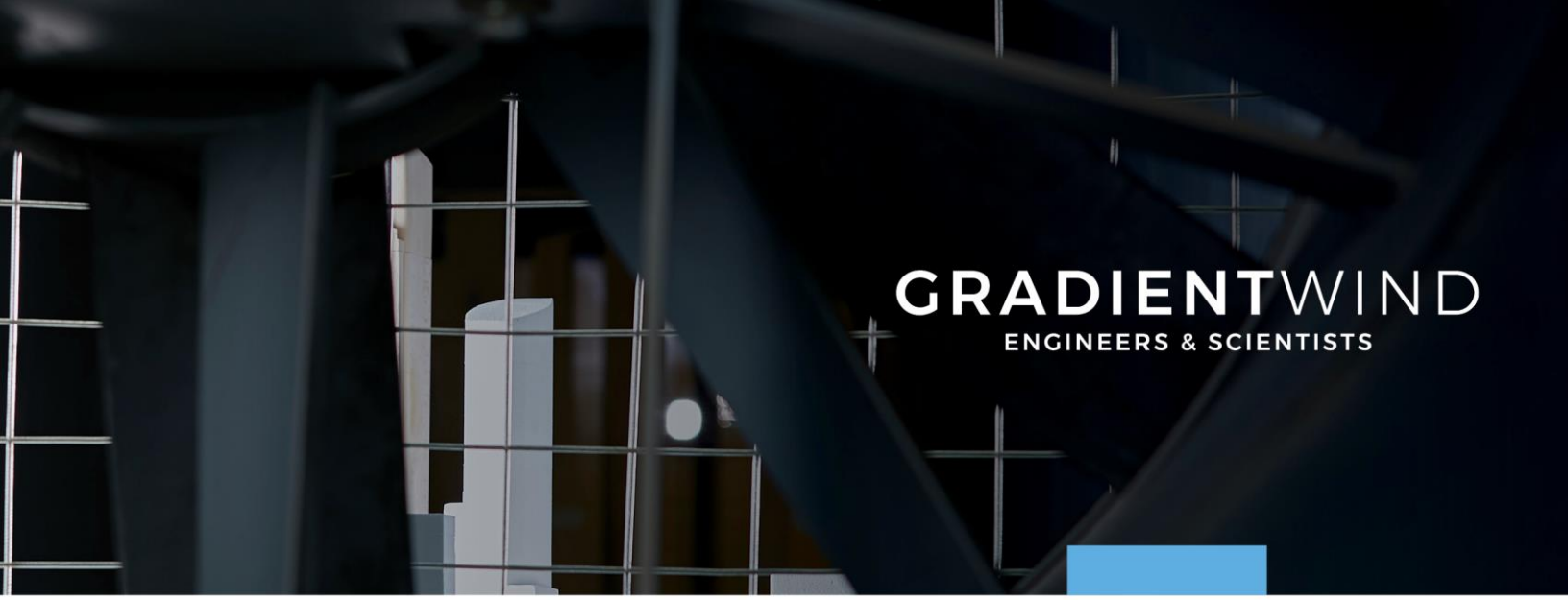
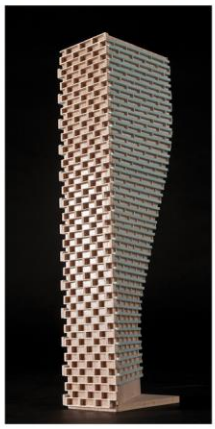


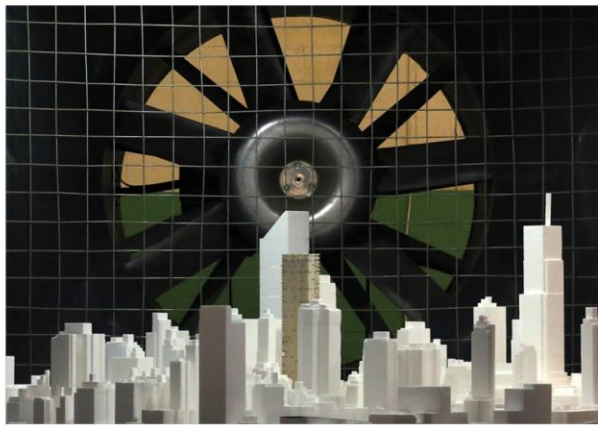
GRADIENTWIND
ENGINEERS & SCIENTISTS

ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

381 Kent Street
Ottawa, Ontario

Report: 21-429-Traffic Noise Feasibility





March 20, 2023

PREPARED FOR

Katasa Groupe + Développement
69 Jean-Proulx Street, unit 301
Gatineau, QC J8Z 1W2

PREPARED BY

Essraa Alqassab, BASc., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken in support of a Zoning By-Law Amendment (ZBA) application submission for the proposed 10-storey residential development located at 381 Kent Street in Ottawa, Ontario. The primary sources of roadway traffic noise are Kent Street and Bank Street. 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); (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 NEUF architect(e)s in February 2023.

The results of the current analysis indicate that noise levels will range between 41 and 68 dBA during the daytime period (07:00-23:00) and between 34 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the west façade, which is nearest and most exposed to Kent Street. The noise levels predicted due to roadway traffic exceed the criteria listed in ENCG for building components and upgraded building components will be required.

Results of the calculations also indicate that the building will require central air conditioning, or a similar ventilation system, due to roadway traffic noise. This will allow occupants to keep windows closed and maintain a comfortable living environment. This will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will also be required on all Lease, Purchase and Sale Agreements., as summarized in Section 6.

The results also indicate that if the Level 10 rooftop terrace is used as an amenity space, acoustic mitigation will not be required as noise levels are below 55 dBA. A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

Stationary noise impacts from surroundings onto the environment are expected to be minimal as the site is not in close proximity to any large mechanical equipment or industrial sites.

Stationary noise impacts from the building onto surroundings can be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. The building will be designed to comply with the ENCG sound level limits. It is recommended a stationary noise study be conducted once mechanical plans for the proposed buildings become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings on surrounding noise-sensitive areas.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Katasa Groupe + Développement to undertake a roadway traffic noise feasibility assessment in support of a Zoning By-Law Amendment (ZBA) application for the proposed residential development located at 381 Kent Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a roadway traffic noise feasibility assessment of exterior noise levels generated by local roadway traffic.

The assessment was performed on the basis of theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[1] guidelines. Noise calculations were based on architectural drawings prepared by NEUF architect(e)s provided in February 2023, 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 381 Kent Street in Ottawa; situated on the west side of a city block bounded by Gilmour Street to the northwest, Bank Street to the northeast, James Street to the southeast, and Kent Street to the southwest. Throughout this report, Kent Street is referred to as project west. The proposed development comprises a near 'Z'-shaped 10-storey mixed-use residential building, with its long axis-oriented along Kent Street.

Above two below-grade parking levels, the ground floor includes a commercial space at the northwest corner, residential main entrances to the north and south, and residential units throughout the remainder of the level. An outdoor amenity area is situated to the west, near the southwest corner of the subject site and walkways are provided along the east and west elevations of the proposed development. Access to below-grade parking is provided by a ramp at the northeast corner from Gilmour Street. Levels 2-9 are reserved for residential use. At Level 3, the building extends from the west elevation, near the northwest corner of the building. The building steps back from the west, north, and east elevations of the northern short-axis and from the east, south, and west elevations of the southern short-axis of the building at Levels

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

3 and 8. Level 10 is served by a potential amenity terrace which encompasses a central area reserved for indoor amenities.

Stationary noise impacts from surroundings onto the environment are expected to be minimal as the site is not in close proximity to any large mechanical equipment or industrial sites.

Stationary noise impacts from the building onto surroundings can be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. The building will be designed to comply with the ENCG sound level limits. It is recommended a stationary noise study be conducted once mechanical plans for the proposed buildings become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings on surrounding noise-sensitive areas.

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) explore potential noise mitigation where required.

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 is 45 and 40 dBA for, living rooms, and sleeping quarters, respectively, as listed in Table 1. Based on Gradient Wind's experience, more comfortable indoor noise levels should be targeted, towards 42, and 37 dBA, respectively, to control peak noise and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [2]

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[3]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[4]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation

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

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[5].

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. As per NPC-300 guidelines, Privately Owned Public Space (POPS), are typically not identified as noise sensitive spaces as they are not "intended and designed for the quiet enjoyment of the outdoor environment"[6].

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.
- The day/night split for all streets was taken to be 92%/10%, 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.
- For select receptors, the proposed building and surrounding existing buildings were considered as noise barriers partially obstructing exposure to the roadway.
- Noise receptors were strategically placed at 7 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figure A1.

[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part A5

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 Volume
Kent Street	2-Lane Urban Arterial (2-UAU)	50	**15,000**
Bank Street	2-Lane Urban Arterial (2-UAU)	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.

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade/Roof (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	26.0	POW – Level 9 West Façade	68	61
2	26.0	POW – Level 9 West Façade	66	58
3	26.0	POW – Level 9 South Façade	62	54
4	26.0	POW – Level 9 East Façade	41	34
5	26.0	POW – Level 9 North Façade	62	54
6	29.5	POW – Level 10 West Façade	48	40
7	29.5	OLA – Potential Level 10 Outdoor Amenity Area	44	N/A*

*OLA noise levels during the nighttime are not considered as per ENCG

The results of the current analysis indicate that noise levels will range between 41 and 68 dBA during the daytime period (07:00-23:00) and between 34 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (67 dBA) occurs at the west façade, which is nearest and most exposed to Kent Street.

6. CONCLUSIONS AND RECOMMENDATIONS

The noise levels predicted due to roadway traffic exceed the criteria listed in ENCG for building components, therefore, upgraded building components will be required A. Due to the limited information available at the time of the study, which was prepared for a ZBA application, detailed STC calculations could not be performed at this time. A detailed review of the window and wall assemblies should be performed by a qualified engineer with expertise in acoustics during the detailed design stage of the building.

Results of the calculations also indicate that the building will require central air conditioning, or a similar ventilation system, due to roadway traffic noise. This will allow occupants to keep windows closed and maintain a comfortable living environment. This will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause Type D will also be required on all Lease, Purchase and Sale Agreements:

Type D:

> *"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

The results also indicate that if the Level 10 rooftop terrace is used as an amenity space, acoustic mitigation will not be required as noise levels are below 55 dBA. Furthermore, a detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

Stationary noise impacts from surroundings onto the environment are expected to be minimal as the site is not in close proximity to any large mechanical equipment or industrial sites.

Stationary noise impacts from the building onto surroundings can be minimized by judicious selection and placement of the equipment. Where necessary, noise screens and silencers can be placed into the design. The building will be designed to comply with the ENCG sound level limits. It is recommended a stationary noise study be conducted once mechanical plans for the proposed buildings become available. This study would assess impacts of stationary noise from rooftop mechanical units serving the proposed buildings on surrounding noise-sensitive areas.

This concludes our roadway 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.

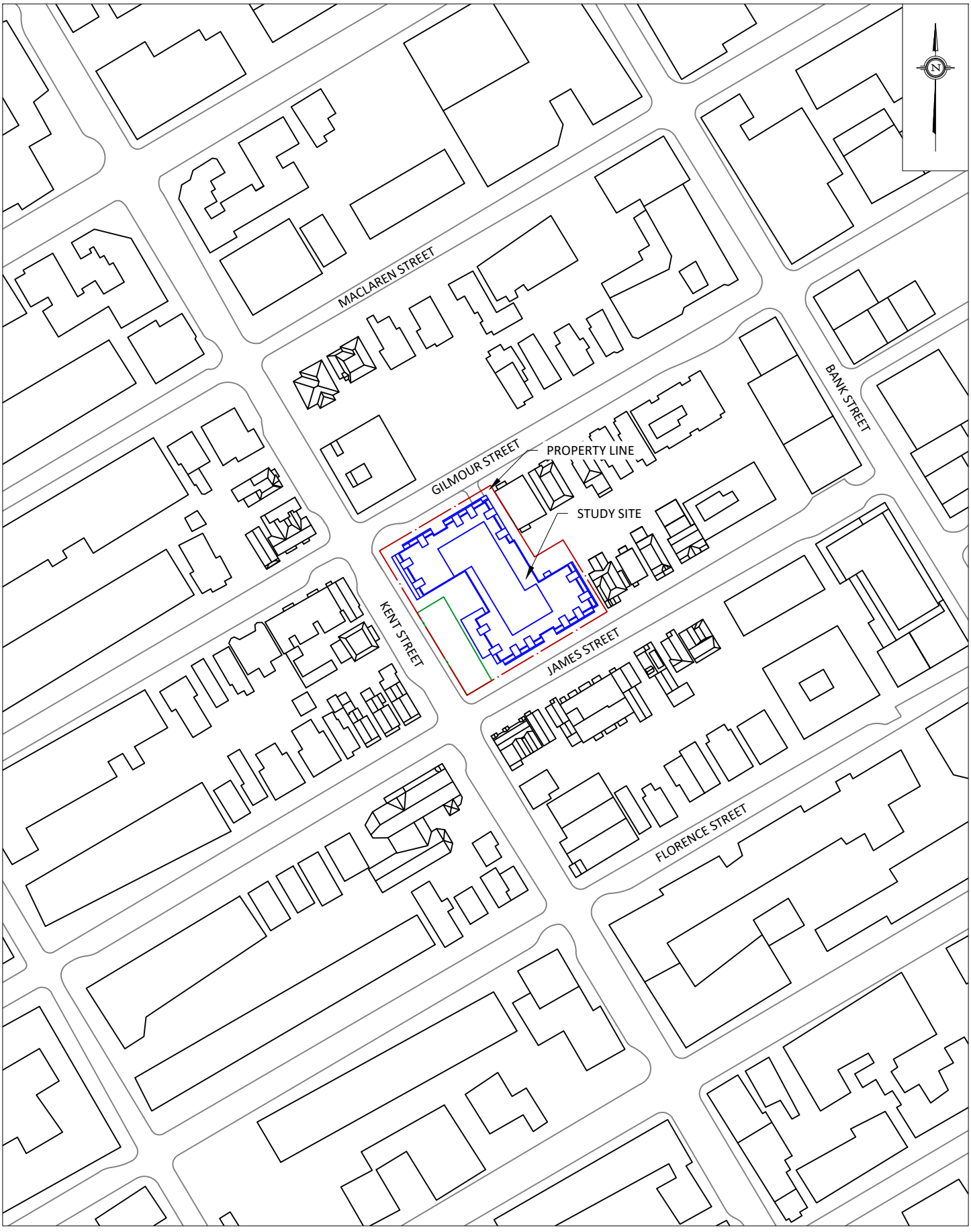
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File 21-429-Traffic Noise Feasibility



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PROJECT	381 KENT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-429-1
DATE	MARCH 15, 2023
DRAWN BY	E.A.
DESCRIPTION	FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	381 KENT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO. GW21-429-2	FIGURE 2: RECEPTOR LOCATIONS
DATE	MARCH 15, 2023	DRAWN BY E.A.	

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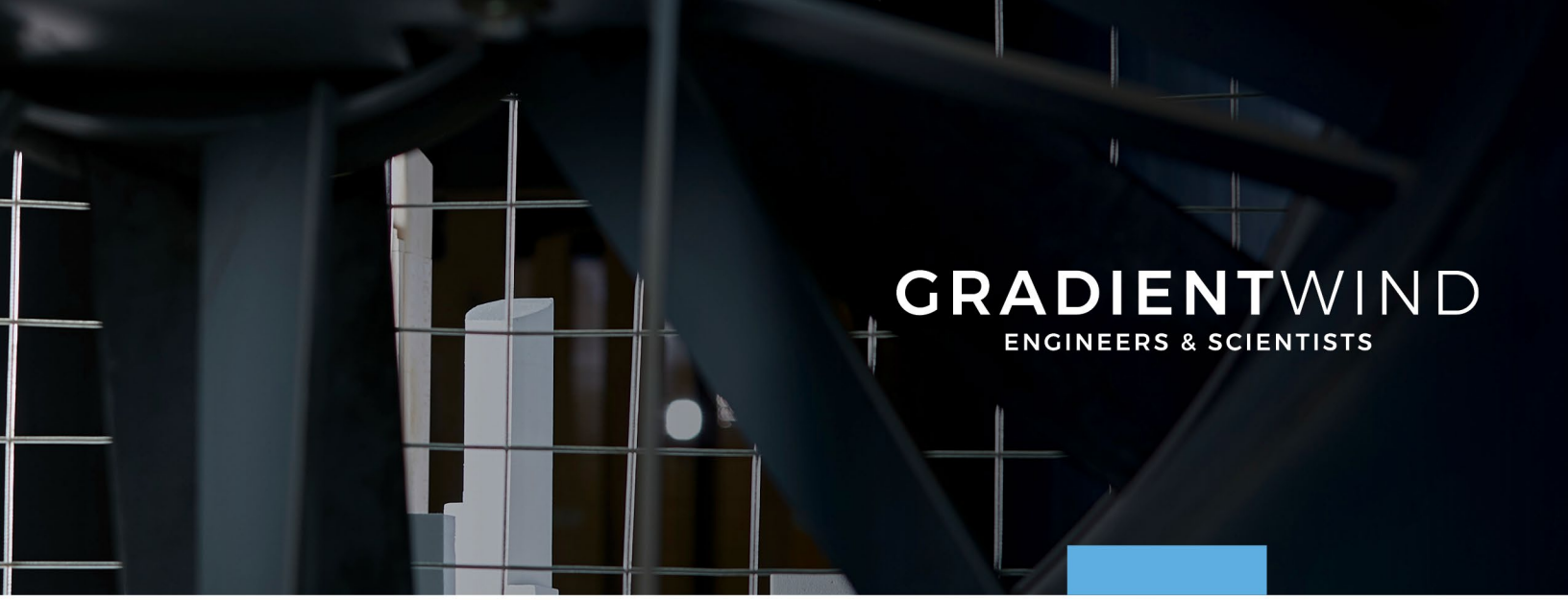
PROJECT	381 KENT STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-429-3
DATE	MARCH 15, 2023
DRAWN BY	E.A.

DESCRIPTION

FIGURE 3:
STAMSON PARAMETERS



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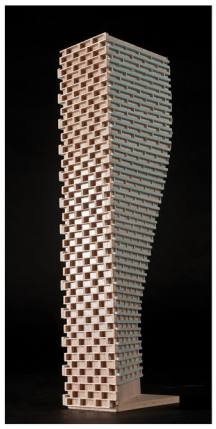

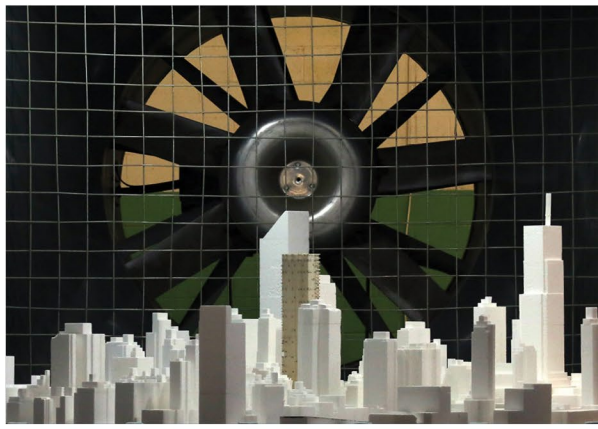

APPENDIX A
STAMSON CALCULATIONS

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

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 14:19:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Kent (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: Kent (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           :  26.00 / 26.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Kent (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: Kent (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: 16-03-2023 16:06:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Kent (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: Kent (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  :  27.00 / 27.00  m
Receiver height           :  26.00 / 26.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 65.93 + 0.00) = 65.93 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  -2.55   0.00   0.00   0.00   0.00
65.93
-------------------------------------------------------------------------------
--
```

```
Segment Leq : 65.93 dBA

Total Leq All Segments: 65.93 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.33 + 0.00) = 58.33 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  -2.55   0.00   0.00   0.00   0.00
58.33
-------------------------------------------------------------------------
--

Segment Leq : 58.33 dBA

Total Leq All Segments: 58.33 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.93
                           (NIGHT): 58.33
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 14:20:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Kent (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: Kent (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  :  33.00 / 33.00  m
Receiver height           :  26.00 / 26.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -40.00 deg
Barrier height            :   6.00 m
Barrier receiver distance :  25.00 / 25.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Kent (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 !       26.00 !        7.44 !         7.44

ROAD (0.00 + 59.49 + 58.52) = 62.05 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -40   0.00  68.48   0.00  -3.42  -5.56   0.00   0.00  -2.10
57.40*
   -90    -40   0.00  68.48   0.00  -3.42  -5.56   0.00   0.00   0.00
59.49
-------------------------------------------------------------------------
--
   -40      0   0.00  68.48   0.00  -3.42  -6.53   0.00   0.00   0.00
58.52
-------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 62.05 dBA

Total Leq All Segments: 62.05 dBA


Results segment # 1: Kent (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 !       26.00 !        7.44 !         7.44

ROAD (0.00 + 51.90 + 50.93) = 54.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -40   0.00  60.88   0.00  -3.42  -5.56   0.00   0.00  -2.10
49.80*
   -90    -40   0.00  60.88   0.00  -3.42  -5.56   0.00   0.00   0.00
51.90
-------------------------------------------------------------------------
--
```

```
   -40       0    0.00   60.88    0.00   -3.42   -6.53    0.00    0.00    0.00
50.93
-------------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 54.45 dBA

Total Leq All Segments: 54.45 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 62.05
                           (NIGHT): 54.45
```

```
STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 14:21:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Bank (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: Bank (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  : 127.00 / 127.00 m
Receiver height           :  26.00 / 26.00  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.00 m
Barrier receiver distance : 118.00 / 118.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Bank (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 !       26.00 !        3.23 !         3.23

ROAD (0.00 + 41.21 + 0.00) = 41.21 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  -9.28   0.00   0.00   0.00 -18.00
41.21
-------------------------------------------------------------------------------
--

Segment Leq : 41.21 dBA

Total Leq All Segments: 41.21 dBA


Results segment # 1: Bank (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 !       26.00 !        3.23 !         3.23

ROAD (0.00 + 33.61 + 0.00) = 33.61 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  -9.28   0.00   0.00   0.00 -18.00
33.61
-------------------------------------------------------------------------------
--

Segment Leq : 33.61 dBA

Total Leq All Segments: 33.61 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 41.21
                           (NIGHT): 33.61
```

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STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 14:24:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Kent Street (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: Kent Street (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  :  28.00 / 28.00  m
Receiver height           :  29.50 / 29.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  28.20 m
Barrier receiver distance :  15.00 / 15.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: Kent Street (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 !       29.50 !       14.50 !        14.50

ROAD (0.00 + 47.85 + 0.00) = 47.85 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  -2.71   0.00   0.00   0.00 -17.92
47.85
-------------------------------------------------------------------------------
--

Segment Leq : 47.85 dBA

Total Leq All Segments: 47.85 dBA


Results segment # 1: Kent Street (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 !       29.50 !       14.50 !        14.50

ROAD (0.00 + 40.25 + 0.00) = 40.25 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  -2.71   0.00   0.00   0.00 -17.92
40.25
-------------------------------------------------------------------------------
--

Segment Leq : 40.25 dBA

Total Leq All Segments: 40.25 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 47.85
                           (NIGHT): 40.25
```

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STAMSON 5.0        NORMAL REPORT        Date: 15-03-2023 14:24:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Kent Street (day/night)
----------------------------------------------
Car traffic volume  :  1600/800   veh/TimePeriod
Medium truck volume :   320/160   veh/TimePeriod
Heavy truck volume  :   160/80    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Kent Street (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  :  22.00 / 22.00  m
Receiver height           :  29.50 / 28.20  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  28.20 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: Kent Street (day)
--------------------------------------

Source height = 1.67 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.67 !       29.50 !       18.11 !        18.11

ROAD (0.00 + 43.54 + 0.00) = 43.54 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
```

```
   -90     90   0.00  62.18   0.00  -1.66   0.00   0.00   0.00 -16.98
43.54
-------------------------------------------------------------------------
--

Segment Leq : 43.54 dBA

Total Leq All Segments: 43.54 dBA


Results segment # 1: Kent Street (night)
----------------------------------------

Source height = 1.67 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.67 !       28.20 !       17.34 !        17.34

ROAD (0.00 + 43.02 + 0.00) = 43.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.00  62.18   0.00  -1.66   0.00   0.00   0.00 -17.50
43.02
-------------------------------------------------------------------------
--

Segment Leq : 43.02 dBA

Total Leq All Segments: 43.02 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 43.54
                           (NIGHT): 43.02
```