

## ROADWAY TRAFFIC NOISE ASSESSMENT

South Nepean Town Centre – Block 3  
Ottawa, Ontario

Report: 23-166 – Roadway Traffic Noise



September 18, 2023

PREPARED FOR

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## EXECUTIVE SUMMARY

This report describes a traffic noise assessment undertaken in support of a Site Plan Control (SPC) application for a proposed residential development known as Block 3 of the South Nepean Town Centre development, located at 3288 Greenbank Road in Ottawa, Ontario. Buildings within the development consist of 10 blocks of townhome units and an urban plaza situated to the northeast corner of the site. The major sources of roadway traffic noise include Chapman Mills Drive, Greenbank Road, and the Bus Rapid Transit (BRT) lane in the center of Chapman Mills Drive. Figure 1 illustrates the site location 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), Ministry of Transportation of Ontario (MTO), and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) site plan drawings by Korsiak Urban Planning dated April 2023.

The results of the current analysis indicated that noise levels at Plane of Window (POW) receptors will range between 58 and 71 dBA during the daytime period (07:00-23:00) and between 53 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east façades of Blocks 6 and 7, which are nearest and most exposed to Greenbank Road. This development does not include any space that could be classified as an Outdoor Living Area (OLA).

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The results of the analysis also indicate some dwellings will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment, and some dwellings will require forced air heating with provisions for central air conditioning as summarized in Table 4 and outlined in Figure 4. Warning Clauses will also be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

As the development comprises of rear lane and back-to-back townhomes, the mechanical equipment servicing these buildings are expected to be small. The buildings will likely have internal forced air heating systems or small internal Energy Recovery Ventilators or heat pump systems, with small residential sized



air conditioning condensers. The mechanical system would be required to comply with MECP's Publication NPC-216 Residential Air Conditioning Devices. As such, negative noise impacts to the surroundings are not expected.

Furthermore, as the development is not in proximity to any large mechanical equipment, stationary noise impacts from existing sources are not expected. The development is surrounded by other low-rise residential buildings.

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## **1. INTRODUCTION**

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Mattamy Homes to undertake a roadway traffic noise assessment for a proposed residential development, known as Block 3 of the South Nepean Town Centre, located at 3288 Greenbank Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa<sup>1</sup> and Ministry of the Environment, Conservation and Parks (MECP)<sup>2</sup> guidelines. Noise calculations were based on site plan drawings by Korsiak Urban Planning dated April 2023, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

## **2. TERMS OF REFERENCE**

The focus of this roadway traffic noise assessment is a proposed residential development located at 3288 Greenbank Road in Ottawa, Ontario, also known as Block 3 of the Nepean Town Centre. The proposed development is located on a rectangular parcel of land situated to the southwest corner of the Greenbank Road and Chapman Mills Drive intersection. The site is bounded by Chapman Mills Drive to the north, Greenbank Road to the east, Verulam Street to the west and a future school to the south.

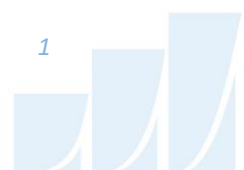
The proposed residential development comprises 10 blocks of rear lane townhomes and back-to-back townhomes, separated by internal laneways. The site also comprises a 445 m<sup>2</sup> urban plaza to the northeast corner of the site, between Block 3 and Block 6.

Primary sources of noise impacting the site include roadway traffic along Greenbank Road and Chapman Mills Drive, and the Bus Rapid Transit (BRT) lane in the center of Chapman Mills Drive. Figure 1 illustrates the site location with surrounding context.

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<sup>1</sup> City of Ottawa Environmental Noise Control Guidelines, January 2016

<sup>2</sup> Ontario Ministry of the Environment, Conservation and Parks – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013



### **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 City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

### **4. METHODOLOGY**

#### **4.1 Background**

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level ( $2 \times 10^{-5}$  Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

#### **4.2 Roadway Traffic Noise**

##### **4.2.1 Criteria for Roadway Traffic Noise**

For surface roadway traffic noise, the equivalent sound energy level,  $L_{eq}$ , provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time-varying noise level over a period of time. For roadways, the  $L_{eq}$  is commonly calculated on the basis of a 16-hour ( $L_{eq16}$ ) daytime (07:00-23:00) / 8-hour ( $L_{eq8}$ ) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1.



**TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD)<sup>3</sup>**

Type of Space	Time Period	L <sub>eq</sub> (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of <b>residences</b> , 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 <b>residences</b> , 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<sup>4</sup>. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment<sup>5</sup>. 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<sup>6</sup>.

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. Furthermore, noise levels at the OLA must not exceed 60 dBA if mitigation can be technically and administratively achieved. No OLAs were identified in this development.

<sup>3</sup> Adapted from ENCG 2016 – Tables 2.2b and 2.2c

<sup>4</sup> Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125

<sup>5</sup> MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

<sup>6</sup> MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3



#### 4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data. Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was assumed to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8%, respectively.
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- For select receptors where appropriate, the proposed building was assumed to act as a barrier partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures A1 and A2.
- Noise receptors were placed at 11 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures A1 and A2.

#### 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<sup>7</sup> 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. As for the BRT, volumes were used based on Gradient Wind's experience with similar developments. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

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<sup>7</sup> City of Ottawa Transportation Master Plan, November 2013





**TABLE 2: ROADWAY TRAFFIC DATA**

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Greenbank Road	4-Lane Urban Arterial Divided (4-UAD)	60	<b>35,000</b>
Chapman Mills Drive	2-Lane Major Urban Collector (2-UMCU)	50	<b>12,000</b>
Bus Rapid Transit	BRT	50	<b>191/67*</b>

### 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 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 are achieved. The calculation procedure<sup>8</sup> 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

<sup>8</sup> Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985



Based on published research<sup>9</sup>, 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, detailed floor layouts 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.

**TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC**

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	4.5	POW – Block 3 North Façade, Level 2	68	61
2	4.5	POW – Block 3 East Façade, Level 2	68	60
3	4.5	POW – Block 6 East Façade, Level 2	71	64
4	4.5	POW – Block 7 South Façade, Level 2	67	59
5	4.5	POW – Block 1 North Façade, Level 2	66	60
6	4.5	POW – Block 8 South Façade, Level 2	63	55
7	4.5	POW – Block 8 East Façade, Level 2	63	55
8	4.5	POW – Block 10 South Façade, Level 2	61	54
9	4.5	POW – Block 1 West Façade, Level 2	62	55
10	4.5	POW – Block 5 East Façade, Level 2	58	53
11	4.5	POW – Block 4 West Façade, Level 2	60	53

The results of the current analysis indicated that noise levels at Plane of Window (POW) receptors will range between 58 and 71 dBA during the daytime period (07:00-23:00) and between 53 and 64 dBA during

<sup>9</sup> CMHC, Road & Rail Noise: Effects on Housing



the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east façades of Blocks 6 and 7, which are nearest and most exposed to Greenbank Road.

Upgraded building components will be required for the dwellings where noise levels exceed 65 dBA at the Plane of Window (POW), as per ENCG criteria. Building components compliant with the Ontario Building Code (OBC 2020) will be sufficient for all other dwellings.

## 5.2 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in Section 4.2 for building components. As discussed in Section 4.3, the anticipated STC requirements for windows and walls have been estimated based on the overall noise reduction required for each intended use of space (STC = Outdoor Noise Level – Targeted Indoor Noise Levels). The STC requirements for the windows are summarized below for various units within the development (see Figure 3):

### ■ Bedroom Windows

- (i) Bedroom windows facing north on Blocks 1, 2, and 3 will require a minimum STC of 31.
- (ii) Bedroom windows facing east on Block 3 will require a minimum STC of 31.
- (iii) Bedroom windows facing east on Blocks 6 and 7 will require a minimum STC of 34.
- (iv) Bedroom windows facing north and south on Blocks 6 and 7 will require a minimum STC of 31.
- (v) All other bedroom windows are to satisfy Ontario Building Code (OBC 2020) requirements.

### ■ Living Room Windows

- (i) Living room windows facing north on Blocks 1, 2, and 3 will require a minimum STC of 26.
- (ii) Living room windows facing east on Block 3 will require a minimum STC of 26.
- (iii) Living room windows facing east on Blocks 6 and 7 will require a minimum STC of 29.
- (iv) Living room windows facing north and south on Blocks 6 and 7 will require a minimum STC of 29.
- (v) All other living room windows are to satisfy Ontario Building Code (OBC 2020) requirements.



■ **Exterior Walls**

- (i) Exterior wall components on the north façade of Blocks 1, 2, 3, 6, and 7, the east facades of Blocks 3, 6, and 7, and the south facades of Blocks 6 and 7 will require a minimum STC of 45, which will be achieved by brick cladding or an acoustical equivalent according to NRC test data<sup>10</sup>

Exterior wall components on these façades are recommended to have a minimum STC of 45, which is achievable with standard wood frame exterior wall construction. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems that have a combination of glass thickness and inter-pane spacing. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that some dwellings will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment, and some dwellings will require forced air heating with provisions for central air conditioning (see Figure 4). In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Table 4 below. The wording for Warning Clauses is presented in Section 6.

**TABLE 4: WARNING CLAUSE REQUIREMENTS**

Warning Clause	Applicable Blocks
Type C	Blocks 4, 5, 8, 9, 10
Type D	Blocks 1, 2, 3, 6, 7

<sup>10</sup> J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.



## **6. CONCLUSIONS AND RECOMMENDATIONS**

The results of the current analysis indicated that noise levels at Plane of Window (POW) receptors will range between 58 and 71 dBA during the daytime period (07:00-23:00) and between 53 and 64 dBA during the nighttime period (23:00-07:00). The highest noise level (71 dBA) occurs at the east façades of Blocks 6 and 7, which are nearest and most exposed to Greenbank Road.

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Section 5.2. The results of the analysis also indicate some dwellings will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment, and some dwellings will require forced air heating with provisions for central air conditioning as summarized in Table 4 and outlined in Figure 4. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized below:

### **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 Municipality and the Ministry of the Environment."*

### **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."*

As the development comprises of rear lane and back-to-back townhomes, the mechanical equipment servicing these buildings are expected to be small. The buildings will likely have internal forced air heating systems or small internal Energy Recovery Ventilators or heat pump systems, with small residential sized air conditioning condensers. The mechanical system would be required to comply with MECP's Publication



NPC-216 Residential Air Conditioning Devices. As such, negative noise impacts to the surroundings are not expected.

Furthermore, as the development is not in proximity to any large mechanical equipment, stationary noise impacts from the environment are not expected. The development will be surrounded by other low-rise residential buildings.

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

Sincerely,

***Gradient Wind Engineering Inc.***



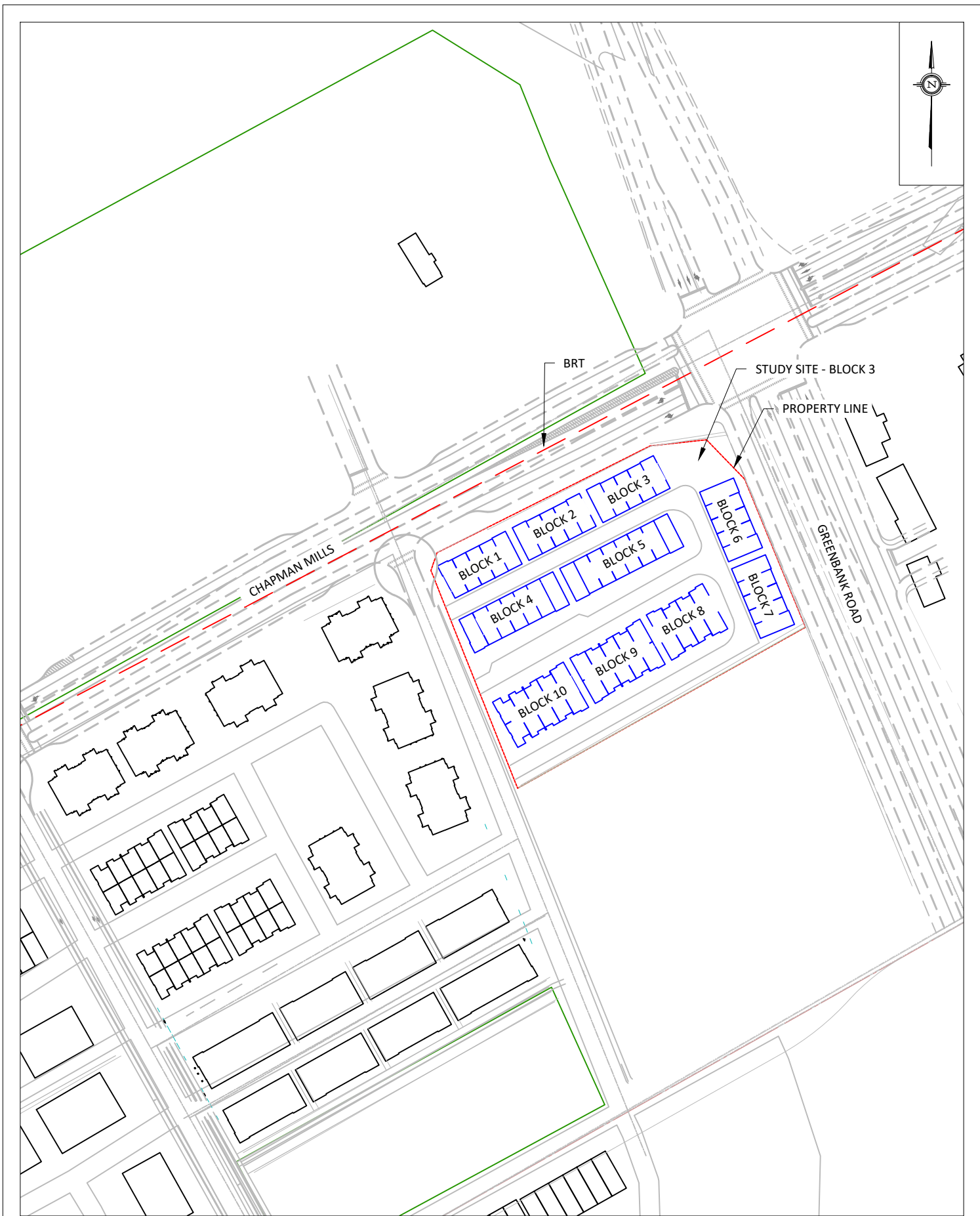
Essraa Alqassab, BASc  
Junior Environmental Scientist



Joshua Foster, P.Eng.  
Lead Engineer

*Gradient Wind File #23-166 – Roadway Traffic Noise*

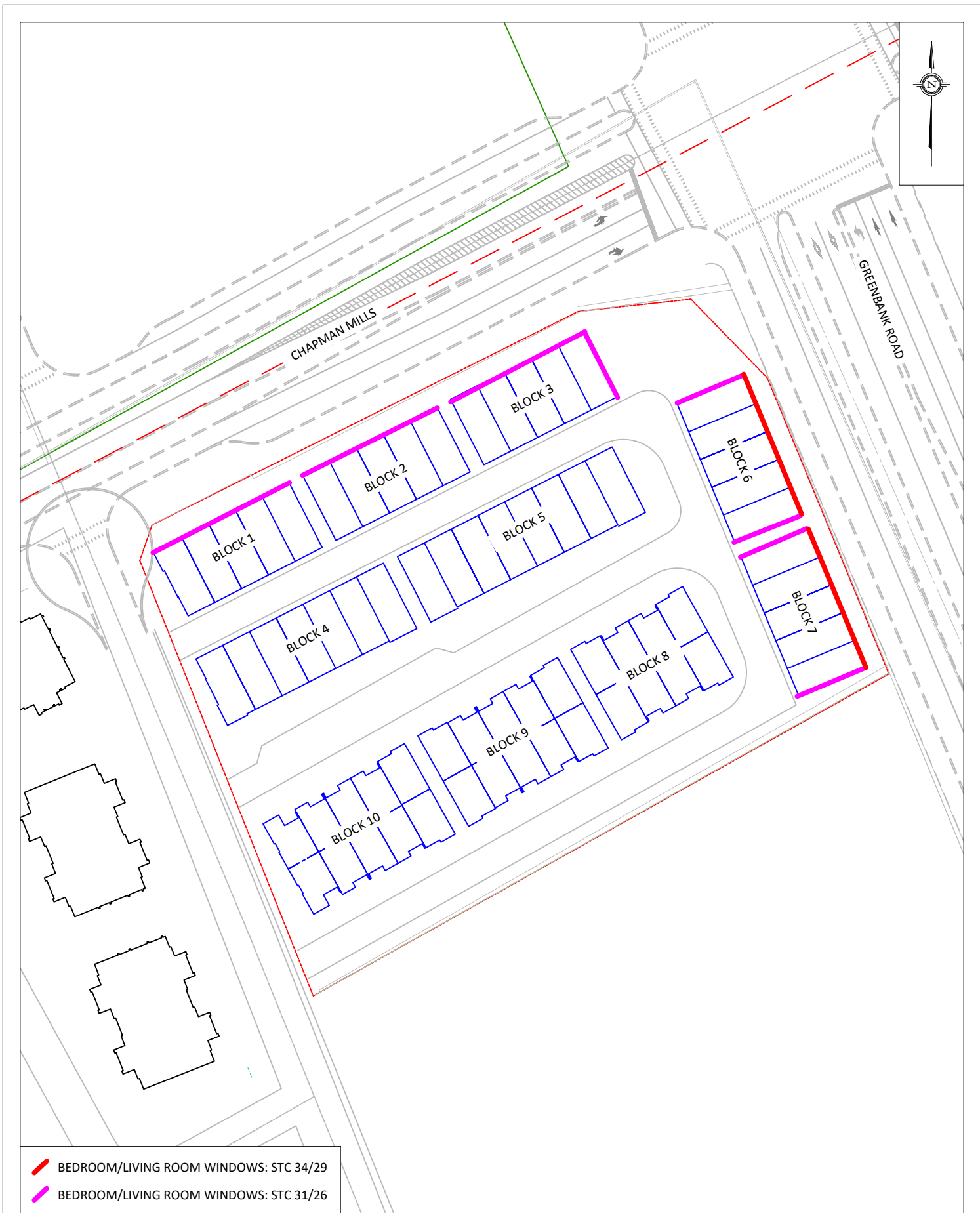














- BEDROOM/LIVING ROOM WINDOWS: STC 34/29
- BEDROOM/LIVING ROOM WINDOWS: STC 31/26



-  AIR CONDITIONING & WARNING CLAUSE TYPE D
-  FORCED AIR HEATING WITH PROVISIONS & WARNING CLAUSE TYPE C

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## APPENDIX A

### STAMSON 5.04 PRINT OUTS







STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:52:28  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Chapmen (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod    \*  
Medium truck volume : 773/67      veh/TimePeriod    \*  
Heavy truck volume : 552/48      veh/TimePeriod    \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Chapmen (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 : 21.00 / 21.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

A1

Road data, segment # 2: Greenbank (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 : 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): 35000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00



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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: Greenbank (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 : 63.00 / 63.00 m  
 Receiver height : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: Chapmen (day)

Source height = 1.50 m

ROAD (0.00 + 66.05 + 0.00) = 66.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  
 -90 90 0.00 67.51 0.00 -1.46 0.00 0.00 0.00 0.00  
 66.05  
 -----  
 --

Segment Leq : 66.05 dBA

## Results segment # 2: Greenbank (day)

Source height = 1.50 m

ROAD (0.00 + 62.92 + 0.00) = 62.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  
 -90 0 0.00 72.16 0.00 -6.23 -3.01 0.00 0.00 0.00  
 62.92  
 -----  
 --

Segment Leq : 62.92 dBA



Total Leq All Segments: 67.77 dBA

Results segment # 1: Chapmen (night)

Source height = 1.50 m

ROAD (0.00 + 58.45 + 0.00) = 58.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	59.91	0.00	-1.46	0.00	0.00	0.00	0.00
58.45									

Segment Leq : 58.45 dBA

Results segment # 2: Greenbank (night)

Source height = 1.50 m

ROAD (0.00 + 55.32 + 0.00) = 55.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	0	0.00	64.56	0.00	-6.23	-3.01	0.00	0.00	0.00
55.32									

Segment Leq : 55.32 dBA

Total Leq All Segments: 60.17 dBA

RT/Custom data, segment # 1: BRT (day/night)

1 - Bus:

Traffic volume	:	191/67	veh/TimePeriod
Speed	:	50 km/h	

Data for Segment # 1: BRT (day/night)

Angle1	Angle2	:	-90.00 deg	90.00 deg
Wood depth	:	0	(No woods.)	





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No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 21.00 / 21.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

## Results segment # 1: BRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 53.07 + 0.00) = 53.07 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	54.54	-1.46	0.00	0.00	0.00	0.00	53.07

Segment Leq : 53.07 dBA

Total Leq All Segments: 53.07 dBA

## Results segment # 1: BRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 51.53 + 0.00) = 51.53 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	53.00	-1.46	0.00	0.00	0.00	0.00	51.53

Segment Leq : 51.53 dBA

Total Leq All Segments: 51.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 67.92  
(NIGHT) : 60.73



STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:53:26  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Chapman (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod    \*  
Medium truck volume : 773/67      veh/TimePeriod    \*  
Heavy truck volume : 552/48      veh/TimePeriod    \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Chapman (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 : 29.00 / 29.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 2: Greenabank (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 35000  
Percentage of Annual Growth : 0.00



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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: Greenabank (day/night)

-----  
 Angle1 Angle2 : -90.00 deg 32.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 2 (Reflective ground surface)  
 Receiver source distance : 53.00 / 53.00 m  
 Receiver height : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: Chapman (day)

-----

Source height = 1.50 m

ROAD (0.00 + 61.64 + 0.00) = 61.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  

0	90	0.00	67.51	0.00	-2.86	-3.01	0.00	0.00	0.00
---	----	------	-------	------	-------	-------	------	------	------

 61.64  
 -----  
 --

Segment Leq : 61.64 dBA

## Results segment # 2: Greenabank (day)

-----

Source height = 1.50 m

ROAD (0.00 + 66.51 + 0.00) = 66.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  

-90	32	0.00	73.68	0.00	-5.48	-1.69	0.00	0.00	0.00
-----	----	------	-------	------	-------	-------	------	------	------

 66.51  
 -----  
 --

Segment Leq : 66.51 dBA



Total Leq All Segments: 67.73 dBA

Results segment # 1: Chapman (night)

Source height = 1.50 m

ROAD (0.00 + 54.04 + 0.00) = 54.04 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	90	0.00	59.91	0.00	-2.86	-3.01	0.00	0.00	0.00
54.04									

Segment Leq : 54.04 dBA

Results segment # 2: Greenabank (night)

Source height = 1.50 m

ROAD (0.00 + 58.91 + 0.00) = 58.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	32	0.00	66.08	0.00	-5.48	-1.69	0.00	0.00	0.00
58.91									

Segment Leq : 58.91 dBA

Total Leq All Segments: 60.13 dBA

RT/Custom data, segment # 1: BRT (day/night)

1 - Bus:

Traffic volume	:	191/67	veh/TimePeriod
Speed	:	50 km/h	

Data for Segment # 1: BRT (day/night)

Angle1	Angle2	:	0.00 deg	90.00 deg
--------	--------	---	----------	-----------



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Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 29.00 / 29.00 m  
 Receiver height : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: BRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 45.59 + 0.00) = 45.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.60	54.54	-4.58	-4.37	0.00	0.00	0.00	45.59

Segment Leq : 45.59 dBA

Total Leq All Segments: 45.59 dBA

## Results segment # 1: BRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 44.05 + 0.00) = 44.05 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.60	53.00	-4.58	-4.37	0.00	0.00	0.00	44.05

Segment Leq : 44.05 dBA

Total Leq All Segments: 44.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.76  
 (NIGHT): 60.24



STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:53:12  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Chapman (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod    \*  
Medium truck volume : 773/67      veh/TimePeriod    \*  
Heavy truck volume : 552/48      veh/TimePeriod    \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Chapman (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 : 51.00 / 51.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 2: Greenbank (day/night)

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

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

24 hr Traffic Volume (AADT or SADT): 35000  
Percentage of Annual Growth : 0.00



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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: Greenbank (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 : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: Chapman (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 59.19 + 0.00) = 59.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  

0	90	0.00	67.51	0.00	-5.31	-3.01	0.00	0.00	0.00
---	----	------	-------	------	-------	-------	------	------	------

 59.19  
 -----  
 --

Segment Leq : 59.19 dBA

## Results segment # 2: Greenbank (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 70.97 + 0.00) = 70.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----  
 --  

-90	90	0.00	73.68	0.00	-2.71	0.00	0.00	0.00	0.00
-----	----	------	-------	------	-------	------	------	------	------

 70.97  
 -----  
 --

Segment Leq : 70.97 dBA



Total Leq All Segments: 71.25 dBA

Results segment # 1: Chapman (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 51.59 + 0.00) = 51.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

-----  
--  

0	90	0.00	59.91	0.00	-5.31	-3.01	0.00	0.00	0.00
---	----	------	-------	------	-------	-------	------	------	------

  
51.59  
-----  
--

Segment Leq : 51.59 dBA

Results segment # 2: Greenbank (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 63.37 + 0.00) = 63.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

-----  
--  

-90	90	0.00	66.08	0.00	-2.71	0.00	0.00	0.00	0.00
-----	----	------	-------	------	-------	------	------	------	------

  
63.37  
-----  
--

Segment Leq : 63.37 dBA

Total Leq All Segments: 63.65 dBA

RT/Custom data, segment # 1: BRT (day/night)

-----  
1 - Bus:

Traffic volume : 191/67 veh/TimePeriod  
Speed : 50 km/h

Data for Segment # 1: BRT (day/night)

-----  
Angle1 Angle2 : 0.00 deg 90.00 deg





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Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 2 (Reflective ground surface)  
 Receiver source distance : 51.00 / 51.00 m  
 Receiver height : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: BRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 46.21 + 0.00) = 46.21 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	54.54	-5.31	-3.01	0.00	0.00	0.00	46.21

Segment Leq : 46.21 dBA

Total Leq All Segments: 46.21 dBA

## Results segment # 1: BRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 44.67 + 0.00) = 44.67 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	53.00	-5.31	-3.01	0.00	0.00	0.00	44.67

Segment Leq : 44.67 dBA

Total Leq All Segments: 44.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.26  
 (NIGHT): 63.70



# GRADIENTWIND

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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:59:01  
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

## Road data, segment # 1: Greenbank (day/night)

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

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

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

## Data for Segment # 1: Greenbank (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 : 37.00 / 37.00 m
Receiver height     : 4.50 / 4.50 m
Topography          : 1          (Flat/gentle slope; no barrier)
Reference angle     : 0.00
```

## Results segment # 1: Greenbank (day)

Source height = 1.50 m

ROAD (0.00 + 66.74 + 0.00) = 66.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

```
-----
--
0      90      0.00  73.68  0.00  -3.92  -3.01  0.00  0.00  0.00
66.74
```



-----  
--  
Segment Leq : 66.74 dBA

Total Leq All Segments: 66.74 dBA

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

Source height = 1.50 m

ROAD (0.00 + 59.15 + 0.00) = 59.15 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----

--  
          0      90     0.00  66.08   0.00  -3.92  -3.01   0.00   0.00   0.00  
59.15  
-----  
--

Segment Leq : 59.15 dBA

Total Leq All Segments: 59.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.74  
                                  (NIGHT): 59.15



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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:58:53  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

## Road data, segment # 1: Chapman (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod \*  
Medium truck volume : 773/67      veh/TimePeriod \*  
Heavy truck volume : 552/48      veh/TimePeriod \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

## Data for Segment # 1: Chapman (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 : 4.50 / 4.50 m  
Topography : 1      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

## Road data, segment # 2: Greenbank (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 : 60 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

## Data for Segment # 2: Greenbank (day/night)

-----  
Angle1    Angle2 : -90.00 deg    0.00 deg  
Wood depth : 0      (No woods.)  
No of house rows : 0 / 0



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Surface : 2 (Reflective ground surface)  
 Receiver source distance : 129.00 / 129.00 m  
 Receiver height : 4.50 / 4.50 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

## Results segment # 1: Chapman (day)

Source height = 1.50 m

ROAD (0.00 + 65.85 + 0.00) = 65.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	90	0.00	67.51	0.00	-1.66	0.00	0.00	0.00	0.00
65.85									

Segment Leq : 65.85 dBA

## Results segment # 2: Greenbank (day)

Source height = 1.67 m

ROAD (0.00 + 51.32 + 0.00) = 51.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-90	0	0.00	63.68	0.00	-9.34	-3.01	0.00	0.00	0.00
51.32									

Segment Leq : 51.32 dBA

Total Leq All Segments: 66.00 dBA

## Results segment # 1: Chapman (night)

Source height = 1.50 m

ROAD (0.00 + 58.25 + 0.00) = 58.25 dBA



Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

```

-----
--
-90      90      0.00  59.91   0.00  -1.66   0.00   0.00   0.00   0.00
58.25
-----
--

```

Segment Leq : 58.25 dBA

Results segment # 2: Greenbank (night)

-----

Source height = 1.67 m

ROAD (0.00 + 51.32 + 0.00) = 51.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

```

-----
--
-90      0      0.00  63.68   0.00  -9.34  -3.01   0.00   0.00   0.00
51.32
-----
--

```

Segment Leq : 51.32 dBA

Total Leq All Segments: 59.05 dBA

RT/Custom data, segment # 1: BRT (day/night)

-----

1 - Bus:

Traffic volume : 191/67 veh/TimePeriod  
Speed : 50 km/h

Data for Segment # 1: BRT (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	:	4.50 / 4.50	m	
Topography	:	1	(Flat/gentle slope; no barrier)	
Reference angle	:	0.00		

Results segment # 1: BRT (day)



-----

Source height = 0.50 m

RT/Custom (0.00 + 52.87 + 0.00) = 52.87 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	54.54	-1.66	0.00	0.00	0.00	0.00	52.87

-----

Segment Leq : 52.87 dBA

Total Leq All Segments: 52.87 dBA

Results segment # 1: BRT (night)

-----

Source height = 0.50 m

RT/Custom (0.00 + 51.33 + 0.00) = 51.33 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	53.00	-1.66	0.00	0.00	0.00	0.00	51.33

-----

Segment Leq : 51.33 dBA

Total Leq All Segments: 51.33 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.21  
(NIGHT): 59.73



STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:58:46  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: Greenbank (day/night)

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

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

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

Data for Segment # 1: Greenbank (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 : 61.00 / 61.00 m  
Receiver height                        :    4.50 / 4.50 m  
Topography                            :        2        (Flat/gentle slope; with barrier)  
Barrier angle1                        :    0.00 deg    Angle2 : 29.00 deg  
Barrier height                         :    6.00 m  
Barrier receiver distance : 31.00 / 31.00 m  
Source elevation                       :    0.00 m  
Receiver elevation                     :    0.00 m  
Barrier elevation                      :    0.00 m  
Reference angle                        :    0.00

Results segment # 1: Greenbank (day)

-----  
Source height = 1.50 m

Barrier height for grazing incidence  
-----





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Source Height	! Receiver (m) !	Barrier Height	! Barrier (m) !	Elevation of Barrier Top	(m)
1.50	!	4.50	!	2.97	!
				2.97	

ROAD (0.00 + 47.29 + 62.88) = 63.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

0	29	0.00	73.68	0.00	-6.09	-7.93	0.00	0.00	-12.37
---	----	------	-------	------	-------	-------	------	------	--------

47.29

29	90	0.00	73.68	0.00	-6.09	-4.70	0.00	0.00	0.00
----	----	------	-------	------	-------	-------	------	------	------

62.88

Segment Leq : 63.00 dBA

Total Leq All Segments: 63.00 dBA

Barrier table for segment # 1: Greenbank (day)

Barrier Height	! Elev of Barr Top!	Road dBA	! Tot Leq dBA !
7.50	!	62.94	!
8.00	!	62.93	!
8.50	!	62.92	!
9.00	!	62.92	!
9.50	!	62.91	!
10.00	!	62.91	!
10.50	!	62.91	!
11.00	!	62.90	!
11.50	!	62.90	!
12.00	!	62.90	!

Results segment # 1: Greenbank (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height	! Receiver (m) !	Barrier Height	! Barrier (m) !	Elevation of Barrier Top	(m)
------------------	---------------------	-------------------	--------------------	-----------------------------	-----



-----+-----+-----+-----									
1.50 !		4.50 !		2.97 !		2.97			
ROAD (0.00 + 39.69 + 55.29) = 55.41 dBA									
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									
-----									
--									
0	29	0.00	66.08	0.00	-6.09	-7.93	0.00	0.00	-12.37
39.69									
-----									
--									
29	90	0.00	66.08	0.00	-6.09	-4.70	0.00	0.00	0.00
55.29									
-----									
--									

Segment Leq : 55.41 dBA

Total Leq All Segments: 55.41 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.00  
(NIGHT): 55.41



# GRADIENTWIND

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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 11:59:11  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

## Road data, segment # 1: Greenbank (day/night)

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

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

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

## Data for Segment # 1: Greenbank (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 : 56.00 / 56.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -90.00 deg Angle2 : 51.00 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: Greenbank (day)

-----  
Source height = 1.50 m

Barrier height for grazing incidence  
-----



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Source Height	! Receiver (m)	! Barrier Height (m)	! Elevation of Barrier Top (m)
1.50	!	4.50	!
		3.16	!
			3.16

ROAD (0.00 + 56.44 + 61.31) = 62.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

--									
-90	51	0.00	73.68	0.00	-5.72	-1.06	0.00	0.00	-10.46
56.44									

--									
51	90	0.00	73.68	0.00	-5.72	-6.64	0.00	0.00	0.00
61.31									

Segment Leq : 62.54 dBA

Total Leq All Segments: 62.54 dBA

Barrier table for segment # 1: Greenbank (day)

Barrier Height	! Elev of Barr Top!	Road dBA	! Tot Leq dBA
7.50	!	7.50	!
		62.01	!
8.00	!	8.00	!
		61.91	!
8.50	!	8.50	!
		61.83	!
9.00	!	9.00	!
		61.76	!
9.50	!	9.50	!
		61.71	!
10.00	!	10.00	!
		61.66	!
10.50	!	10.50	!
		61.63	!
11.00	!	11.00	!
		61.61	!
11.50	!	11.50	!
		61.59	!
12.00	!	12.00	!
		61.58	!

Results segment # 1: Greenbank (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height	! Receiver (m)	! Barrier Height (m)	! Elevation of Barrier Top (m)



1.50 !		4.50 !		3.16 !		3.16			
ROAD (0.00 + 48.84 + 53.72) = 54.94 dBA									
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									
-----									
--									
-90	51	0.00	66.08	0.00	-5.72	-1.06	0.00	0.00	-10.46
48.84									
-----									
--									
51	90	0.00	66.08	0.00	-5.72	-6.64	0.00	0.00	0.00
53.72									
-----									
--									

Segment Leq : 54.94 dBA

Total Leq All Segments: 54.94 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.54  
(NIGHT): 54.94



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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 12:05:47  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te                      Time Period: Day/Night 16/8 hours  
Description:

## Road data, segment # 1: Greenbank (day/night)

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

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

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

## Data for Segment # 1: Greenbank (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 : 124.00 / 124.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

## Results segment # 1: Greenbank (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 61.49 + 0.00) = 61.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq									
-----									
--									
0	90	0.00	73.68	0.00	-9.17	-3.01	0.00	0.00	0.00
61.49									
-----									
--									



Segment Leq : 61.49 dBA

Total Leq All Segments: 61.49 dBA

Results segment # 1: Greenbank (night)

-----

Source height = 1.50 m

ROAD (0.00 + 53.90 + 0.00) = 53.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----

--	0	90	0.00	66.08	0.00	-9.17	-3.01	0.00	0.00	0.00
53.90										

-----

--

Segment Leq : 53.90 dBA

Total Leq All Segments: 53.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.49

(NIGHT): 53.90



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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 12:06:12  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9.te                      Time Period: Day/Night 16/8 hours  
Description:

Road data, segment # 1: Chapman (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod    \*  
Medium truck volume : 773/67      veh/TimePeriod    \*  
Heavy truck volume : 552/48      veh/TimePeriod    \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Chapman (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 : 25.00 / 25.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1                      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Results segment # 1: Chapman (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 62.28 + 0.00) = 62.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

-----  
--  
-90                      0                      0.00                      67.51                      0.00                      -2.22                      -3.01                      0.00                      0.00                      0.00  
62.28





-----  
--  
Segment Leq : 62.28 dBA

Total Leq All Segments: 62.28 dBA

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

Source height = 1.50 m

ROAD (0.00 + 54.68 + 0.00) = 54.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----

--  
-90            0      0.00   59.91    0.00   -2.22   -3.01    0.00    0.00    0.00  
54.68  
-----  
--

Segment Leq : 54.68 dBA

Total Leq All Segments: 54.68 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.28  
  (NIGHT): 54.68



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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 12:06:28  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10.te                      Time Period: Day/Night 16/8 hours  
Description:

## Road data, segment # 1: Greenbank (day/night)

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

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

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

## Data for Segment # 1: Greenbank (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 : 58.00 / 58.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 2 (Flat/gentle slope; with barrier)  
Barrier angle1 : -90.00 deg    Angle2 : 90.00 deg  
Barrier height : 6.00 m  
Barrier receiver distance : 28.00 / 28.00 m  
Source elevation : 0.00 m  
Receiver elevation : 0.00 m  
Barrier elevation : 0.00 m  
Reference angle : 0.00

## Road data, segment # 2: Chapman (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: Chapman (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 : 50.00 / 50.00 m
Receiver height  :   4.50 / 4.50 m
Topography      :           2   (Flat/gentle slope; with barrier)
Barrier angle1   :   0.00 deg   Angle2 : 90.00 deg
Barrier height   :   6.00 m
Barrier receiver distance : 27.00 / 27.00 m
Source elevation :   0.00 m
Receiver elevation :   0.00 m
Barrier elevation :   0.00 m
Reference angle  :   0.00
  
```

Results segment # 1: Greenbank (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 !          4.50 !          3.05 !          3.05
  
```

ROAD (0.00 + 57.89 + 0.00) = 57.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

```

-----
--
-90      90      0.00  73.68   0.00  -5.87   0.00   0.00   0.00  -9.91
57.89
-----
--
  
```

Segment Leq : 57.89 dBA

Results segment # 2: Chapman (day)

Source height = 1.67 m

Barrier height for grazing incidence



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Source	!	Receiver	!	Barrier	!	Elevation of				
Height	(m)	!	Height	(m)	!	Barrier Top	(m)			
-----+-----+-----+-----										
	1.67	!		4.50	!		2.97			
ROAD (0.00 + 49.37 + 0.00) = 49.37 dBA										
Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	
SubLeq										
-----										
--										
	0	90	0.00	68.08	0.00	-5.23	-3.01	0.00	0.00	-10.47
49.37										
-----										
--										

Segment Leq : 49.37 dBA

Total Leq All Segments: 58.46 dBA

Barrier table for segment # 1: Greenbank (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
7.50	7.50	55.48	55.48
8.00	8.00	54.80	54.80
8.50	8.50	54.17	54.17
9.00	9.00	53.58	53.58
9.50	9.50	53.02	53.02
10.00	10.00	52.49	52.49
10.50	10.50	52.16	52.16
11.00	11.00	51.80	51.80
11.50	11.50	51.48	51.48
12.00	12.00	51.20	51.20

Barrier table for segment # 2: Chapman (day)

Barrier Height	Elev of Barr Top	Road dBA	Tot Leq dBA
7.50	7.50	46.95	46.95
8.00	8.00	46.28	46.28
8.50	8.50	45.66	45.66
9.00	9.00	45.09	45.09
9.50	9.50	44.55	44.55
10.00	10.00	44.11	44.11
10.50	10.50	43.73	43.73



```

11.00 !    11.00 !    43.41 !    43.41 !
11.50 !    11.50 !    43.12 !    43.12 !
12.00 !    12.00 !    42.87 !    42.87 !

```

Results segment # 1: Greenbank (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 !          4.50 !          3.05 !          3.05

```

ROAD (0.00 + 50.29 + 0.00) = 50.29 dBA

```

Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq

```

```

-----
--
-90      90      0.00  66.08   0.00  -5.87   0.00   0.00   0.00  -9.91
50.29
-----
--

```

Segment Leq : 50.29 dBA

Results segment # 2: Chapman (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 !          4.50 !          2.97 !          2.97

```

ROAD (0.00 + 49.37 + 0.00) = 49.37 dBA

```

Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq

```

```

-----
--
0        90      0.00  68.08   0.00  -5.23  -3.01   0.00   0.00 -10.47
49.37
-----
--

```



Segment Leq : 49.37 dBA

Total Leq All Segments: 52.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 58.46  
(NIGHT) : 52.86



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STAMSON 5.0                      NORMAL REPORT                      Date: 20-07-2023 12:11:03  
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11.te                      Time Period: Day/Night 16/8 hours  
Description:

Road data, segment # 1: Chapman (day/night)

-----  
Car traffic volume : 9715/845      veh/TimePeriod    \*  
Medium truck volume : 773/67      veh/TimePeriod    \*  
Heavy truck volume : 552/48      veh/TimePeriod    \*  
Posted speed limit : 50 km/h  
Road gradient : 0 %  
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 12000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Chapman (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 : 49.00 / 49.00 m  
Receiver height : 4.50 / 4.50 m  
Topography : 1                      (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Results segment # 1: Chapman (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 59.36 + 0.00) = 59.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------

SubLeq

-----  
--  
-90                      0                      0.00                      67.51                      0.00                      -5.14                      -3.01                      0.00                      0.00                      0.00  
59.36



-----  
--

Segment Leq : 59.36 dBA

Total Leq All Segments: 59.36 dBA

Results segment # 1: Chapman (night)

-----

Source height = 1.50 m

ROAD (0.00 + 51.76 + 0.00) = 51.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
SubLeq									

-----

--	-90	0	0.00	59.91	0.00	-5.14	-3.01	0.00	0.00	0.00
51.76										

-----

--

Segment Leq : 51.76 dBA

Total Leq All Segments: 51.76 dBA

RT/Custom data, segment # 1: BRT (day/night)

-----

1 - Bus:

Traffic volume	:	191/67	veh/TimePeriod
Speed	:	50 km/h	

Data for Segment # 1: BRT (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	:	49.00 / 49.00	m	
Receiver height	:	4.50 / 4.50	m	
Topography	:	1	(Flat/gentle slope; no barrier)	
Reference angle	:	0.00		

Results segment # 1: BRT (day)

-----

Source height = 0.50 m





RT/Custom (0.00 + 46.38 + 0.00) = 46.38 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	54.54	-5.14	-3.01	0.00	0.00	0.00	46.38

Segment Leq : 46.38 dBA

Total Leq All Segments: 46.38 dBA

Results segment # 1: BRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 44.84 + 0.00) = 44.84 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	53.00	-5.14	-3.01	0.00	0.00	0.00	44.84

Segment Leq : 44.84 dBA

Total Leq All Segments: 44.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.57  
(NIGHT): 52.56

