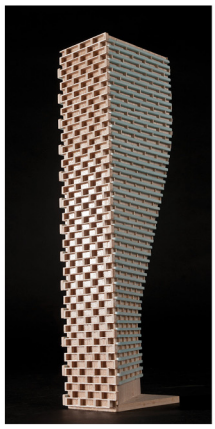
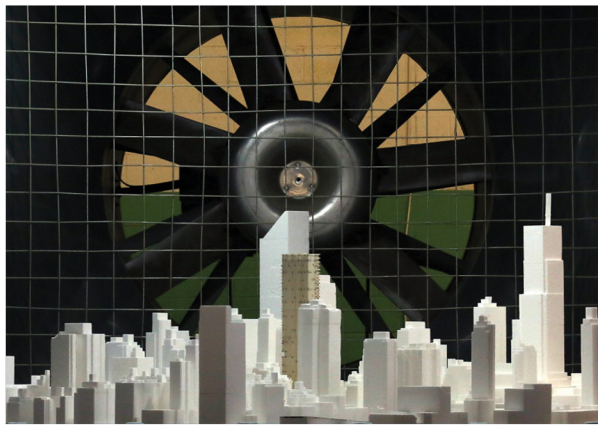
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRAFFIC NOISE ASSESSMENT

2983 Navan Road
Ottawa, Ontario

REPORT: GW23-273-Environmental Noise





December 8th, 2023

PREPARED FOR
12714001 Canada Inc.
768 Boulevard St-Joseph, Bureau 100
Gatineau, QC, J8Y 4B8

PREPARED BY
Adam Bonello, B. Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes an environmental noise assessment performed for the proposed mixed-use development, located 2983 Navan Road in Ottawa, Ontario. The proposed development comprises of six condominiums, ten townhouse blocks. To the west of the site is a proposed gas station with retail space, subject to a separate site plan control application. The major sources of noise in the area are Navan Road, Brian Coburn Blvd, and Renaud Road; and proposed future Blackburn Hamlet Bypass Extension, and bus rapid transit (Cumberland Transitway). Figure 1 illustrates a complete site plan with surrounding context.

The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa and Ministry of the Environment, Conservation and Parks (MECP) NPC-300 guidelines, the site plan prepared by PMA Architects and Lapalme Rheault Architects dated June 2023, with future roadway traffic volumes corresponding with the City of Ottawa's Official Plan (OP) roadway classifications and Environmental Noise Control Guidelines

The results of the current analysis indicate that noise levels will range between 44 and 70 dBA during the daytime period (07:00-23:00) and between 37 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs along the North façade of Condo B which is most exposed to Brian Coburn Blvd. and the planned Cumberland Transitway. At all outdoor living areas (OLA) noise levels were found to below or equal to 60 dBA therefore no noise screens or barriers are required.

Table E1 above outlines the required noise control measures required for the development. The following warning clauses will be applied to purchase, sale and lease agreements to the specified buildings indicated in Tabel E1. Draft language for each warning clause can be found in Section 6:

TABLE E1: NOISE CONTROL REQUIREMENTS

Building	Façade	Window STC	Exterior Wall STC	Warning Clauses	Ventilation
Condo A, B, C, D	North, East, West	35	45	Type D	Air Conditioning
Condo E, F	N/A	OBC	OBC	Type D	Air Conditioning
Townhouse 1	North, East, West	35	45	Type D	Air Conditioning
Townhouse 2 to 6	N/A	OBC	OBC	Type C	Forced Air /w provisions for AC
Townhouse 8 to 11	N/A	OBC	OBC	Type C & A	Forced Air /w provisions for AC

Gradient Wind investigated the potential stationary noise impacts from proposed gas station / retail space, Chapel Hill Park and Ride, and Transit Station. The proposed gas station will be designed to comply with ENCG sound level limits, as per the stationary noise report prepared by Gradient Wind (ref. Gradient File #23-204, Stationary Noise Assessment 2983 Navan Road, dated August 25, 2023). As per the Environmental Assessment Report for the Brian Coburn Boulevard Extension / Cumberland Transitway Westerly (ref Gradient Wind File # 17-123, Air Quality, Noise & Vibration Impact Assessment, dated November 10, 2021), stationary noise impacts from the proposed Chapel Hill Park and Ride and Transitway Station will fall below the ENCG sound level limits. No other significant sources of stationary noise were identified in the area. . Based on the findings of the analysis, the proposed development is expected to be compatible with existing and proposed stationary sources in the area.

Regarding the impacts of the development on its surroundings and itself, stationary noise impacts can be minimized by judicious selection of mechanical equipment, and placing equipment away from sensitive areas such as on a high roof. The buildings will be designed to comply with the ENCG Sound Level Limits and City of Ottawa Noise By-Law No. 2017-255. The proposed townhouses are not anticipated to have any larger equipment associated with them, however for the condominium blocks stationary noise should be considered once the mechanical equipment is known.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 12714001 Canada Inc. to undertake a traffic noise assessment for the proposed residential development, located at 2983 Navan Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to an environmental noise assessment.

The present scope of work involves assessing exterior noise and ground vibration levels at the study site generated by the surrounding transportation sources. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP) NPC-300[2] guidelines, the site plan provided by PMA Architects and Lapalme Rheault Architects and dated June 2023, with future roadway traffic volumes corresponding with the City of Ottawa's Official Plan (OP) roadway classifications and Environmental Noise Control Guidelines.

2. TERMS OF REFERENCE

The proposed development comprises of six, 4-stoery condominium buildings , ten townhouse blocks. The condo buildings (named A through F) have rectangular floorplate. Buildings B and C will have grade level commercial and office space. Ten townhouse blocks are also proposed and will be located on Blocks 1 to 6 and 8 to 11. In the centre of the site will be a park located on Block 7. On the west side of the site is a proposed gas station, restaurant and drive thru, which are subjects of a separate site plan control application.

The main sources of noise impacting the site include Navan Road which borders the study site to the south, Brian Coburn Boulevard, which borders the study site to the north, and Renaud Road further to the south. A future extension of Brian Coburn Boulevard is planned for west of Navan Road. A future bus rapid transit system (Cumberland Transitway) is also proposed to run parallel and north of Brian Coburn Boulevard. Figure 1 illustrates a complete site plan with surrounding context.

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the study site produced by local transportation, (ii) provide appropriate noise contour measure where noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4 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 ENCG guidelines specify the recommended indoor noise limit as outlined in Table 1..

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

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, **retail** stores, etc.	07:00 – 23:00	50
Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centers, 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]. 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 roadway 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 objective sound level limit is 55 dBA during the daytime period. Where noise levels exceed 60 dBA, noise mitigation is required where technical, economic or administrative feasible. Furthermore, balconies and terraces extending less than 4m in depth from the façade do not require consideration as Outdoor Living Areas and were excluded from the analysis.

[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

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[6] 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)	Ultimate AADT	Day/Night Split	Truck Volume Percentages	
					Medium Truck	Heavy Truck
Navan Road	2-Lane Major Urban Collector	60	15,000	92/8	7	5
Brian Coburn Blvd.	2-Lane Urban Collector	70	35,000	92/8	7	5
Renaud Road	2-Lane Urban Collector	50	8,000	92/8	7	5
Cumberland Transitway	Bus	70	530	92/8	N/A	

4.2.3 Theoretical Traffic Noise Predictions

The impact of transportation noise sources on the development was determined by computer modelling. Transportation noise source modelling is based on the software program *Predictor-Lima* which utilizes the United States Federal Highway Administration's Traffic Noise Model (TNM) to represent the roadway line sources. The TNM analysis model has been recognized by the Ministry of Transportation Ontario (MTO) as the recommended noise model for transportation projects (ref. Environmental Guide for Noise, 2022

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

by the Ministry of Transportation (MTO)[7]. The Ministry of Environment, Conservation and Parks has also adopted the TMN model as per their "Draft Guideline Noise Pollution Control Publications 306 (NPC-306)[8].

A set of comparative calculations were also performed for comparisons using STAMSON. The *Predictor-Lima* computer program can represent three-dimensional surfaces and the first reflection of sound waves over a suitable spectrum for human hearing. The STAMSON model, however, is an older software and requires each receptor to be calculated separately. STAMSON also does not accurately account for building reflections, multiple screening elements, and curved road geometry. The result of the comparative calculations can be seen in Section 5

Roadway traffic noise calculations were performed by treating each roadway segment as a separate line source of noise, and by using 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:

- Vehicle parameters such as truck traffic volume percentages, posted speed limit, and day/night split are summarized in Table 2.
- Default ground surface was noted as lawn (absorbative) due to the ample vegetative surroundings.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 225locations around the study area (see Figure 2).
- For select sources where appropriate, receptors considered the proposed and existing building as a barrier partially or fully obstructing exposure to the source.

4.3 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

[7] Ministry of Transportation, Environmental Guide for Noise, 2022. Retrieved from Environmental Guide for Noise 2022
[8] Ministry of Environment, Conservation and Parks, Ontario, "Methods to determine Sound Levels Due to Road and Rail Traffic", Draft February 12, 2020

cladding, thickness, and interior finish details. For example, concrete and masonry walls can achieve STC 50 or more. Curtainwall systems typically provide around STC 35, depending on the glazing elements. 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.

According to the ENCG, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA daytime or 60 dBA nighttime, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[9] 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[10], 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, final detailed floor layouts and building elevations were unavailable and 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 + safety factor).

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

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the current analysis indicate that noise levels will range between 44 and 70dBA during the daytime period (07:00-23:00) and between 37 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs along the North façade of Condo B which is most exposed to Brian Coburn Boulevard and the planned Cumberland Transitway. Figure 4 and 5 depicts the sound level contours across the site at a height of 1.5 m, for the daytime and nighttime periods respectively.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height (m)	Receptor Location	STAMSON Roadway Noise Level (dBA)	
			Day	Night
1	4.5	POW – Townhouse 1	67	59
2	10.5	POW – Condo A North	69	62
3	10.5	POW – Condo A East	62	55
4	10.5	POW – Condo A West	62	55
5	10.5	POW – Condo B North	70	62
6	10.5	POW – Condo C North	69	62
7	10.5	POW – Condo D North	69	62
8	10.5	POW – Condo D East	59	52
9	10.5	POW – Condo D West	65	58
10	1.5	OLA– Townhouse Block 11	59	51
11	1.5	OLA – Townhouse Block 11	60	52
12	4.5	POW – Townhouse Block 11	60	53
13	4.5	POW – Townhouse Block 10	57	50
14	4.5	POW – Townhouse Block 8	57	49
15	10.5	POW – Condo E West	61	53
16	10.5	POW – Condo E South	65	57

**Noise levels during the nighttime are not considered for OLAs*

TABLE 3 (CONTINUED): EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height (m)	Receptor Location	STAMSON Roadway Noise Level (dBA)	
			Day	Night
17	10.5	POW – Condo E East	59	52
18	10.5	POW – Condo F South	63	55
19	10.5	POW – Condo F East	56	49
20	4.5	POW – Townhouse Block 4	50	42
21	4.5	POW – Townhouse Block 2	49	41
22	1.5	OLA – Public Park	53	N/A*
23	1.5	OLA – Townhouse Block 10	57	N/A*
24	1.5	OLA – Townhouse Block 8	57	N/A*
25	1.5	OLA – Townhouse Block 1	44	N/A*

Table 4 below shows a comparison between Predictor-Lima and STAMSON. Noise levels calculated in STAMSON were found to have a strong correlation with Predictor-Lima and variability between the two programs was within an acceptable level of ±0-3 dBA.

TABLE 4: EXTERIOR NOISE LEVEL COMPARISON

Receptor Number	Receptor Location	Predictor Noise Level (dBA)		STAMSON Noise Level (dBA)	
		Day	Day	Day	Night
7	POW – Condo D North	69	62	70	62
18	POW – Condo E South	63	55	64	56

The results of the comparison between the Predictor-Lima and STAMSON analysis indicate that the STAMSON values are more conservative, but otherwise very similar. The difference between the analyses are equal to or less than 1 dBA, which is considered imperceivable. The STAMSON and Predictor roadway traffic calculations can be found in Appendix A and B respectively.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components for the Condo buildings A, B, C, D and Townhouse Block 1. 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 + safety factor). As per NPC-300 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 Table 5 below and Figure 3). Furthermoer these buildings will require central air conditioning and a warning clause Type D all purchase, sale and lease agreements, see Section 6.

For the remaining townhouse blocks and Condo E and F bedroom/living room/retail or office windows which satisfy Ontario Building Code (OBC 2020) requirements will be sufficient at reducing indoor noise levels. The dwellings will need to have a forced air heating system with provisions for adding air conditioning. If provided air conditioning will allow occupants to keep windows and doors closed, thus proving a quite and comfortable indoor environment. For these buildings a Type C warning on purchase, sale and lease agreements will be required, see Section 6. The Condo buildings E and F are expected to have central air conditioning so therefore a Type D warning clause should apply to these condo buildings.

At all outdoor living areas noise levels fall below 60 dBA, therefore no noise screens are required. However at Townhouse Blocks 8 to 11noise levels range between 55 dBA to 65 dBA therefore a Type A warning clause would also apply to these units.

TABLE 5: NOISE CONTROL REQUIREMENTS

Building	Façade	Window STC	Exterior Wall STC	Warning Clauses	Ventilation
Condo A, B, C, D	North, East, West	35	45	Type D	Air Conditioning
Condo E, F	N/A	OBC	OBC	Type D	Air Conditioning
Townhouse 1	North, East, West	35	45	Type D	Air Conditioning
Townhouse 2 to 6	N/A	OBC	OBC	Type C	Forced Air /w provisions for AC
Townhouse 8 to 11	N/A	OBC	OBC	Type C & A	Forced Air /w provisions for AC

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 44 and 70dBA during the daytime period (07:00-23:00) and between 37 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (70 dBA) occurs along the North façade of Condo B which is most exposed to Brian Coburn Blvd. and the planned Cumberland Transitway. At all outdoor living areas noise levels were found to be below 60 dBA therefore no noise barriers are required.

Table 5 above outlines the required noise control measures required for the development. The following warning clauses will be applied to purchase, sale and lease agreements to the specified buildings indicated in Tabel 5. Draft language for each warning clause will be as follows:

TYPE A:

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

TYPE C:

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City of Ottawa and the Ministry of the Environment, Conservations and Parks."*

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 City of Ottawa and the Ministry of the Environment, Conservations and Parks."*

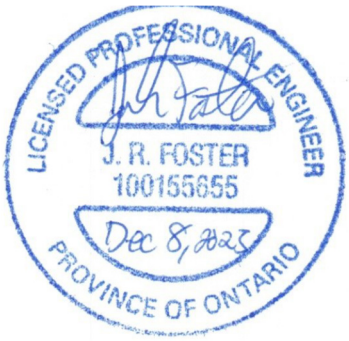
Gradient Wind investigated the potential stationary noise impacts from proposed gas station / retail space, Chapel Hill Park and Ride, and Transit Station. The proposed gas station will be designed to comply with ENCG sound level limits, as per the stationary noise report prepared by Gradient Wind (ref. Gradient File #23-204, Stationary Noise Assessment 2983 Navan Road, dated August 25, 2023). As per the Environmental Assessment Report for the Brian Coburn Boulevard Extension / Cumberland Transitway Westerly (ref Gradient Wind File # 17-123, Air Quality, Noise & Vibration Impact Assessment, dated November 10, 2021), stationary noise impacts from the proposed Chapel Hill Park and Ride and Transitway Station will fall below the ENCG sound level limits. No other significant sources of stationary noise were identified in the area. Based on the findings of the analysis, the proposed development is expected to be compatible with existing and proposed stationary sources in the area.

Regarding the impacts of the development on its surroundings and itself, stationary noise impacts can be minimized by judicious selection of mechanical equipment and placing equipment away from sensitive areas such as on a high roof. The buildings will be designed to comply with the ENCG Sound Level Limits and City of Ottawa Noise By-Law No. 2017-255. The proposed townhouses are not anticipated to have any larger equipment associated with them, however for the condominium blocks stationary noise should be considered once the mechanical equipment is known.

This concludes our 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.



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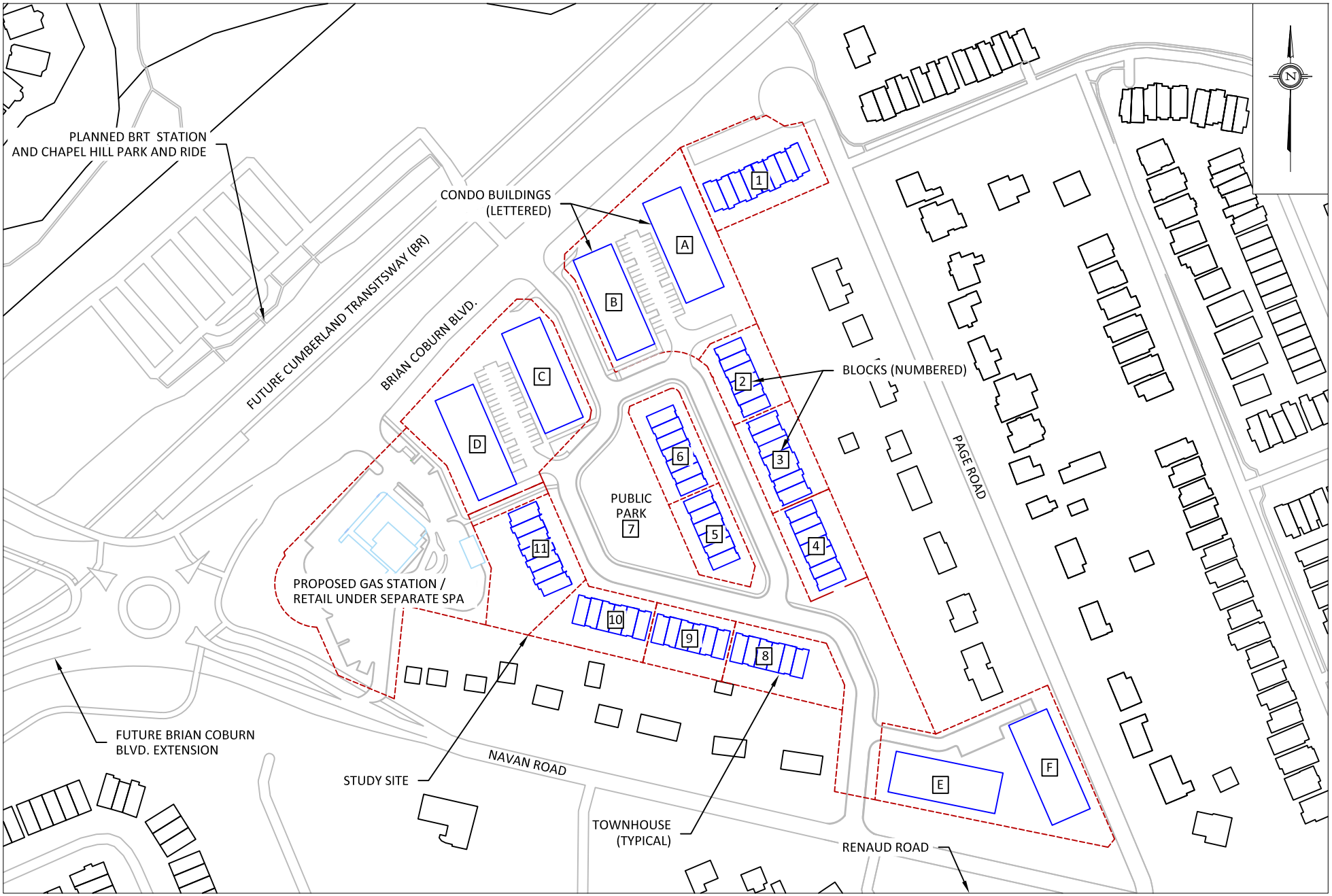
Gradient Wind File #23-273-Environmental Noise



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PROJECT	2983 NAVAN ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2500 (APPROX.)
DRAWING NO.	GW23-273-1
DATE	DECEMBER 8, 2023
DRAWN BY	A.B.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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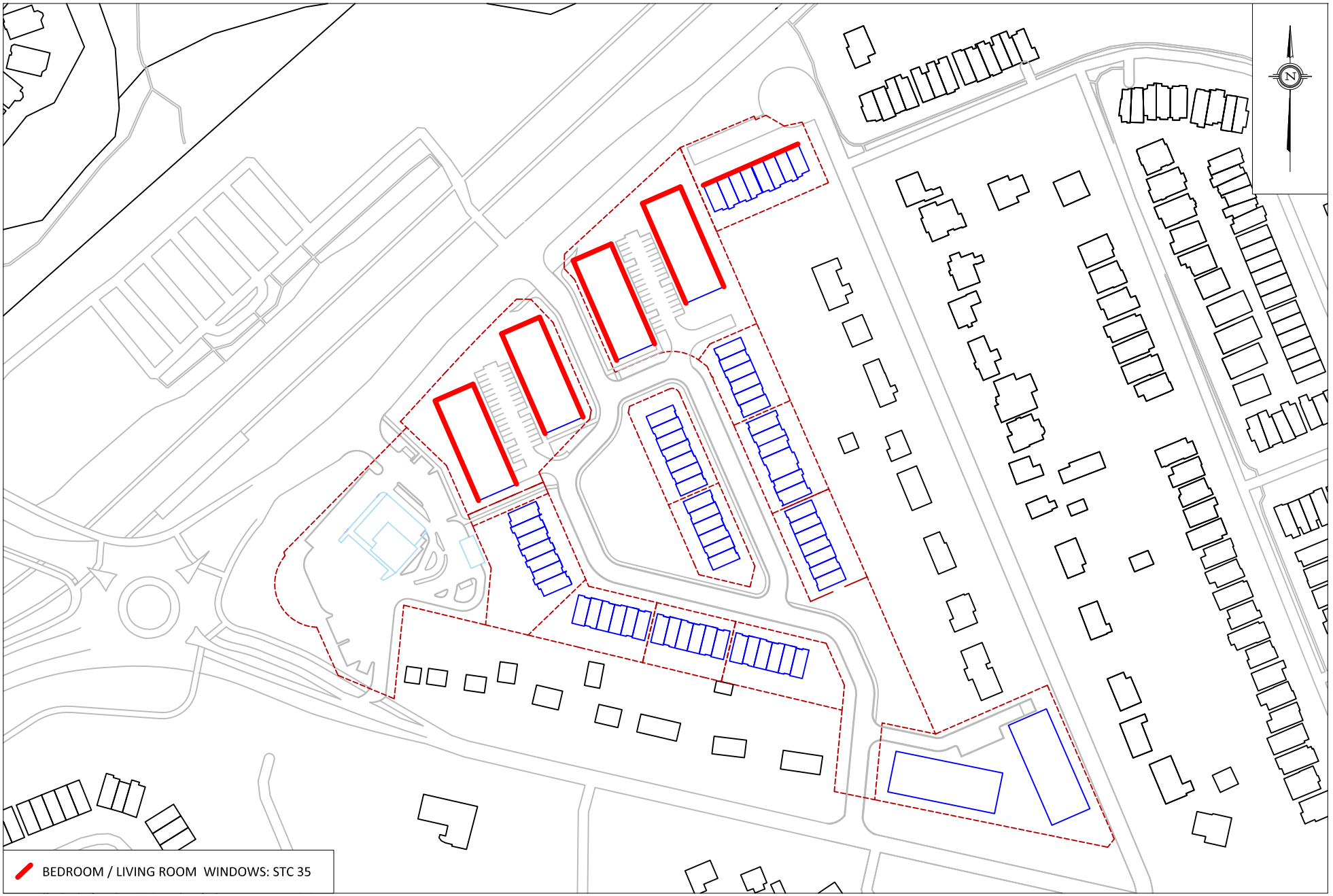
PROJECT	2983 NAVAN ROAD, OTTAWA ROADWAY TRAFFIC/STATIONARY NOISE ASSESSMENT		
SCALE	1:2500 (APPROX.)	DRAWING NO.	GW23-273-2
DATE	DECEMBER 8, 2023	DRAWN BY	A.B.

DESCRIPTION

FIGURE 2:
TRAFFIC NOISE RECEPTOR LOCATIONS



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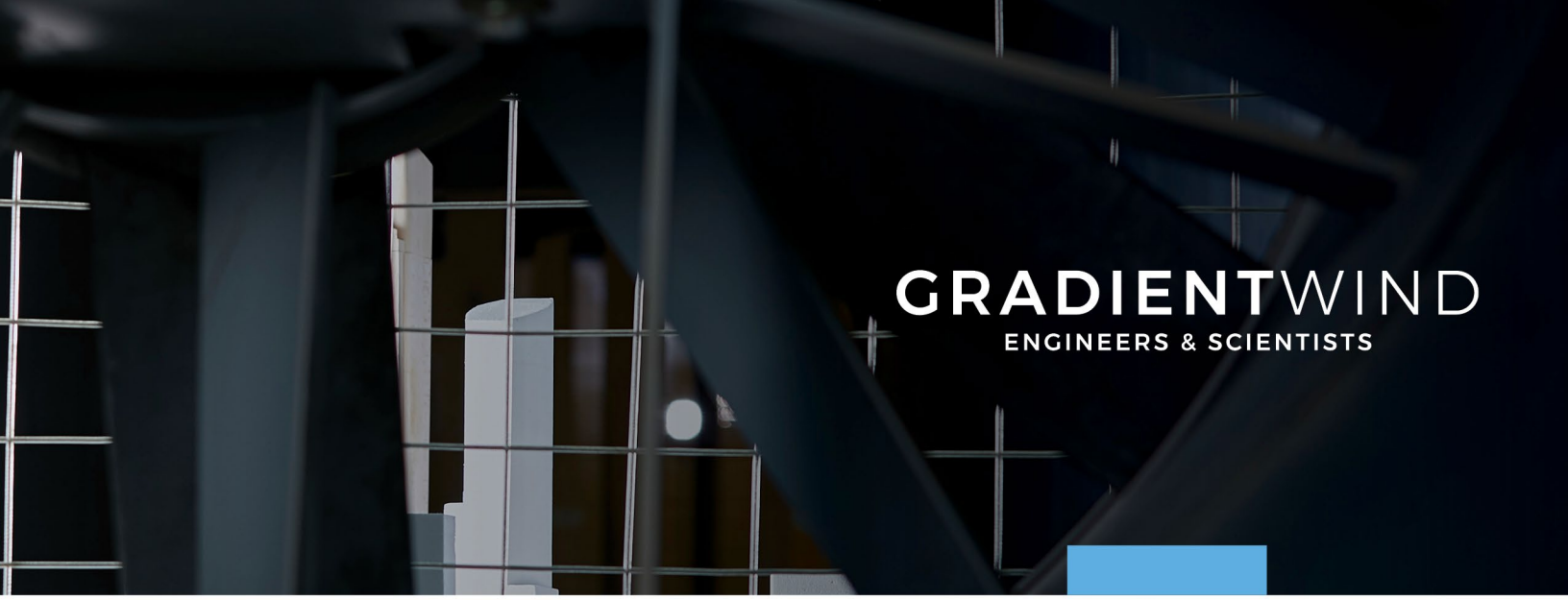
PROJECT	2983 NAVAN ROAD, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:2500 (APPROX.)	DRAWING NO.	GW23-273-3
DATE	DECEMBER 8, 2023	DRAWN BY	A.B.

DESCRIPTION

FIGURE 3:
WINDOW STC REQUIREMENTS

FIGURE 4: DAYTIME NOISE CONTOURS AT 1.5 M AGL

FIGURE 5: NIGHTTIME NOISE CONTOURS AT 1.5 M AGL



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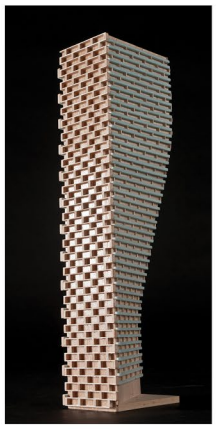

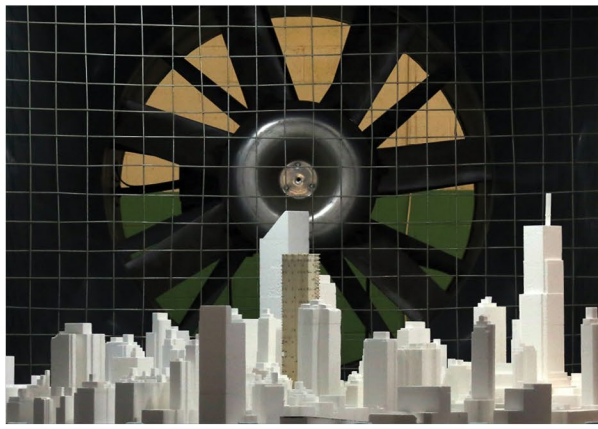

APPENDIX A

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: 07-12-2023 18:05:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

```
Road data, segment # 1: Navan (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  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Navan (day/night)
---------------------------------------
Angle1   Angle2           :  46.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 160.00 / 160.00 m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Brian Coburn (day/night)
------------------------------------------------
Car traffic volume  : 28336/2464  veh/TimePeriod  *
Medium truck volume :  2254/196   veh/TimePeriod  *
Heavy truck volume  :  1610/140   veh/TimePeriod  *
Posted speed limit  :    70 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

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

```
Data for Segment # 2: Brian Coburn (day/night)
-----------------------------------------------
Angle1   Angle2           : -69.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  28.00 / 28.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 47.64 + 0.00) = 47.64 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    46     90   0.39  70.00   0.00 -14.29  -8.06   0.00   0.00   0.00  47.64
-------------------------------------------------------------------------------

Segment Leq : 47.64 dBA

Results segment # 2: Brian Coburn (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 69.95 + 0.00) = 69.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -69     90   0.39  75.00   0.00  -3.77  -1.28   0.00   0.00   0.00  69.95
-------------------------------------------------------------------------------

Segment Leq : 69.95 dBA

Total Leq All Segments: 69.98 dBA

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

Source height = 1.50 m

ROAD (0.00 + 40.04 + 0.00) = 40.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    46     90   0.39  62.40   0.00 -14.29  -8.06   0.00   0.00   0.00  40.04
-------------------------------------------------------------------------------

Segment Leq : 40.04 dBA

Results segment # 2: Brian Coburn (night)
```

```
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.35 + 0.00) = 62.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -69     90   0.39  67.40   0.00  -3.77  -1.28   0.00   0.00   0.00  62.35
-------------------------------------------------------------------------------

Segment Leq : 62.35 dBA

Total Leq All Segments: 62.38 dBA

RT/Custom data, segment # 1: C Transit (day/night)
-------------------------------------------------
1 - Bus:
Traffic volume    :   488/42    veh/TimePeriod
Speed             :    70 km/h

Data for Segment # 1: C Transit (day/night)
-------------------------------------------
Angle1   Angle2           : -69.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  65.00 / 65.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: C Transit (day)
------------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 51.73 + 0.00) = 51.73 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -69     90   0.42  62.10  -9.04  -1.33   0.00   0.00   0.00  51.73
-------------------------------------------------------------------------

Segment Leq : 51.73 dBA

Total Leq All Segments: 51.73 dBA

Results segment # 1: C Transit (night)
--------------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 44.09 + 0.00) = 44.09 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
```

```
-------------------------------------------------------------------------
   -69      90    0.42  54.46  -9.04  -1.33   0.00   0.00   0.00  44.09
-------------------------------------------------------------------------

Segment Leq : 44.09 dBA

Total Leq All Segments: 44.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.04
                           (NIGHT): 62.44
```

```
STAMSON 5.0          NORMAL REPORT          Date: 07-12-2023 17:52:29
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r18.te                 Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Navan (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  :    60 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Navan (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   54.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  33.00 / 33.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Road data, segment # 2: Renaud (day/night)
----------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    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):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00
```

```
Data for Segment # 2: Renaud (day/night)
----------------------------------------
Angle1   Angle2           : -85.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 168.00 / 168.00 m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

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

Source height = 1.50 m

ROAD (0.00 + 63.58 + 0.00) = 63.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     54   0.39  70.00   0.00  -4.76  -1.66   0.00   0.00   0.00  63.58
-------------------------------------------------------------------------------

Segment Leq : 63.58 dBA

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

Source height = 1.50 m

ROAD (0.00 + 50.16 + 0.00) = 50.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -85     90   0.39  65.75   0.00 -14.59  -1.00   0.00   0.00   0.00  50.16
-------------------------------------------------------------------------------

Segment Leq : 50.16 dBA

Total Leq All Segments: 63.77 dBA

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

Source height = 1.50 m

ROAD (0.00 + 55.98 + 0.00) = 55.98 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     54   0.39  62.40   0.00  -4.76  -1.66   0.00   0.00   0.00  55.98
-------------------------------------------------------------------------------

Segment Leq : 55.98 dBA

Results segment # 2: Renaud (night)
```

```
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 42.57 + 0.00) = 42.57 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -85     90   0.39  58.16   0.00 -14.59  -1.00   0.00   0.00   0.00  42.57
-------------------------------------------------------------------------------

Segment Leq : 42.57 dBA

Total Leq All Segments: 56.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.77
                           (NIGHT): 56.17
```