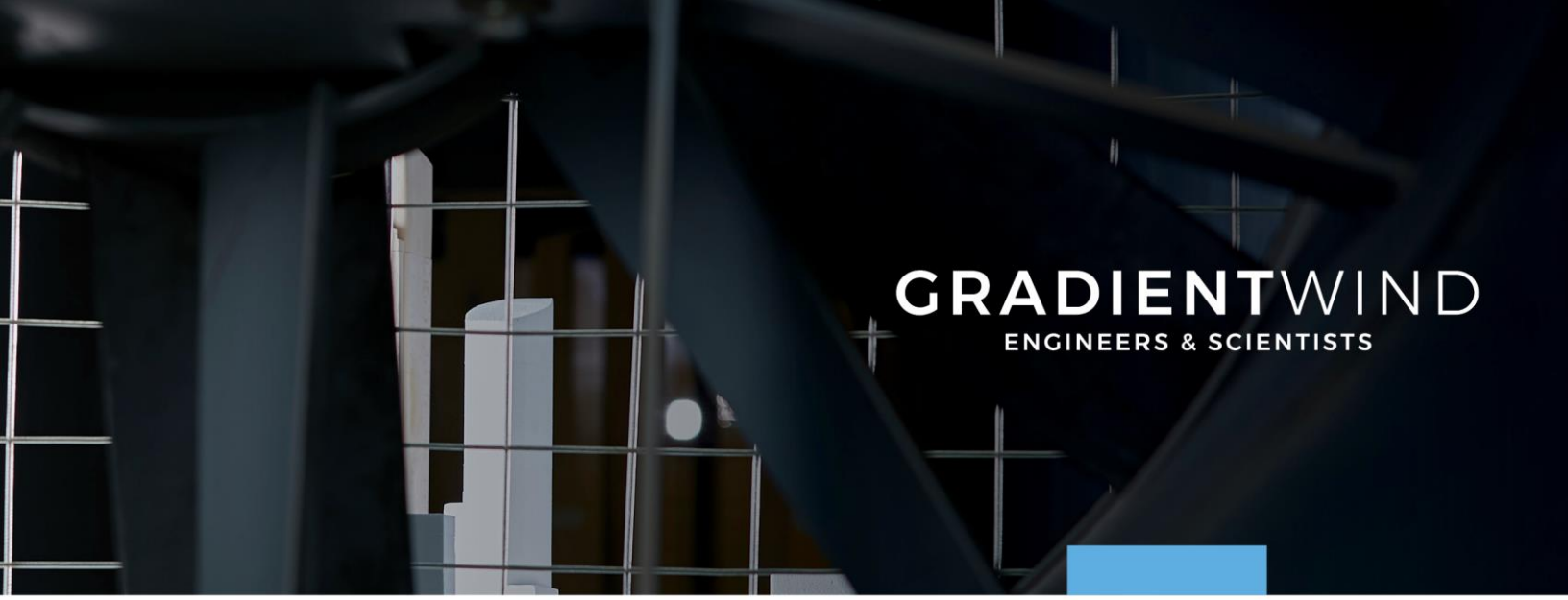
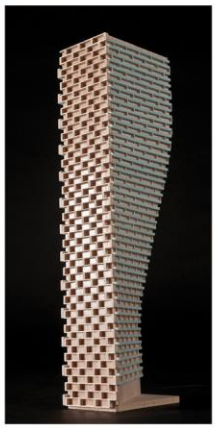


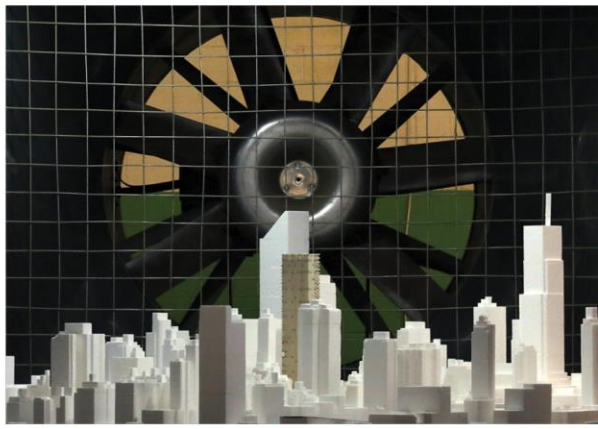
GRADIENTWIND
ENGINEERS & SCIENTISTS

Roadway Traffic Noise Assessment

357-363 Preston Street
Ottawa, Ontario

Report: 22-300 Traffic Noise





October 24, 2022

PREPARED FOR

Woodman Architect & Associates Ltd.
4 Beechwood Ave, Unit 201
Ottawa, ON K1L 8L9

PREPARED BY

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

EXECUTIVE SUMMARY

This report describes a traffic noise assessment for a proposed 6-storey development located at 357-363 Preston Street in Ottawa, Ontario. The primary sources of roadway traffic noise are Preston Street and the TransCanada Highway/ Queensway. As the study site is further than 75 m away from any rail line, ground vibration impacts are not significant. This report also provides commentary on stationary noise impacts from existing surrounding buildings and impacts of the proposed mechanical systems on the surroundings and the development itself. Figure 1 illustrates the site location with the 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 provided by Woodman Architect & Associates, dated September 1st, 2022.

The results of the current analysis indicate that noise levels will range between 58 and 69 dBA during the daytime period (07:00-23:00) and between 50 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (69 dBA) occurs at the west façade which is nearest and most exposed to Preston Street. Upgraded building components with a higher Sound Transmission Class (STC) will be required where exterior noise exceeds 65 dBA, as detailed in Table 4 and Figure 3. The noise level at the rooftop amenity area does not exceed ENCG criteria, therefore requiring no acoustic mitigation.

Results of the calculations also indicate that the proposed development will require central air conditioning, or a similar mechanical system, which will allow occupants to keep windows closed and maintain a comfortable living/working environment. A Type D Warning Clause[1] will also be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

[1] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 8

With regards to on-site stationary noise impacts, Gradient Wind conducted a survey of the site using aerial imagery and no significant off-site sources of stationary noise were identified. There are several small rooftop units however, this will be sufficiently attenuated by the setback distances to the study site. The rooftop equipment associated with the property at 343 Preston Street is expected to have little exposure to the study site.

In addition, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Woodman Architect & Associates Ltd. to undertake a traffic noise study in support of a Site Plan Control (SPC) application for the proposed development located at 357-363 Preston Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic and provide commentary on stationary sources.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on architectural drawings provided by Woodman Architect & Associates, dated September 1st, 2022, with future vehicular traffic volumes corresponding to roadway classifications, roadway traffic count data and theoretical roadway capacities.

2. TERMS OF REFERENCE

The focus of this traffic noise assessment is a proposed 6-storey residential development located at 357-363 Preston Street in Ottawa, Ontario. The study site is bounded by Aberdeen Street to the north, Preston Street to the west, Beech Street to the south, and a parking lot to the east. The relevant sources of traffic noise considered in this study are Preston Street to the east and Highway 417/Queensway 200 metres to the north of the study site. As the site is further than 100 m away from the future O-train Line 2, noise and vibration impacts are not deemed significant.

The basement of the development contains 9 parking spaces, lockers, storage space and bike racks. At grade, the south and east corners of the floorplan are occupied by a space dedicated to a bank. The lobby and other residential service rooms are present at the northwest corner. Level 2 has a second space dedicated to the bank, with the rest of the floorplan occupied by residential units. Levels 3 to 6 are occupied entirely by residential units, with private terraces east of the site at Level 4 and west of the site

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

at Level 5. The building is topped with a mechanical room, existing adjacent to a canopy-covered outdoor amenity area.

With regards to on-site stationary noise impacts, Gradient Wind conducted a survey of the site using aerial imagery and no significant off-site sources of stationary noise were identified. There are several small rooftop units however, this will be sufficiently attenuated by the setback distances to the study site. The rooftop equipment associated with the property at 343 Preston Street is expected to have little exposure to the study site.

In addition, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment have been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the Ministry of Environment, Conservation and Parks (MECP) NPC-300 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 vehicle traffic, 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 NPC-300 guidelines specify that the recommended indoor noise limit range (that is relevant to this study) is 50, 45. and 40 dBA for retail, residence living rooms and sleeping quarters respectively, as listed in Table 1. However, to account for deficiencies in building construction and to control peak noise, these levels should be targeted toward 45, 42 and 37 dBA.

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

Type of Space	Time Period	L_{eq} (dBA)
		Road
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
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 - 07:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of residences, nursing/retirement homes, etc.	07:00 - 23:00	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]. 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[5].

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit, between 55 dBA and 60 dBA, is acceptable only in cases where the required noise control measures are not feasible for technical, economic or administrative reasons. Noise levels at OLA

[3] Adapted from Table C-2, Part C, Section 3.2.3 of NPC-300
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3
[6] Ontario Ministry of Transportation provincial highways traffic volume sheet
[7] Toronto 24hr Traffic Volume Count

must not exceed 60 dBA in all cases. Terraces or balconies extending more than 4m are considered as OLAs. For this development, the rooftop amenity terrace is the only OLA identified.

4.2.2 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 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 Class	Speed Limit (km/h)	Traffic Volumes
Preston Street	2-Lane Urban Arterial Undivided	50	**15,000**
Trans-Canada Highway/Queensway	8-Lane Highway	100	**146,664**

4.2.3 Theoretical Roadway Traffic 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 a separate line source of noise, and by using proposed and existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks.
- The daytime and night volume split was assumed to be 92% daytime and 10% nighttime.
- Reflective intermediate ground surfaces were assumed for paved ground.
- POW receptor heights were placed at 18.1 m for Level 6.

- OLA receptors were placed at the rooftop outdoor amenity space.
- The study site was treated as having gently sloping topography
- Noise receptors were strategically placed at 5 locations around the study area, as illustrated in Figure 2.

4.2.4 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[6] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[7], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor

[6] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[7] CMHC, Road & Rail Noise: Effects on Housing

layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. The results indicate that Plane of Window noise levels will range between 58 and 69 dBA during the daytime period (07:00-23:00) and between 50 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (69 dBA) occurs at the west façade which is nearest and most exposed to Preston Street.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Roadway Noise Level (dBA)	
			Day	Night
1	18.1	POW – Level 6 West Façade	69	61
2	18.1	POW – Level 6 North Façade	64	57
3	18.1	POW – Level 6 South Façade	64	57
4	21.2	OLA – Rooftop Amenity	48	N/A*
5	18.1	POW – Level 6 East Façade	58	50

* OLA Nighttime noise levels are not considered, as per the ENCG.

5.1.1 Noise Control Measures

The noise level on the west façade predicted due to traffic noise exceeds the criteria listed in Section 4.2 for building components for the development. As discussed in Section 4.2, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per NPC-300 and ENCG requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 3).

TABLE 4: NOISE CONTROL REQUIREMENTS

Façade	Window STC (Bedroom/Living Room/Retail)	Exterior Wall Minimum STC
West	32/27/25	45

The results of the calculations also indicate that the development should be designed with central air conditioning or a similar system, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Type D Warning Clause should be used in all Lease, Purchase and Sale Agreements of the building's units, as summarized in section 6.

The noise level at the rooftop amenity does not exceed the ENCG 55dBA criterion. Therefore, no acoustic mitigation will be required for this area.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the roadway traffic noise calculations indicate that Plane of Window noise levels will range between 58 and 69 dBA during the daytime period (07:00-23:00) and between 50 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (69 dBA) occurs at the north façade which is nearest and most exposed to Preston Street. Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The STC requirements can be seen in Table 4 as well as in Figure 3. As the noise level does not exceed limits for the rooftop amenity area, no acoustic mitigation will be required.

Results of the calculations also indicate that the proposed building will require central air conditioning, or a similar mechanical system, which will allow occupants to keep windows closed and maintain a comfortable living/working environment. The following Type D Warning Clause[8] will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

[8] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 8

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."*

With regards to on-site stationary noise impacts, Gradient Wind conducted a survey of the site using aerial imagery and no significant off-site sources of stationary noise were identified. There are several small rooftop units however, this will be sufficiently attenuated by the setback distances to the study site. The rooftop equipment associated with the property at 343 Preston Street is expected to have little exposure to the study site.

In addition, the stationary noise impacts of the building on the surroundings would be considered at a future stage once the mechanical design has progressed and equipment has been selected. Stationary noise sources associated with the development could include rooftop air handling units, cooling towers or dry coolers, and emergency generators. Should noise levels from these units exceed the criteria established in NPC-300, noise from these sources can be controlled to acceptable limits by judicious selection of the equipment, locating the equipment on a high roof away from nearby residential receptors, and where necessary, installing silencers or noise screens.

This concludes our environmental 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.

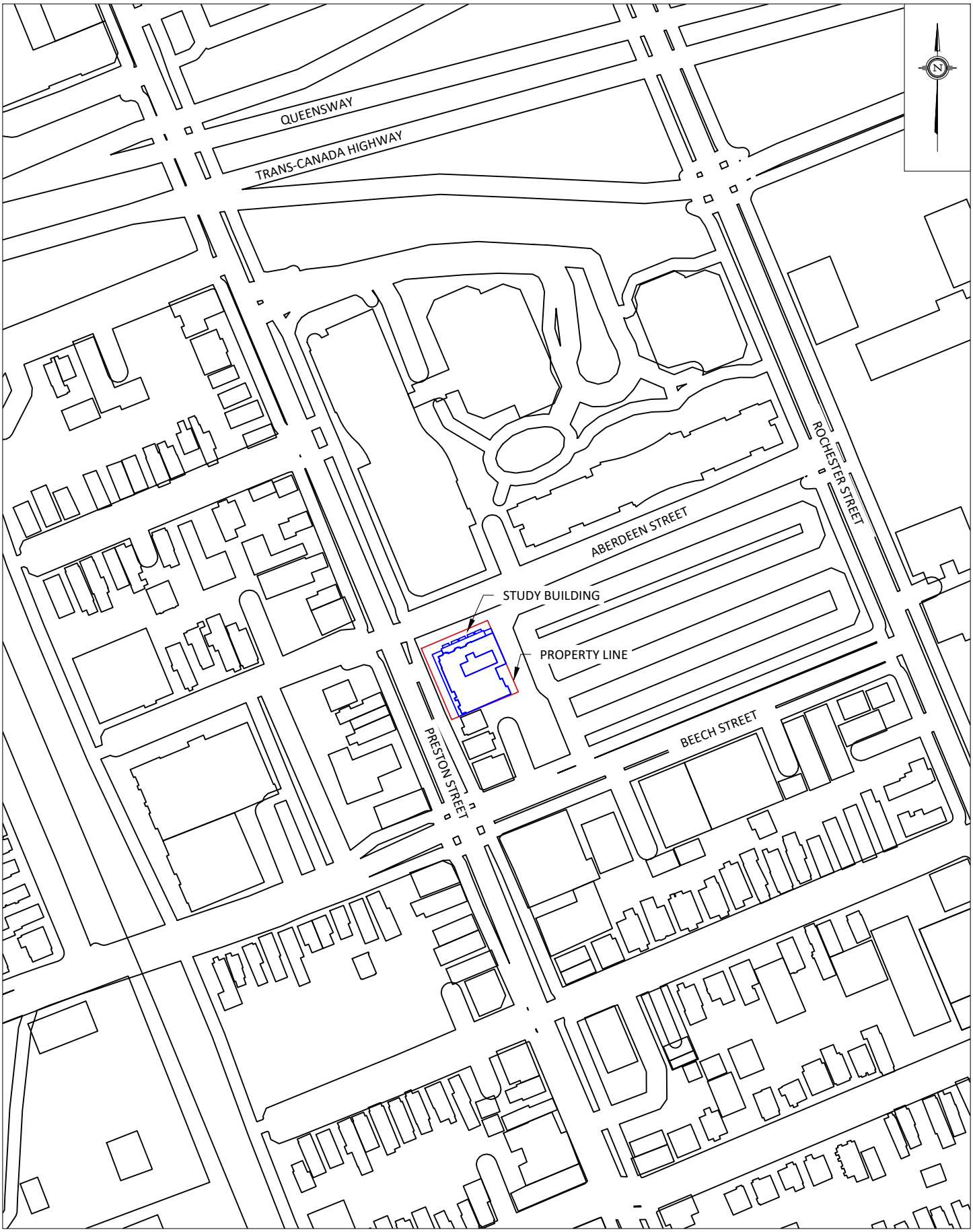
Sincerely,

Gradient Wind Engineering Inc.

Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #22-300 – Traffic Noise



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PROJECT	357-363 PRESTON STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW22-300-1
DATE	OCTOBER 13, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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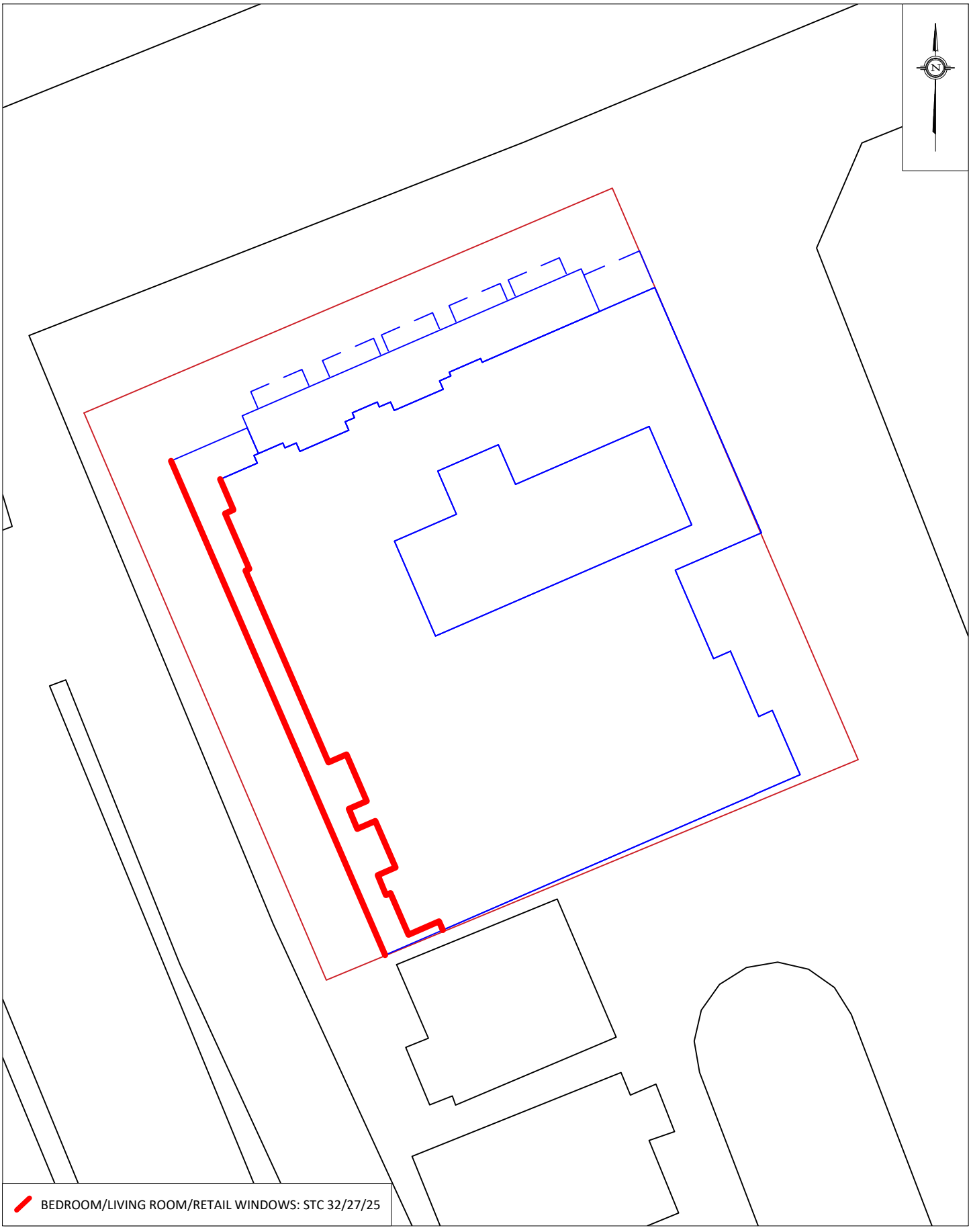
SCALE	1:400 (APPROX.)
DRAWING NO.	GW22-300-2
DATE	OCTOBER 13, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 2:
SITE PLAN AND SURROUNDING CONTEXT



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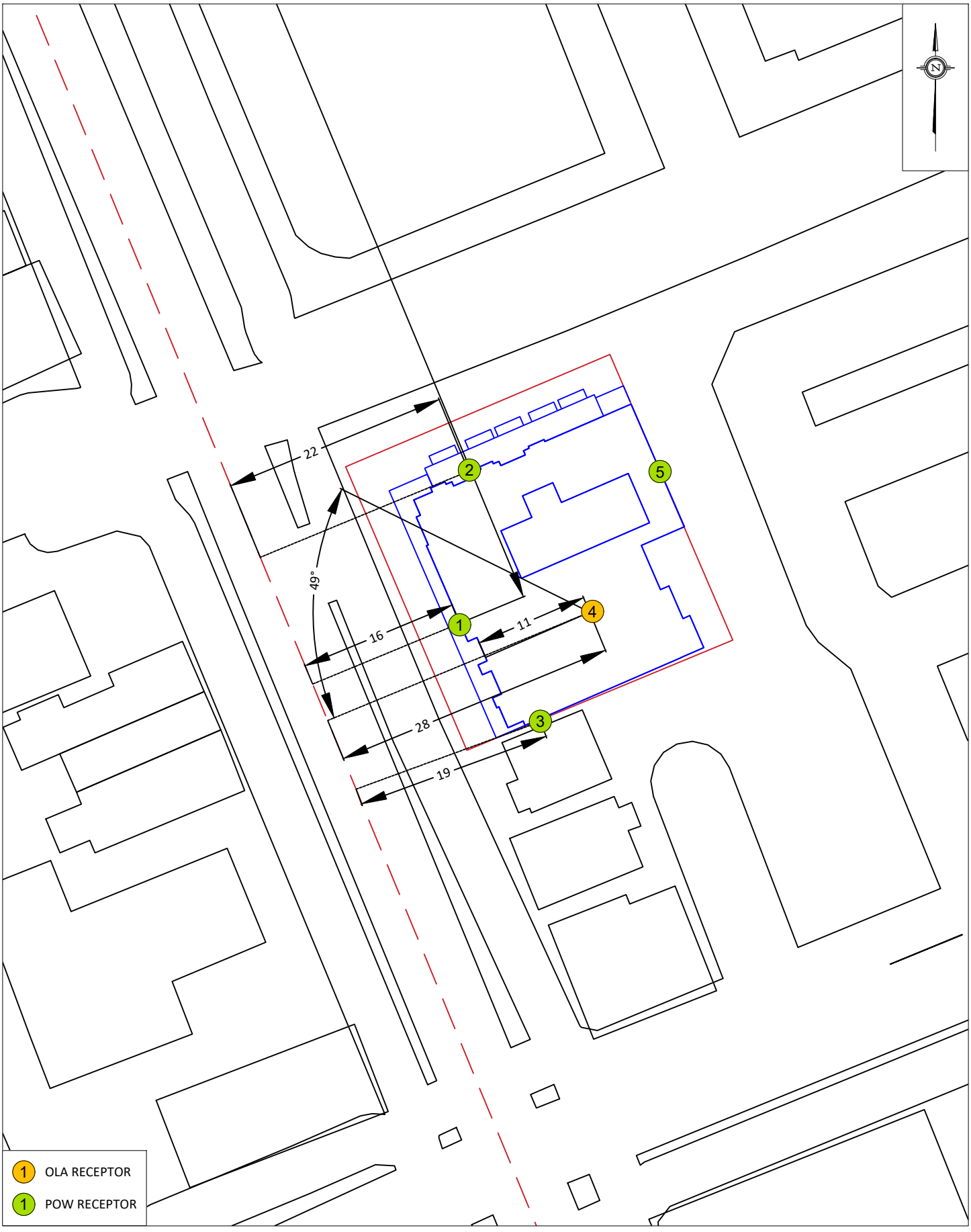
PROJECT	357-363 PRESTON STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:400 (APPROX.)	DRAWING NO.	GW22-300-3
DATE	OCTOBER 13, 2022	DRAWN BY	E.A.

FIGURE 3:
STC RECOMMENDATIONS



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PROJECT	357-363 PRESTON STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:200 (APPROX.)	DRAWING NO.	GW22-300-4
DATE	OCTOBER 13, 2022	DRAWN BY	E.A.

FIGURE 4:
STAMSON PARAMETERS (1)

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PROJECT	357-363 PRESTON STREET, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW22-300-5
DATE	OCTOBER 13, 2022
DRAWN BY	E.A.

DESCRIPTION

FIGURE 5:
STAMSON PARAMETERS (2)

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: 13-10-2022 11:44:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (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: Preston (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  :  16.00 / 16.00  m
Receiver height           :  18.10 / 18.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Road data, segment # 2: HWY 417 (day/night)
-------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: HWY 417 (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  : 223.00 / 223.00 m
Receiver height           :  18.10 / 18.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  10.00 m
Barrier receiver distance : 182.00 / 182.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 68.20 + 0.00) = 68.20 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  -0.28   0.00   0.00   0.00   0.00  68.20
-------------------------------------------------------------------------------

Segment Leq : 68.20 dBA


Results segment # 2: HWY 417 (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 !       18.10 !        4.55 !         4.55

ROAD (0.00 + 58.70 + 0.00) = 58.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  84.41   0.00 -11.72  -3.01   0.00   0.00 -10.97  58.70
-------------------------------------------------------------------------------

Segment Leq : 58.70 dBA

Total Leq All Segments: 68.66 dBA
```

```
Results segment # 1: Preston (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.60 + 0.00) = 60.60 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  -0.28   0.00   0.00   0.00   0.00  60.60
-------------------------------------------------------------------------------

Segment Leq : 60.60 dBA


Results segment # 2: HWY 417 (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 !       18.10 !        4.55 !         4.55

ROAD (0.00 + 51.11 + 0.00) = 51.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  76.81   0.00 -11.72  -3.01   0.00   0.00 -10.97  51.11
-------------------------------------------------------------------------------

Segment Leq : 51.11 dBA

Total Leq All Segments: 61.06 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 68.66
                           (NIGHT): 61.06
```

```
STAMSON 5.0         NORMAL REPORT         Date: 13-10-2022 11:44:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston St (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: Preston St (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  :  22.00 / 22.00  m
Receiver height           :  18.10 / 18.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: HWY 417 (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  :   100 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 2: HWY 417 (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  : 208.00 / 208.00 m
Receiver height           :  18.10 / 18.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  10.00 m
Barrier receiver distance : 135.00 / 135.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00


Results segment # 1: Preston St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.81 + 0.00) = 63.81 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  -1.66  -3.01   0.00   0.00   0.00  63.81
-------------------------------------------------------------------------------

Segment Leq : 63.81 dBA
```

```
Results segment # 2: HWY 417 (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 !       18.10 !        7.43 !         7.43

ROAD (0.00 + 49.84 + 0.00) = 49.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.08   0.00 -11.42   0.00   0.00   0.00  -6.82  49.84
-------------------------------------------------------------------------------

Segment Leq : 49.84 dBA

Total Leq All Segments: 63.98 dBA


Results segment # 1: Preston St (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.21 + 0.00) = 56.21 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  -1.66  -3.01   0.00   0.00   0.00  56.21
-------------------------------------------------------------------------------

Segment Leq : 56.21 dBA
```

```
Results segment # 2: HWY 417 (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 !       18.10 !        7.43 !         7.43

ROAD (0.00 + 49.84 + 0.00) = 49.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  68.08   0.00 -11.42   0.00   0.00   0.00  -6.82  49.84
-------------------------------------------------------------------------------

Segment Leq : 49.84 dBA

Total Leq All Segments: 57.11 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 63.98
                           (NIGHT): 57.11
```

```
STAMSON 5.0         NORMAL REPORT         Date: 13-10-2022 11:45:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (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: Preston (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  :  19.00 / 19.00  m
Receiver height           :  18.10 / 18.10  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 64.44 + 0.00) = 64.44 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  -1.03  -3.01   0.00   0.00   0.00  64.44
-------------------------------------------------------------------------------

Segment Leq : 64.44 dBA

Total Leq All Segments: 64.44 dBA
```

```
Results segment # 1: Preston (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.85 + 0.00) = 56.85 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  -1.03  -3.01   0.00   0.00   0.00  56.85
-------------------------------------------------------------------------------

Segment Leq : 56.85 dBA

Total Leq All Segments: 56.85 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 64.44
                           (NIGHT): 56.85
```

```
STAMSON 5.0         NORMAL REPORT         Date: 13-10-2022 11:45:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Preston (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: Preston (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   49.00 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           :  21.10 / 21.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 49.00 deg
Barrier height            :  19.70 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
```

```
Results segment # 1: Preston (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 !       21.10 !       13.40 !        13.40

ROAD (0.00 + 48.07 + 0.00) = 48.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     49   0.00  68.48   0.00  -2.71  -1.12   0.00   0.00 -16.58  48.07
-------------------------------------------------------------------------------

Segment Leq : 48.07 dBA

Total Leq All Segments: 48.07 dBA


Results segment # 1: Preston (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 !       21.10 !       13.40 !        13.40

ROAD (0.00 + 40.47 + 0.00) = 40.47 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     49   0.00  60.88   0.00  -2.71  -1.12   0.00   0.00 -16.58  40.47
-------------------------------------------------------------------------------

Segment Leq : 40.47 dBA

Total Leq All Segments: 40.47 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 48.07
                           (NIGHT): 40.47
```

```
STAMSON 5.0         NORMAL REPORT         Date: 13-10-2022 11:42:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: HWY 417 (day/night)
-------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: HWY 417 (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  : 213.00 / 213.00 m
Receiver height           :  18.10 / 18.10  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 90.00 deg
Barrier height            :  15.00 m
Barrier receiver distance : 143.00 / 143.00 m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: HWY 417 (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 !       18.10 !        6.95 !         6.95

ROAD (0.00 + 57.56 + 0.00) = 57.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  84.41   0.00 -11.52  -3.01   0.00   0.00 -12.31  57.56
-------------------------------------------------------------------------------

Segment Leq : 57.56 dBA

Total Leq All Segments: 57.56 dBA


Results segment # 1: HWY 417 (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 !       18.10 !        6.95 !         6.95

ROAD (0.00 + 49.96 + 0.00) = 49.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     90   0.00  76.81   0.00 -11.52  -3.01   0.00   0.00 -12.31  49.96
-------------------------------------------------------------------------------

Segment Leq : 49.96 dBA

Total Leq All Segments: 49.96 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 57.56
                           (NIGHT): 49.96
```