	OLA – 5th Floor Terrace	52	N/A

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 52 and 73 dBA during the daytime period (07:00-23:00) and between 52 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (73 dBA) occurs at the south façade, which is nearest and most exposed to Montreal Road. Noise levels at the 5th Floor terrace fall below the ENCG criterion for outdoor living areas, therefore noise control measures are not expected to be required.

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Upgraded building components, including STC rated glazing elements and exterior walls, will be required where noise levels exceed 65 dBA, as discussed in Section 4.2.1. The results also indicate that the development will require 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 be placed on all Lease, Purchase and Sale Agreements. Specific noise control for the development would be evaluated at the time of site plan control.

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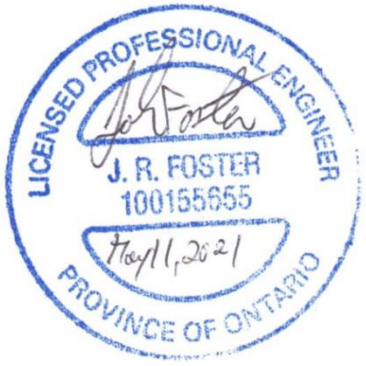
This concludes our traffic noise feasibility assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

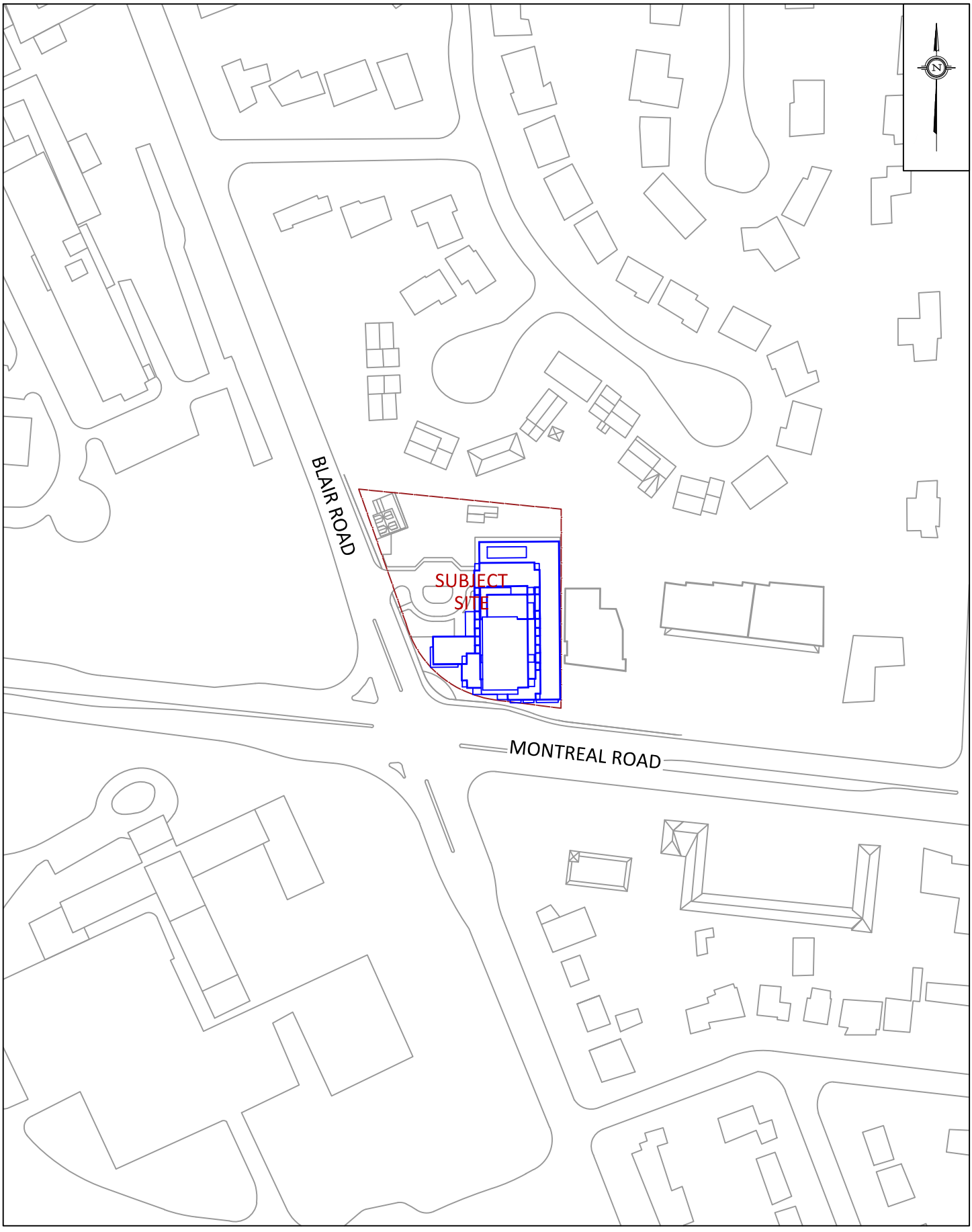
Gradient Wind Engineering Inc.



Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #21-088-Traffic Noise



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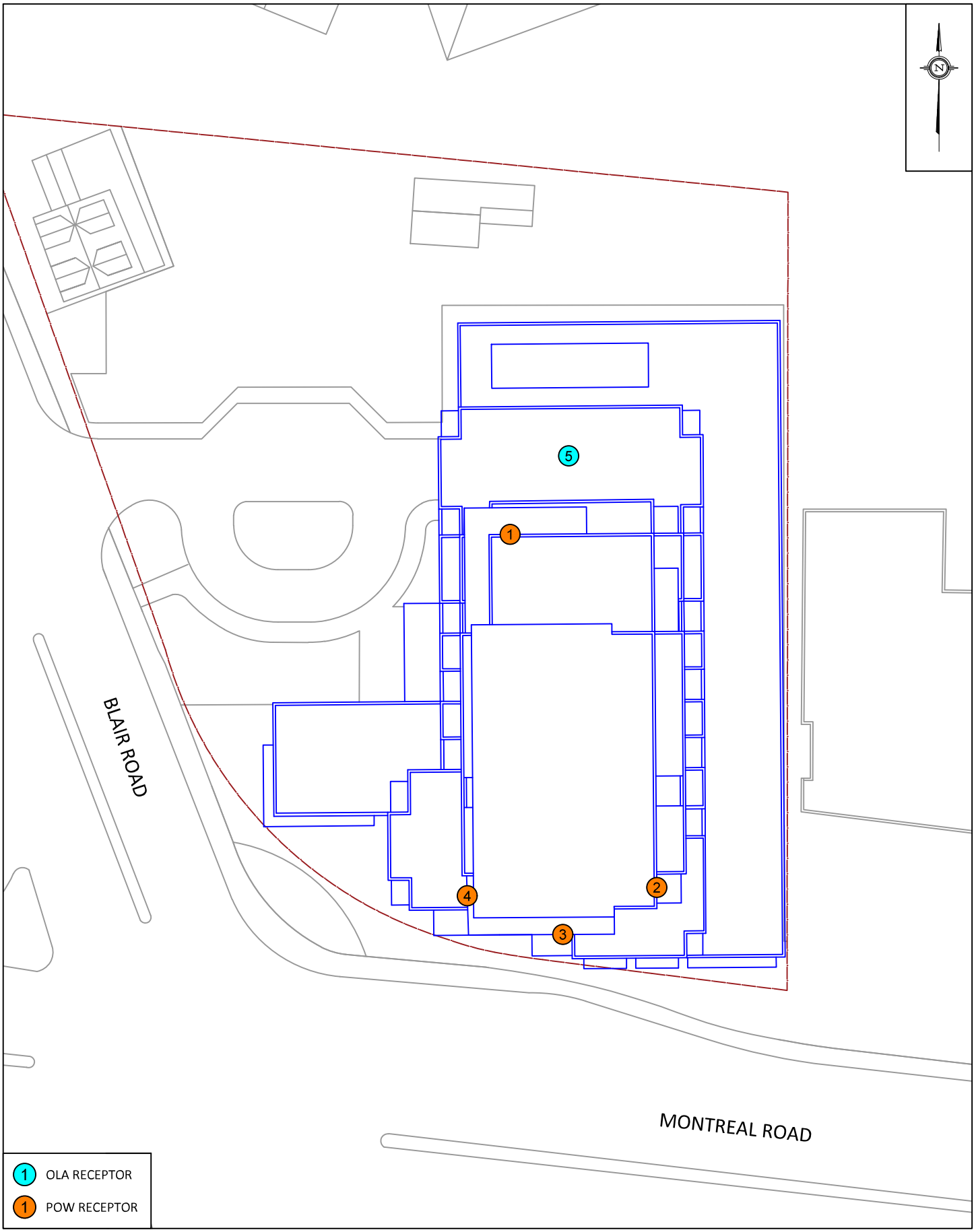
PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW21-088-1
DATE	APRIL 30, 2021	DRAWN BY	M.L.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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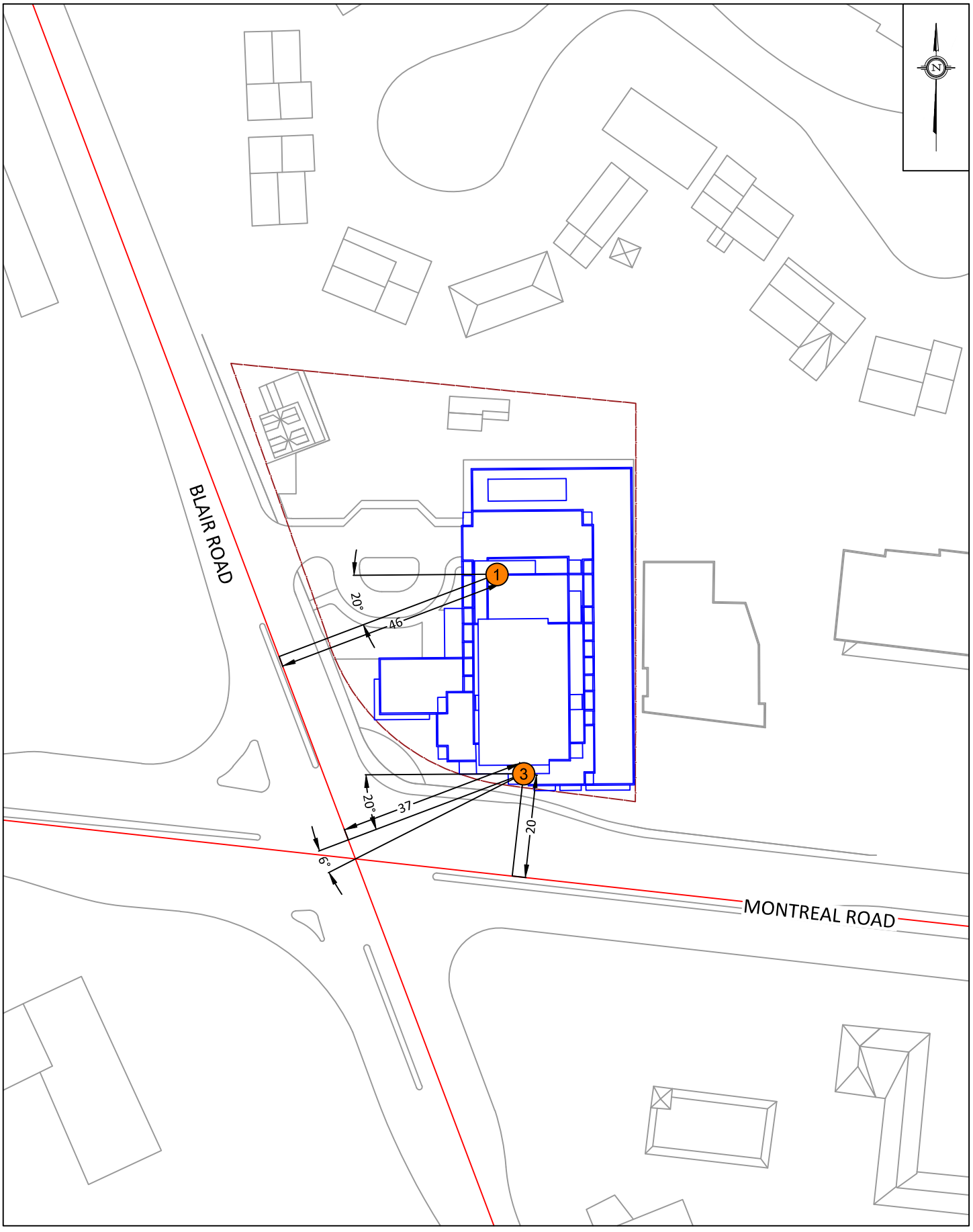
PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GW21-088-2
DATE	APRIL 30, 2021
DRAWN BY	M.L.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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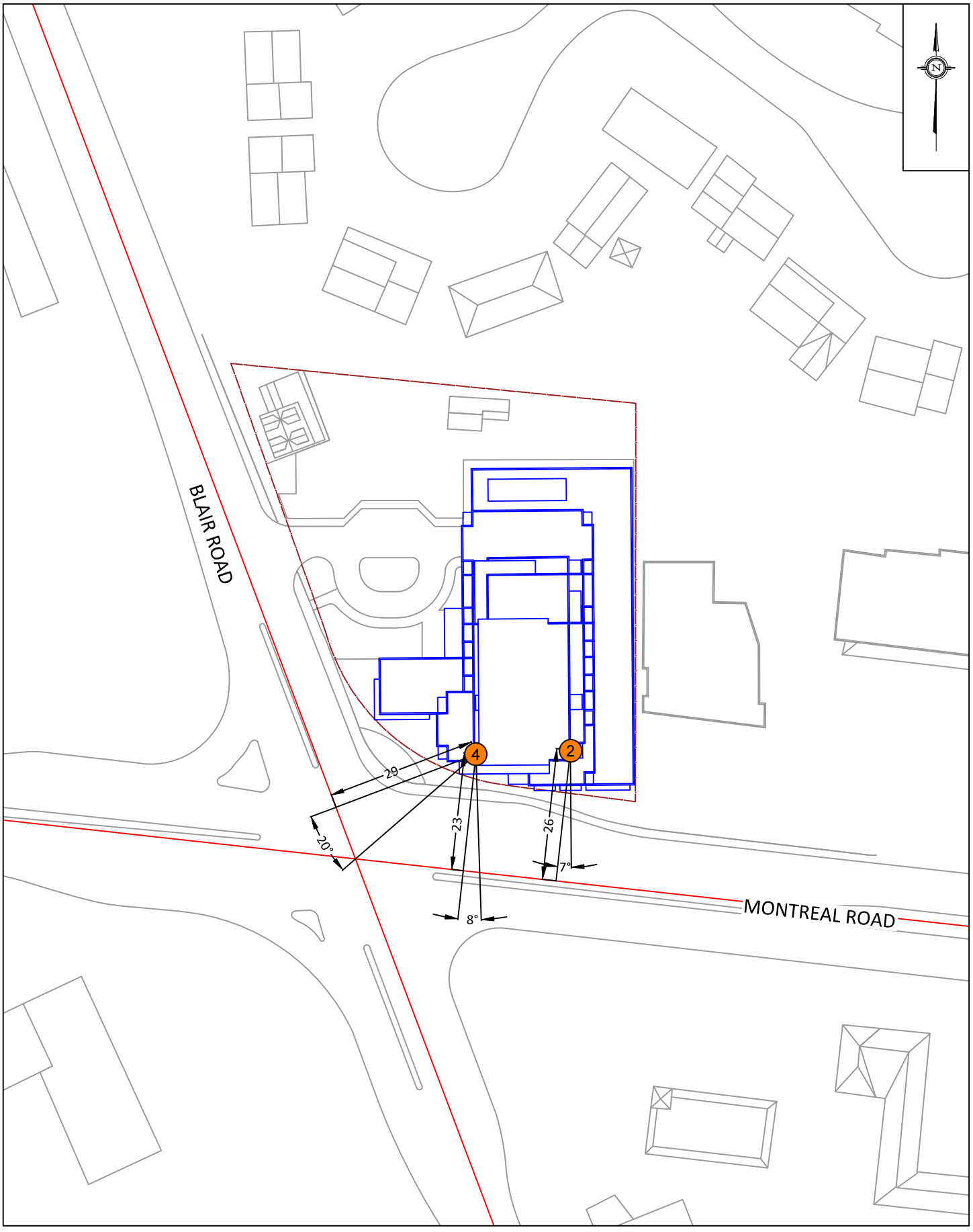
PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW21-088-3
DATE	APRIL 30, 2021	DRAWN BY	M.L.

FIGURE 3:
STAMSON INPUT PARAMETERS - RECEPTOR 1,3



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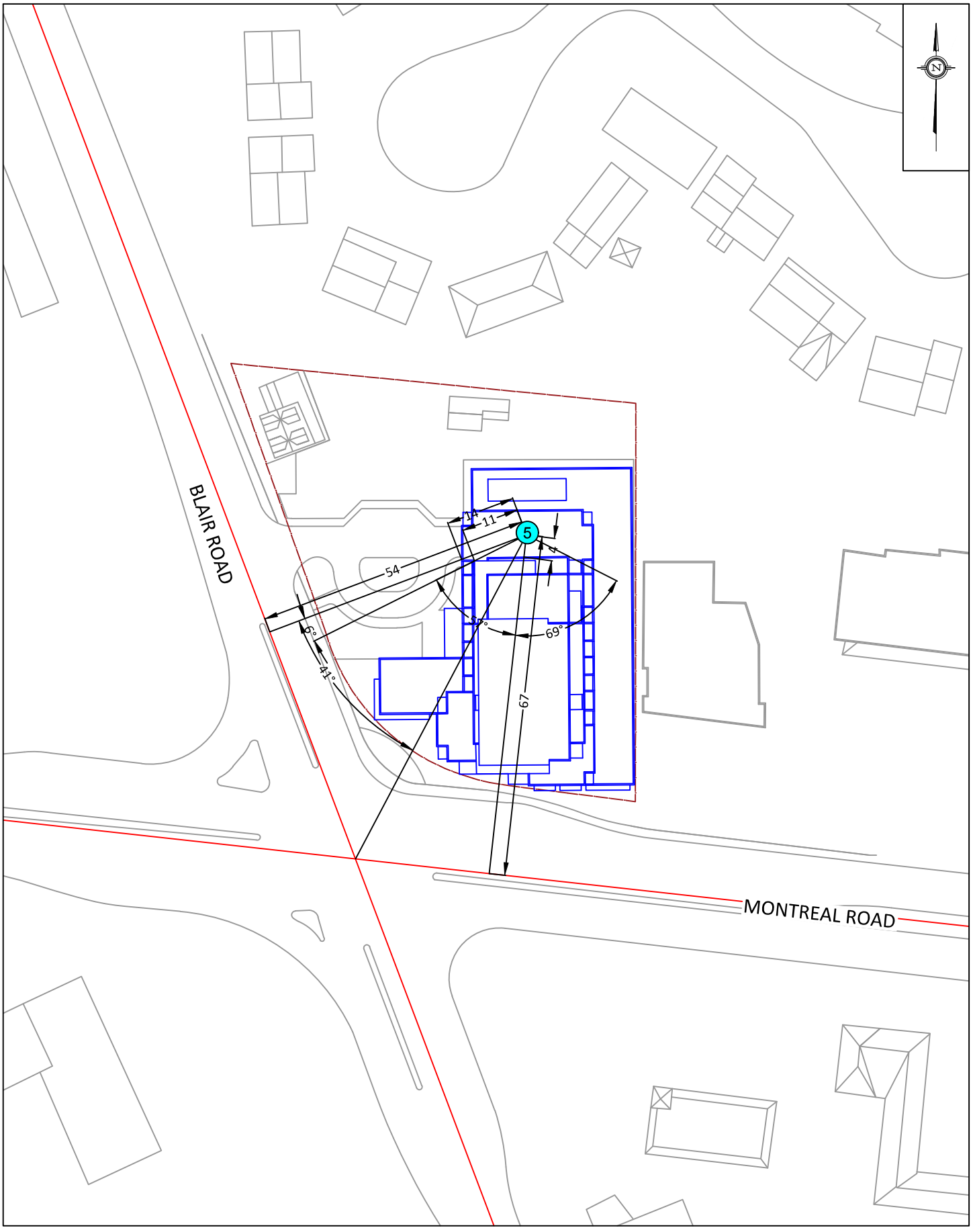
PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW21-088-4
DATE	APRIL 30, 2021	DRAWN BY	M.L.

FIGURE 4:
STAMSON INPUT PARAMETERS - RECEPTOR 2,4



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PROJECT	1649 MONTREAL ROAD, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW21-088-5
DATE	APRIL 30, 2021	DRAWN BY	M.L.

FIGURE 5:
STAMSON INPUT PARAMETERS - RECEPTOR 5

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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```
STAMSON 5.0        NORMAL REPORT        Date: 29-04-2021 34:45:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: BlairN (day/night)
-----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: BlairN (day/night)
----------------------------------------
Angle1   Angle2           :  20.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  46.00 / 46.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: BlairN (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.54 + 0.00) = 58.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    20     90   0.00  67.51   0.00  -4.87  -4.10   0.00   0.00   0.00
58.54
-------------------------------------------------------------------------
--

Segment Leq : 58.54 dBA

Total Leq All Segments: 58.54 dBA


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

Source height = 1.50 m

ROAD (0.00 + 50.94 + 0.00) = 50.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    20     90   0.00  59.91   0.00  -4.87  -4.10   0.00   0.00   0.00
50.94
-------------------------------------------------------------------------
--

Segment Leq : 50.94 dBA

Total Leq All Segments: 50.94 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 58.54
                           (NIGHT): 50.94
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-04-2021 34:45:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Montreal (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   -7.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 67.93 + 0.00) = 67.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -7   0.00  73.68   0.00  -2.39  -3.36   0.00   0.00   0.00
67.93
-------------------------------------------------------------------------
--

Segment Leq : 67.93 dBA

Total Leq All Segments: 67.93 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.33 + 0.00) = 60.33 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -7   0.00  66.08   0.00  -2.39  -3.36   0.00   0.00   0.00
60.33
-------------------------------------------------------------------------
--

Segment Leq : 60.33 dBA

Total Leq All Segments: 60.33 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.93
                           (NIGHT): 60.33
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-04-2021 34:45:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Montreal (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: BlairN (day/night)
------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: BlairN (day/night)
----------------------------------------
Angle1   Angle2           :  -6.00 deg   20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  37.00 / 37.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: BlairS (day/night)
------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 3: BlairS (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   -6.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  37.00 / 37.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 72.43 + 0.00) = 72.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  73.68   0.00  -1.25   0.00   0.00   0.00   0.00
72.43
-------------------------------------------------------------------------
--

Segment Leq : 72.43 dBA


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

Source height = 1.50 m

ROAD (0.00 + 55.19 + 0.00) = 55.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -6     20   0.00  67.51   0.00  -3.92  -8.40   0.00   0.00   0.00
55.19
-------------------------------------------------------------------------
--

Segment Leq : 55.19 dBA
```

```
Results segment # 3: BlairS (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.25 + 0.00) = 61.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -6   0.00  68.48   0.00  -3.92  -3.31   0.00   0.00   0.00
61.25
-------------------------------------------------------------------------
--

Segment Leq : 61.25 dBA

Total Leq All Segments: 72.82 dBA


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

Source height = 1.50 m

ROAD (0.00 + 64.83 + 0.00) = 64.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  66.08   0.00  -1.25   0.00   0.00   0.00   0.00
64.83
-------------------------------------------------------------------------
--

Segment Leq : 64.83 dBA
```

```
Results segment # 2: BlairN (night)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.59 + 0.00) = 47.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -6     20   0.00  59.91   0.00  -3.92  -8.40   0.00   0.00   0.00
47.59
-------------------------------------------------------------------------
--

Segment Leq : 47.59 dBA


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

Source height = 1.50 m

ROAD (0.00 + 53.65 + 0.00) = 53.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     -6   0.00  60.88   0.00  -3.92  -3.31   0.00   0.00   0.00
53.65
-------------------------------------------------------------------------
--

Segment Leq : 53.65 dBA

Total Leq All Segments: 65.22 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 72.82
                           (NIGHT): 65.22
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-04-2021 34:45:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Montreal (day/night)
-------------------------------------------
Angle1   Angle2           :  -8.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: BlairN (day/night)
------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: BlairN (day/night)
----------------------------------------
Angle1   Angle2           : -20.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: BlairS (day/night)
------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 3: BlairS (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   -20.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :  60.50 / 60.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 69.18 + 0.00) = 69.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -8     90   0.00  73.68   0.00  -1.86  -2.64   0.00   0.00   0.00
69.18
-------------------------------------------------------------------------
--

Segment Leq : 69.18 dBA


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

Source height = 1.50 m

ROAD (0.00 + 62.51 + 0.00) = 62.51 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -20     90   0.00  67.51   0.00  -2.86  -2.14   0.00   0.00   0.00
62.51
-------------------------------------------------------------------------
--

Segment Leq : 62.51 dBA
```

```
Results segment # 3: BlairS (day)
---------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.52 + 0.00) = 61.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -20   0.00  68.48   0.00  -2.86  -4.10   0.00   0.00   0.00
61.52
-------------------------------------------------------------------------
--

Segment Leq : 61.52 dBA

Total Leq All Segments: 70.60 dBA


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

Source height = 1.50 m

ROAD (0.00 + 61.58 + 0.00) = 61.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -8     90   0.00  66.08   0.00  -1.86  -2.64   0.00   0.00   0.00
61.58
-------------------------------------------------------------------------
--

Segment Leq : 61.58 dBA
```

```
Results segment # 2: BlairN (night)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.91 + 0.00) = 54.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -20     90   0.00  59.91   0.00  -2.86  -2.14   0.00   0.00   0.00
54.91
-------------------------------------------------------------------------
--

Segment Leq : 54.91 dBA


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

Source height = 1.50 m

ROAD (0.00 + 53.92 + 0.00) = 53.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -20   0.00  60.88   0.00  -2.86  -4.10   0.00   0.00   0.00
53.92
-------------------------------------------------------------------------
--

Segment Leq : 53.92 dBA

Total Leq All Segments: 63.00 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 70.60
                           (NIGHT): 63.00
```

```
STAMSON 5.0        NORMAL REPORT        Date: 29-04-2021 34:45:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Montreal (day/night)
----------------------------------------------
Angle1   Angle2           : -69.00 deg   57.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  67.00 / 67.00  m
Receiver height           :  15.50 / 15.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -69.00 deg   Angle2 : 57.00 deg
Barrier height            :  88.00 m
Barrier receiver distance :   4.00 / 4.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: BlairN1 (day/night)
-------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: BlairN1 (day/night)
-----------------------------------------
Angle1   Angle2           : -41.00 deg   -6.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :  15.50 / 15.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -41.00 deg   Angle2 : -6.00 deg
Barrier height            :  88.00 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: BlairN2 (day/night)
-------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    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):  12000
    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: BlairN2 (day/night)
-----------------------------------------
Angle1   Angle2           :  -6.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :  15.50 / 15.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -6.00 deg   Angle2 : 90.00 deg
Barrier height            :  14.00 m
Barrier receiver distance :  14.00 / 14.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.50 !       14.66 !        14.66

ROAD (0.00 + 45.63 + 0.00) = 45.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -69     57   0.00  73.68   0.00  -6.50  -1.55   0.00   0.00 -20.00
45.63
-------------------------------------------------------------------------------
--

Segment Leq : 45.63 dBA


Results segment # 2: BlairN1 (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 !       15.50 !       12.65 !        12.65

ROAD (0.00 + 34.84 + 0.00) = 34.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -41     -6   0.00  67.51   0.00  -5.56  -7.11   0.00   0.00 -20.00
34.84
-------------------------------------------------------------------------------
--

Segment Leq : 34.84 dBA
```

```
Results segment # 3: BlairN2 (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 !       15.50 !       11.87 !        11.87

ROAD (0.00 + 50.19 + 0.00) = 50.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    -6     90   0.00  67.51   0.00  -5.56  -2.73   0.00   0.00  -9.02
50.19
-------------------------------------------------------------------------------
--

Segment Leq : 50.19 dBA

Total Leq All Segments: 51.59 dBA


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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       15.50 !       14.66 !        14.66

ROAD (0.00 + 38.03 + 0.00) = 38.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -69     57   0.00  66.08   0.00  -6.50  -1.55   0.00   0.00 -20.00
38.03
-------------------------------------------------------------------------------
--

Segment Leq : 38.03 dBA
```

```
Results segment # 2: BlairN1 (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 !       15.50 !       12.65 !        12.65

ROAD (0.00 + 27.24 + 0.00) = 27.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -41     -6   0.00  59.91   0.00  -5.56  -7.11   0.00   0.00 -20.00
27.24
-------------------------------------------------------------------------------
--

Segment Leq : 27.24 dBA
Results segment # 3: BlairN2 (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 !       15.50 !       11.87 !        11.87

ROAD (0.00 + 42.59 + 0.00) = 42.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    -6     90   0.00  59.91   0.00  -5.56  -2.73   0.00   0.00  -9.02
42.59
-------------------------------------------------------------------------------
--

Segment Leq : 42.59 dBA

Total Leq All Segments: 43.99 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 51.59
                           (NIGHT): 43.99
```