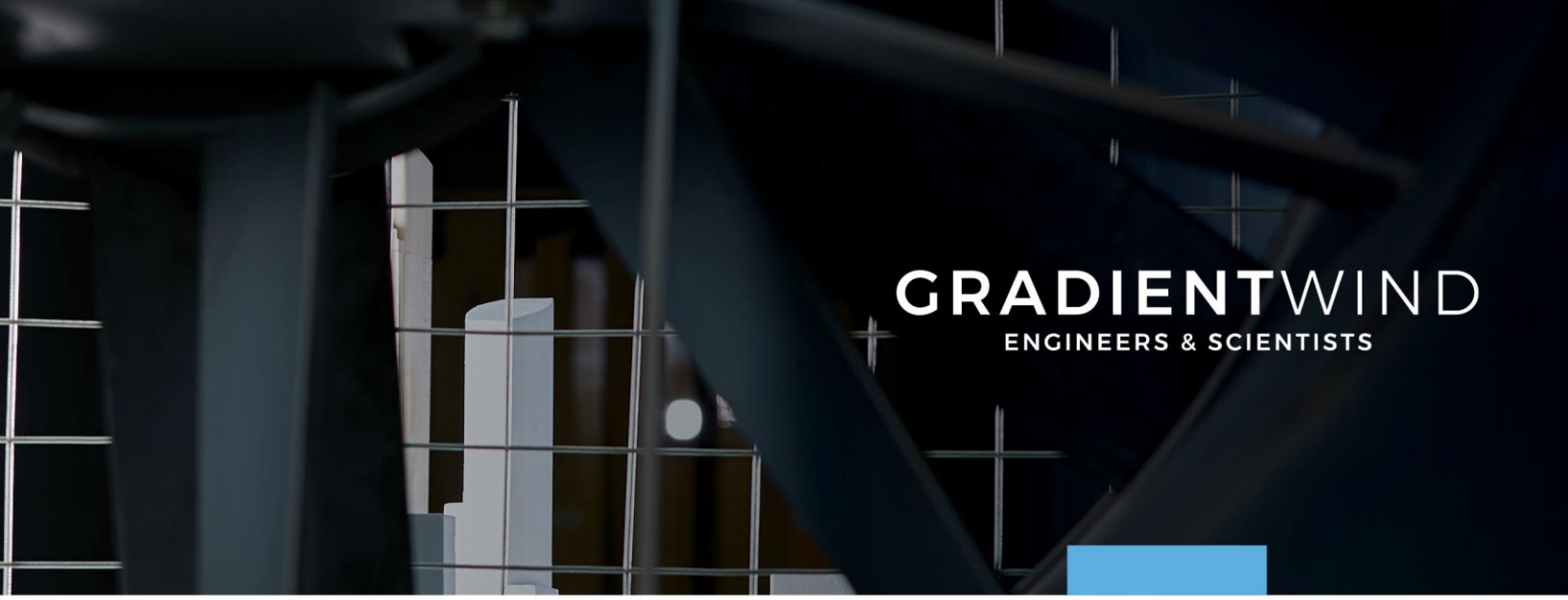
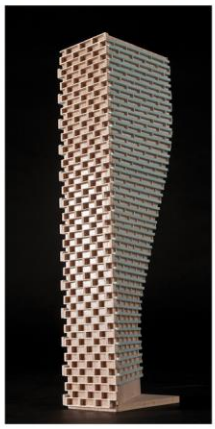


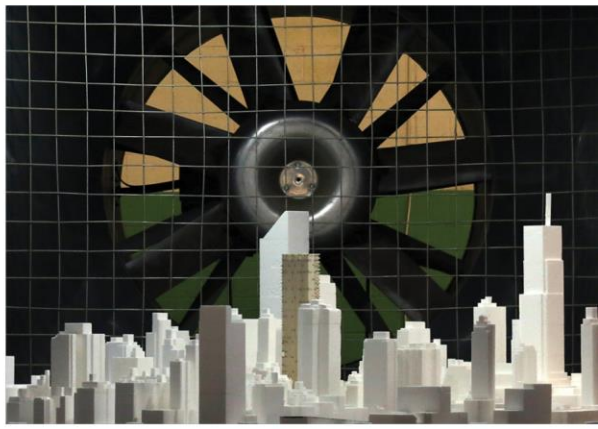
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

725 Somerset Street West
Ottawa, Ontario

REPORT: 23-108-Traffic Noise





May 24, 2023

PREPARED FOR

1303263 BC ULC
725 Somerset Street West
Ottawa, ON
K1R 6P7

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment for a proposed mixed-use development located at 725 Somerset Street West in Ottawa, Ontario. The proposed development comprises a nine-storey mixed-use residential/commercial building with a nominally rectangular planform, and a mechanical penthouse. The major source of traffic noise impacting the study site is Somerset Street West. 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) site plan drawings prepared by RLA Architecture dated May 2018.

The results of the current analysis indicate that noise levels will range between 50 and 68 dBA during the daytime period (07:00-23:00) and between 56 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the south façade, which is nearest and most exposed to Somerset Street West. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. Noise levels at the rooftop terrace fall below the outdoor living area noise criterion, therefore no mitigation will be required.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause will also be required be placed on all Lease, Purchase and Sale Agreements.

Specific noise control measures for roadway traffic noise will be determined as part of a detailed roadway traffic noise assessment conducted at the time of SPA.

Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with surrounding commercial buildings are at a sufficient setback distance, and smaller units associated with adjacent residential 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 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.

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 1303263 BC ULC to undertake a roadway traffic noise feasibility assessment for a proposed mixed-use development at 725 Somerset Street West 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 received from Rossmann Architecture in May 2023, 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 nine-storey mixed-use residential/commercial building with a nominally rectangular planform, and a mechanical penthouse. At grade the building comprises a retail space to the south, a lobby accessible by Empress Avenue. Also to the north of the building is a stacked parking one level of below-grade with bicycle storage. Floors two to nine contain residential units and balconies, with a floorplate change at level two to the north and south, and level five to the north, south, and west. At the mechanical penthouse level is a rooftop patio.

The site is surrounded by low-rise commercial properties along Somerset Street West, with low and mid-rise residential buildings beyond. The major source of traffic noise impacting the study site is Somerset Street West. 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

[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

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 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.
- Noise receptors were strategically placed at 6 locations around 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
Somerset Street West	2-Lane Arterial	50	**15,000**

[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	11.1	POW – 4th Floor – West Façade	65	58
2	11.1	POW – 4th Floor – South Façade	68	61
3	26.1	POW – 9th Floor – West Façade	64	56
4	26.1	POW – 9th Floor – South Façade	68	60
5	26.1	POW – 9th Floor – East Façade	65	58
6	30	OLA – Rooftop Terrace	50	N/A

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 50 and 68 dBA during the daytime period (07:00-23:00) and between 56 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the south façade, which is nearest and most exposed to Somerset Street West. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. Noise levels at the rooftop terrace fall below the outdoor living area noise criterion, therefore no mitigation will be required.

Results of the calculations also indicate that the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause[8] will also be required be placed on all Lease, Purchase and Sale Agreements.

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

Specific noise control measures for roadway traffic noise will be determined as part of a detailed roadway traffic noise assessment conducted at the time of SPA.

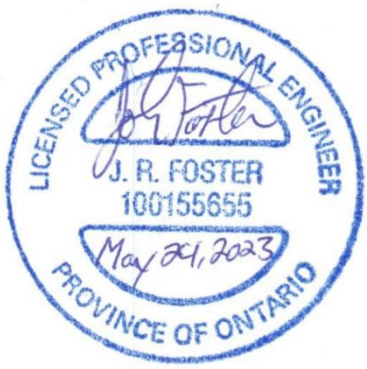
Regarding stationary noise, impacts from the surroundings on the study building are expected to be minimal. Sources associated with surrounding commercial buildings are at a sufficient setback distance, and smaller units associated with adjacent residential are expected to be in compliance with the MECP's 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 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.

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,

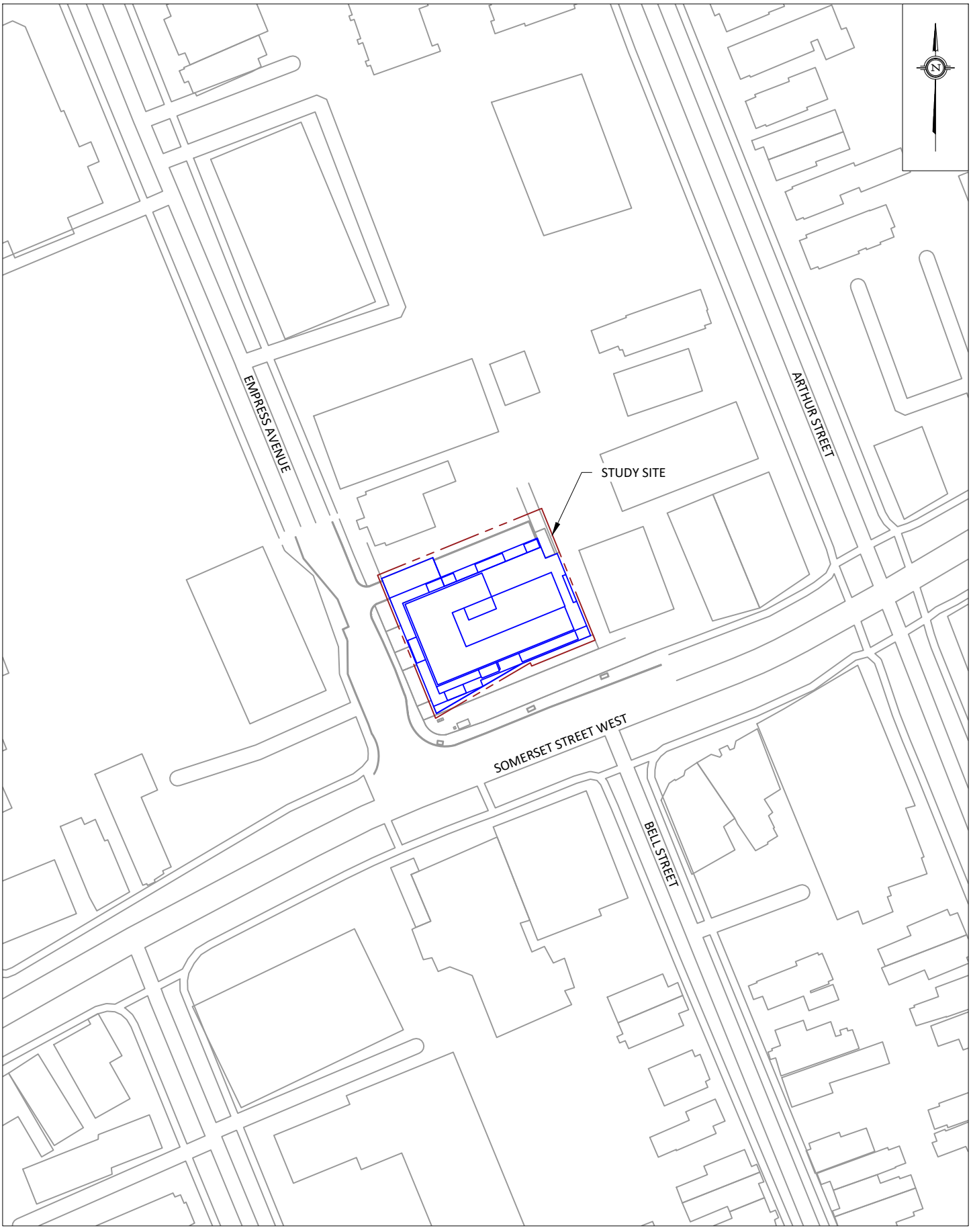
Gradient Wind Engineering Inc.



Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #23-108-Traffic Noise



GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	725 SOMERSET STREET WEST, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-108-1
DATE	MAY 18, 2023	DRAWN BY	M.L.

DESCRIPTION

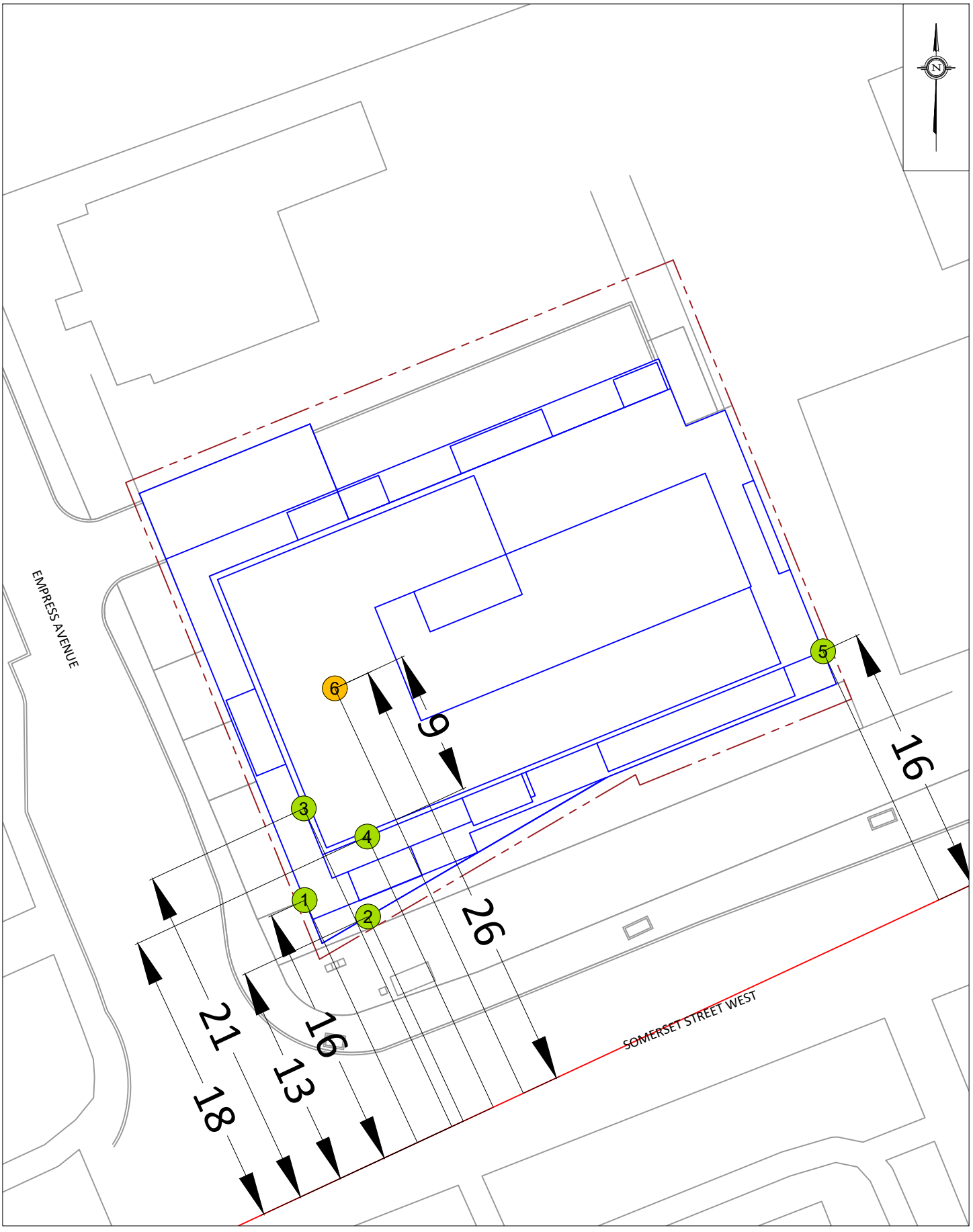
FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

GRADIENTWIND
ENGINEERS & SCIENTISTS

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

PROJECT	725 SOMERSET STREET WEST, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:300 (APPROX.)	DRAWING NO.	GW23-108-2
DATE	MAY 18, 2023	DRAWN BY	M.L.

FIGURE 2:
RECEPTOR LOCATIONS



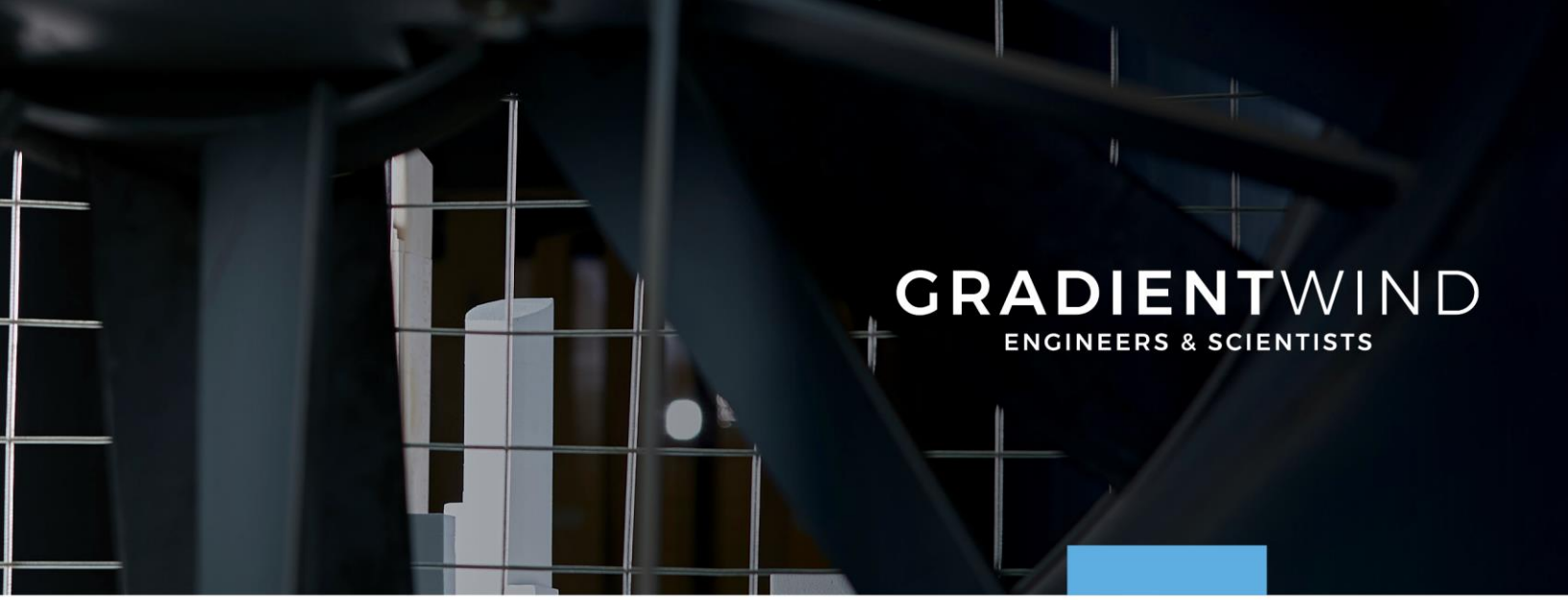
GRADIENTWIND
ENGINEERS & SCIENTISTS

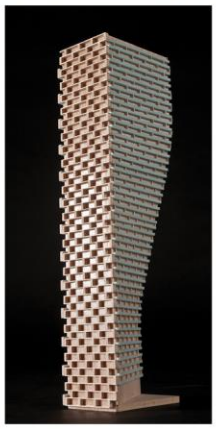
127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

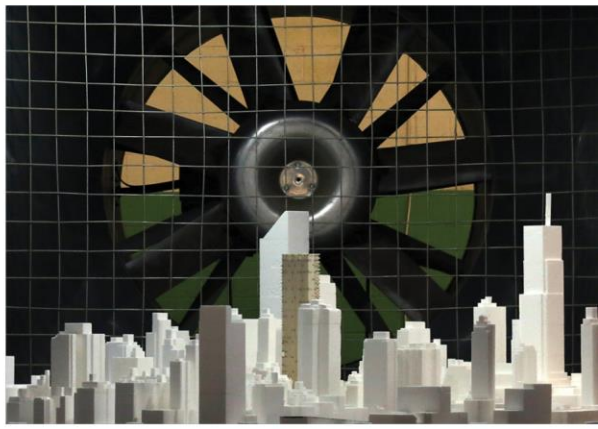
PROJECT	725 SOMERSET STREET WEST, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		
SCALE	1:300 (APPROX.)	DRAWING NO.	GW23-108-3
DATE	MAY 18, 2023	DRAWN BY	M.L.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS







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: 18-05-2023 13:23:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  16.00 / 16.00  m
Receiver height           :  11.10 / 11.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.19 + 0.00) = 65.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  68.48   0.00  -0.28  -3.01   0.00   0.00   0.00
65.19
-------------------------------------------------------------------------
--

Segment Leq : 65.19 dBA

Total Leq All Segments: 65.19 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.59 + 0.00) = 57.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  60.88   0.00  -0.28  -3.01   0.00   0.00   0.00
57.59
-------------------------------------------------------------------------
--

Segment Leq : 57.59 dBA

Total Leq All Segments: 57.59 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.19
                           (NIGHT): 57.59
```

```
STAMSON 5.0        NORMAL REPORT        Date: 18-05-2023 13:23:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  11.10 / 11.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

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

Segment Leq : 68.48 dBA

Total Leq All Segments: 68.48 dBA


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

Source height = 1.50 m

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

Segment Leq : 60.88 dBA

Total Leq All Segments: 60.88 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 68.48
                           (NIGHT): 60.88
```

```
STAMSON 5.0        NORMAL REPORT        Date: 18-05-2023 13:24:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :  26.10 / 26.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 64.01 + 0.00) = 64.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  68.48   0.00  -1.46  -3.01   0.00   0.00   0.00
64.01
-------------------------------------------------------------------------
--

Segment Leq : 64.01 dBA

Total Leq All Segments: 64.01 dBA


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

Source height = 1.50 m

ROAD (0.00 + 56.41 + 0.00) = 56.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     90   0.00  60.88   0.00  -1.46  -3.01   0.00   0.00   0.00
56.41
-------------------------------------------------------------------------
--

Segment Leq : 56.41 dBA

Total Leq All Segments: 56.41 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 64.01
                           (NIGHT): 56.41
```

```
STAMSON 5.0        NORMAL REPORT        Date: 18-05-2023 13:24:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (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  :  18.00 / 18.00  m
Receiver height           :  26.10 / 26.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 67.69 + 0.00) = 67.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  68.48   0.00  -0.79   0.00   0.00   0.00   0.00
67.69
-------------------------------------------------------------------------
--

Segment Leq : 67.69 dBA

Total Leq All Segments: 67.69 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.09 + 0.00) = 60.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00  -0.79   0.00   0.00   0.00   0.00
60.09
-------------------------------------------------------------------------
--

Segment Leq : 60.09 dBA

Total Leq All Segments: 60.09 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.69
                           (NIGHT): 60.09
```

```
STAMSON 5.0        NORMAL REPORT        Date: 18-05-2023 13:24:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (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  :  16.00 / 16.00  m
Receiver height           :  26.10 / 26.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.19 + 0.00) = 65.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  68.48   0.00  -0.28  -3.01   0.00   0.00   0.00
65.19
-------------------------------------------------------------------------
--

Segment Leq : 65.19 dBA

Total Leq All Segments: 65.19 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.59 + 0.00) = 57.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      0   0.00  60.88   0.00  -0.28  -3.01   0.00   0.00   0.00
57.59
-------------------------------------------------------------------------
--

Segment Leq : 57.59 dBA

Total Leq All Segments: 57.59 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.19
                           (NIGHT): 57.59
```

```
STAMSON 5.0        NORMAL REPORT        Date: 18-05-2023 13:24:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Somerset (day/night)
-------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  26.00 / 26.00  m
Receiver height           :  30.00 / 30.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  28.50 m
Barrier receiver distance :   9.00 / 9.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Somerset (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 !       30.00 !       20.13 !        20.13

ROAD (0.00 + 49.72 + 0.00) = 49.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.00  68.48   0.00  -2.39   0.00   0.00   0.00 -16.37
49.72
-------------------------------------------------------------------------------
--

Segment Leq : 49.72 dBA

Total Leq All Segments: 49.72 dBA
```

```
Results segment # 1: Somerset (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 !       30.00 !       20.13 !        20.13

ROAD (0.00 + 42.12 + 0.00) = 42.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  60.88   0.00  -2.39   0.00   0.00   0.00 -16.37
42.12
-------------------------------------------------------------------------------
--

Segment Leq : 42.12 dBA

Total Leq All Segments: 42.12 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 49.72
                           (NIGHT): 42.12
```