Detailed Roadway Traffic Noise Assessment

2795 Baseline Road - Phase 2 (Formerly Known as Phase 3)

Ottawa, Ontario

REPORT: GWE17-059 - Traffic Noise (P2) R1

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EXECUTIVE SUMMARY

This document describes a detailed roadway traffic noise assessment performed for a proposed residential subdivision located at 2795 Baseline Road in Ottawa, Ontario. The proposed development comprises four (4) three-storey residential townhomes blocks (containing a total of 32 dwelling units). This represents Phase 2 (formerly known as Phase 3) of the parent development at 2710 Draper Avenue (Phase 1 and 3). Gradient Wind has previously studied the full build out scenario for the site, a focused Phase 1 study as well as a focused Phase 3 study dated March 19, 2018, August 21, 2018, and November 2, 2018 respectively. This report provides an analysis focused on Phase 2 of the development. The major sources of noise impacting the site is roadway traffic noise along Baseline Road and Morrison Drive. Figure 1 illustrates the site plan and surrounding context.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings received from Roderick Lahey Architect Inc. dated November 26, 2019 (ref. Drawing No. 1733: SP-01).

The results of the current analysis indicate that noise levels will range between 63 and 73 dBA during the daytime period (07:00-23:00) and between 56 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the South façade of Block 14 and 15 (Receptor 6 and 7), which is nearest and most exposed to Baseline Road. Building components with a higher sound transmission class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that all buildings in the development will require provisions for central heating and air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. A Warning Clause will also be required in all Lease, Purchase and Sale Agreements as stipulated in Section 6.

TABLE OF CONTENTS

PAGE

1. INTRODUCTION 1
2. TERMS OF REFERENCE 1
3. OBJECTIVES 2
4. METHODOLOGY 2
   - 4.1 Background 2
   - 4.2 Criteria for Roadway Traffic Noise 2
   - 4.3 Roadway Noise Assessment 4
     - 4.3.1 Theoretical Roadway Noise Predictions 4
     - 4.3.2 Roadway Traffic Volumes 5
     - 4.3.3 Indoor Noise Calculations 5
5. RESULTS AND DISCUSSION 6
   - 5.1 Roadway Traffic Noise Levels 6
   - 5.2 Noise Control Measures 7
6. CONCLUSIONS AND RECOMMENDATIONS 9

FIGURES

APPENDICES:

Appendix A – Traffic Modelling Input and Output Data

1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Greatwise Developments to undertake a detailed roadway traffic noise assessment of Phase 2 of the proposed residential subdivision located at 2795 Baseline Road in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a traffic noise assessment focusing on Phase 2. Gradient Wind has conducted previous noise studies for the full build out of the site (GWE17-059) dated March 19, 2018, a focused study on Phase 1 (GWE17-059) dated August 21, 2018, as well as a focused study on Phase 3 (GWE17-059) dated November 2, 2018.

GWE's scope of work involved assessing exterior noise levels throughout the site that are generated by local roadway traffic. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines. Noise calculations were based on site plan and architectural drawings prepared by Roderick Lahey Architect Inc., 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 Phase 2 of a proposed subdivision located at 2795 Baseline Road in Ottawa, Ontario. The subdivision consists of 4 three-storey residential townhouse blocks (containing a total of 32 dwelling units). Each townhouse features a garage on the ground level, a living/dining area with an adjoining balcony on the second floor, and two bedrooms plus two washrooms on the upper floor. The private balconies are not considered outdoor living areas (OLA) since they are less than 4-meteres in depth.

The study site is located on a rectangular parcel of land at the intersection of Baseline Road and Morrison Drive. The development is comprised of Block 12 and 13 which consist of back-to-back townhomes and Block 14 and 15 which consist of a traditional townhome layout. No outdoor amenity spaces are associated with this development. Man doors at the rear of Blocks 14 and 15 have an access path to the sidewalk which

[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

travels adjacent to Baseline Road. An existing apartment building towards the east was considered as a potential barrier for several receptors.

The site is surrounded by residential area in all directions. The major sources of roadway traffic noise affecting the development are Baseline Road to the south and Morrison Drive to the west. Figure 1 Illustrates the site plan and surrounding context.

3. OBJECTIVES

The main objectives of this work are to: (i) calculate the future noise levels on the study building produced by local roadway traffic, (ii) ensure that interior noise 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 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 impacts 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 residence living rooms and sleeping quarters respectively, as listed in Table 1.

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

Type of Space	Time Period	L_{eq} (dBA)
		Road
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
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 normally triggers the need for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation[5].

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion.

[3] Adapted from ENCG 2016 – Part 1, Table 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.3 Roadway Noise Assessment

4.3.1 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Noise receptors were strategically identified at 8 locations around the study area, as illustrated in Figure 2. Roadway noise calculations were performed by treating each road segment as separate line sources of noise, and by using existing and approved building locations as noise barriers. In addition to the traffic volumes summarized in Table 2 below, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions
- The day/night split was taken to be 92% / 8% respectively for all streets
- Ground surfaces were taken to be reflective due to the presence of hard (paved) ground
- Receptor heights taken to be 7.5 metres above grade at the third floor for the plane of window (POW)
- Road gradient of Morrison Drive was found to be greater than 2% but the elevation change along the road near the site is less than 6 m. Therefore, road gradient was assumed to be flat; see further explanation below
- Surrounding buildings towards the west and east used as a barrier in some cases where the line of sight between the source and receiver is broken by the building
- Noise receptors were strategically placed at 8 locations within the study area (see Figure 2)
- Receptor exposure angles and distances illustrated in Figures 3 and 4

According to Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT) protocol, the road grade factor in STAMSON is used to account for heavy trucks ascending a steep long hill. The factor accounts for the higher engine speeds need by the trucks to climb the steeper slopes. The factor is applied when the road gradient is more than 2% and the change in elevation is more than 6 m[6]. Since the elevation change does not exceed 6 m across the site and surroundings, road grade was treated as flat.

[6] ORNAMENT Technical Document, October 1989, Section 5.2

4.3.2 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[7], which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Morrison Drive	2-Lane Urban Collector (2-UCU)	40	**8,000**
Baseline Road	4-Lane Urban Arterial-Divided (4-UAD)	70	**35,000**

4.3.3 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.

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

As per Section 4.2, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[8] 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[9], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway noise calculations are summarized in Table 3 below. Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	7.5	POW – 3rd Floor – Block 12 West Façade	67	59
2	7.5	POW – 3rd Floor – Block 12 South Façade	64	57
3	7.5	POW – 3rd Floor – Block 13 South Façade	63	56

[8] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

[9] CMHC, Road & Rail Noise: Effects on Housing

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

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
4	7.5	POW – 3rd Floor – Block 13 East Façade	64	56
5	7.5	POW – 3rd Floor – Block 14 West Façade	70	63
6	7.5	POW – 3rd Floor – Block 14 South Façade	73	65
7	7.5	POW – 3rd Floor – Block 15 South Façade	73	65
8	7.5	POW – 3rd Floor – Block 15 East Façade	69	61

The results of the current analysis indicate that noise levels will range between 63 and 73 dBA during the daytime period (07:00-23:00) and between 56 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the South façade of Block 14 and 15 (Receptor 6 and 7), which is nearest and most exposed to Baseline Road.

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 4.3.3, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 5):

For Block 12:

- **Bedroom Windows**

(i) Bedroom windows facing west will require a minimum STC of 30

(ii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**

(i) Living room windows facing west will require a minimum STC of 25

(ii) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**

(i) Exterior wall components on the north, east, south and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[10]

For Block 14 and 15:

- **Bedroom Windows**

(iii) Bedroom windows facing west/east will require a minimum STC of 32

(iv) Bedroom windows facing south will require a minimum STC of 35

(v) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**

(iii) Living room windows facing west/east will require a minimum STC of 27

(iv) Living room windows facing south will require a minimum STC of 30

(v) All other living room windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Exterior Walls**

(ii) Exterior wall components on the north, east, south and west façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[11]

The STC requirements apply to windows and doors. Exterior wall components on these façades are recommended to have a minimum STC of 45. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. 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

[10] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

[11] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

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 Block 13 will require forced air heating with provision for central air conditioning. If installed, air conditioning will allow occupants to keep windows closed and maintain a comfortable living environment during the warmer months. For the other blocks (12, 14 & 15) central air conditioning systems will need to be provided by the builder. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6 below.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 63 and 73 dBA during the daytime period (07:00-23:00) and between 56 and 65 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the South façade of Block 14 and 15 (Receptor 6 and 7), which is nearest and most exposed to Baseline Road. Building components with a higher sound transmission class (STC) rating will be required where exterior noise levels exceed 65 dBA, as indicated in Figure 5.

Results of the calculations also indicate that all buildings of the development will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause[12] will also be required to be placed on all Lease, Purchase and Sale Agreements of Block 12, as summarized below:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing roadway traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of the Environment and Climate Change. To help address the need for sound attenuation, this development includes:*
>
> - *STC rated multi-pane glazing elements*
> - *West façade bedroom: 30*

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

- *West façade living room 25*

- *STC rated exterior walls*
  - *west façade: STC 45*

This dwelling unit has been supplied with a central air conditioning system and other measures 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 and the Ministry of the Environment, Conservation and Parks.

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

The following Warning Clause[13] will also be required to be placed on all Lease, Purchase and Sale Agreements of Blocks 13, as summarized below:

"Purchasers/tenants are advised that due to increasing roadway traffic may occasionally interfere with some outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.

To help address the need for sound attenuation, this dwelling unit has also been designed with the provision for adding central air conditioning at the occupant's discretion. This 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 and the Ministry of the Environment, Conservation and Parks.

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

The following Warning Clause[14] will also be required to be placed on all Lease, Purchase and Sale Agreements of Blocks 14 and 15, as summarized below:

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

"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing roadway traffic may, on occasion, interfere with some activities of the dwelling occupants, as the sound levels exceed the sound level limits of the City and the Ministry of the Environment and Climate Change. To help address the need for sound attenuation, this development includes:

- *STC rated multi-pane glazing elements and spandrel panels*
  - *West and East façade bedroom/living room: 32/27*
  - *South façade bedroom/living room: STC 35/30*
- *STC rated exterior walls*
  - *North, east, south and west façade: STC 45*

This dwelling unit has been supplied with a central air conditioning system and other measures 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 and the Ministry of the Environment, Conservation and Parks.

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

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.

Yours truly,

Gradient Wind Engineering Inc.

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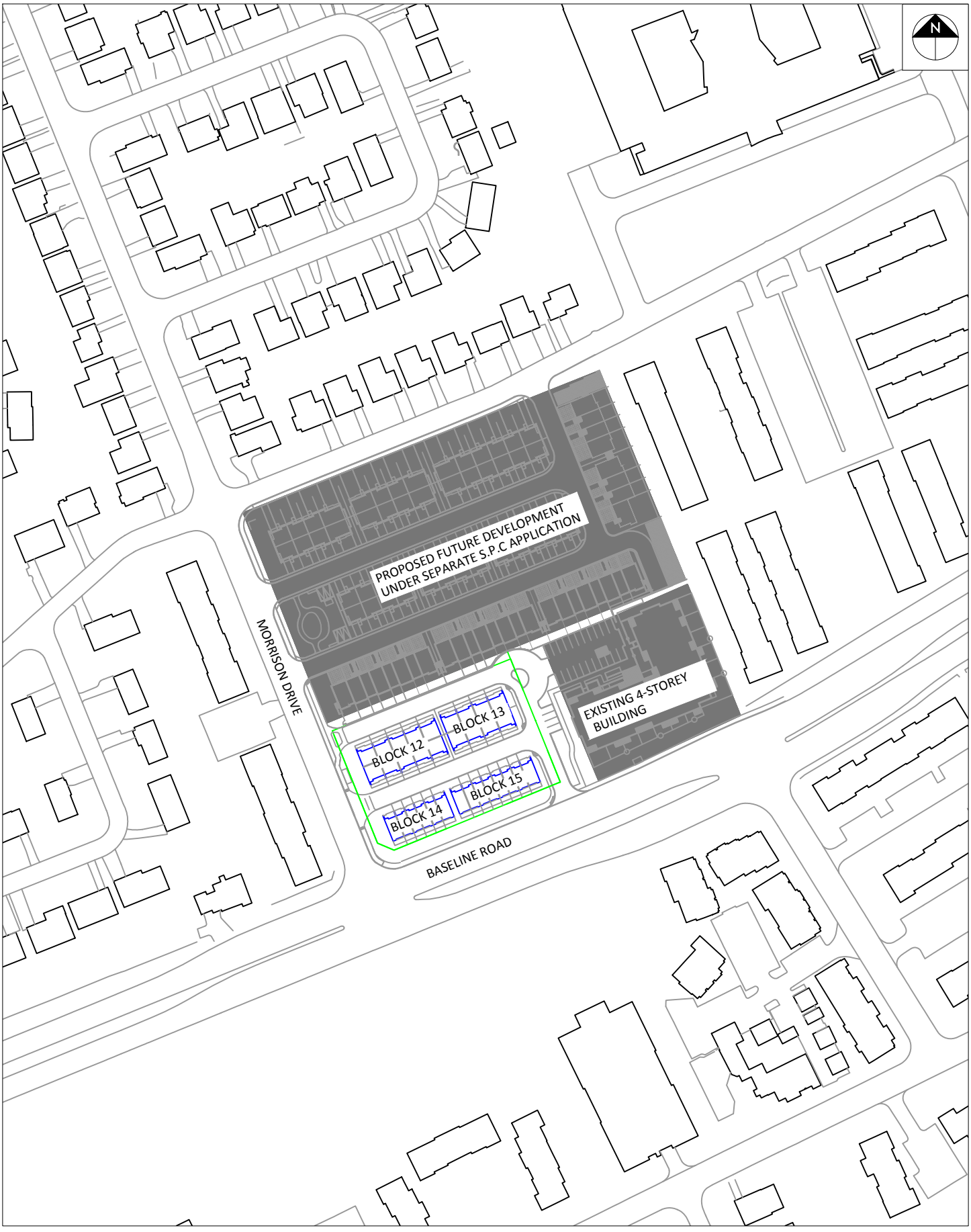


127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	2795 BASELINE ROAD - TRAFFIC NOISE ASSESSMENT		
SCALE	1:2000 (APPROX.)	DRAWING NO.	GWE17-059-1
DATE	NOVEMBER 26, 2019	DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	2795 BASELINE ROAD - TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE17-059-2
DATE	NOVEMBER 26, 2019	DRAWN BY	G.G.

FIGURE 2:
RECEPTOR LOCATION

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

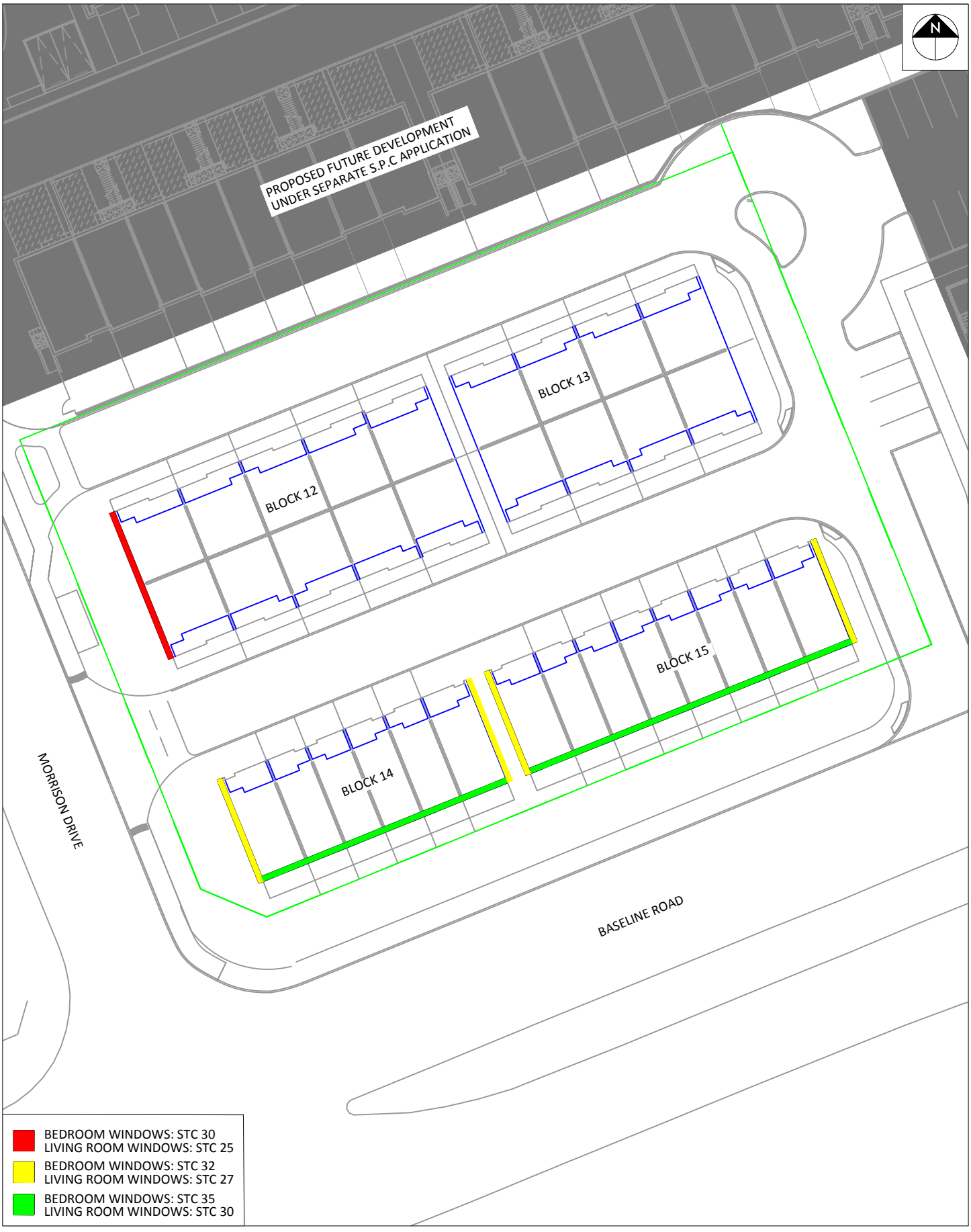
GRADIENT WIND ENGINEERING INC

PROJECT	2795 BASELINE ROAD - TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE17-059-3
DATE	NOVEMBER 26, 2019
DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
RECEPTOR 1,3,6 AND 8 STAMSON INPUT

127 Walgreen Road Ottawa, Ontario (613) 836 0934	PROJECT: 2795 BASELINE ROAD - TRAFFIC NOISE ASSESSMENT		DESCRIPTION: FIGURE 4: RECEPTOR 2,4,5 AND 7 STAMSON INPUT
GRADIENT WIND ENGINEERING INC	SCALE: 1:1000 (APPROX.)	DRAWING NO.: GWE17-059-4	
	DATE: NOVEMBER 26, 2019	DRAWN BY: G.G.	



127 Walgreen Road
Ottawa, Ontario
(613) 836 0934
GRADIENT WIND ENGINEERING INC

PROJECT	2795 BASELINE ROAD - TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GWE17-059-5
DATE	NOVEMBER 26, 2019	DRAWN BY	G.G.

FIGURE 5:
BEDROOM AND LIVING ROOM STC REQUIREMENTS

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:37:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -74.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   45.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  52.00 / 52.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Morrison Dr (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.55 + 0.00) = 63.55 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -74     90   0.00  63.96   0.00   0.00  -0.40   0.00   0.00   0.00
63.55
-------------------------------------------------------------------------------
--

Segment Leq : 63.55 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (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
-------------------------------------------------------------------------
--
     0     45   0.00  75.00   0.00  -5.40  -6.02   0.00   0.00   0.00
63.58
-------------------------------------------------------------------------
--

Segment Leq : 63.58 dBA

Total Leq All Segments: 66.58 dBA


Results segment # 1: Morrison Dr (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.96 + 0.00) = 55.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -74     90   0.00  56.36   0.00   0.00  -0.40   0.00   0.00   0.00
55.96
-------------------------------------------------------------------------
--

Segment Leq : 55.96 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (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
-------------------------------------------------------------------------
--
     0     45   0.00  67.40   0.00  -5.40  -6.02   0.00   0.00   0.00
55.98
-------------------------------------------------------------------------
--

Segment Leq : 55.98 dBA

Total Leq All Segments: 58.98 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 66.58
                           (NIGHT): 58.98
#                       #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:37:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -68.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           :  18.00 deg   53.00 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           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Morrison Dr (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.48 + 0.00) = 58.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -68      0   0.00  63.96   0.00  -1.25  -4.23   0.00   0.00   0.00
58.48
-------------------------------------------------------------------------------
--

Segment Leq : 58.48 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.74 + 0.00) = 62.74 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    18     53   0.00  75.00   0.00  -5.14  -7.11   0.00   0.00   0.00
62.74
-------------------------------------------------------------------------
--

Segment Leq : 62.74 dBA

Total Leq All Segments: 64.12 dBA


Results segment # 1: Morrison Dr (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.89 + 0.00) = 50.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -68      0   0.00  56.36   0.00  -1.25  -4.23   0.00   0.00   0.00
50.89
-------------------------------------------------------------------------
--

Segment Leq : 50.89 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.15 + 0.00) = 55.15 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    18     53   0.00  67.40   0.00  -5.14  -7.11   0.00   0.00   0.00
55.15
-------------------------------------------------------------------------
--

Segment Leq : 55.15 dBA

Total Leq All Segments: 56.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.12
                           (NIGHT): 56.53
#                       #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:37:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -13.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  74.00 / 74.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -55.00 deg   -18.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  48.00 / 48.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Morrison Dr (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.61 + 0.00) = 45.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -13      0   0.00  63.96   0.00  -6.93 -11.41   0.00   0.00   0.00
45.61
-------------------------------------------------------------------------------
--

Segment Leq : 45.61 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.07 + 0.00) = 63.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -55    -18   0.00  75.00   0.00  -5.05  -6.87   0.00   0.00   0.00
63.07
-------------------------------------------------------------------------
--

Segment Leq : 63.07 dBA

Total Leq All Segments: 63.15 dBA

Results segment # 1: Morrison Dr (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 38.02 + 0.00) = 38.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -13      0   0.00  56.36   0.00  -6.93 -11.41   0.00   0.00   0.00
38.02
-------------------------------------------------------------------------
--

Segment Leq : 38.02 dBA

#                       #
```

```
Results segment # 2: Baseline Rd (night)
-----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.48 + 0.00) = 55.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -55    -18   0.00  67.40   0.00  -5.05  -6.87   0.00   0.00   0.00
55.48
-------------------------------------------------------------------------------
--

Segment Leq : 55.48 dBA

Total Leq All Segments: 55.56 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 63.15
                           (NIGHT): 55.56
#                      #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:38:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Baseline Rd (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 # 1: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -46.00 deg   0.00 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           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Results segment # 1: Baseline Rd (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.59 + 0.00) = 63.59 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -46      0   0.00  75.00   0.00  -5.48  -5.93   0.00   0.00   0.00
63.59
-------------------------------------------------------------------------
--

Segment Leq : 63.59 dBA

Total Leq All Segments: 63.59 dBA


Results segment # 1: Baseline Rd (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.99 + 0.00) = 55.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -46      0   0.00  67.40   0.00  -5.48  -5.93   0.00   0.00   0.00
55.99
-------------------------------------------------------------------------
--

Segment Leq : 55.99 dBA

Total Leq All Segments: 55.99 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 63.59
                           (NIGHT): 55.99
#                       #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:38:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -62.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (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  :  27.00 / 27.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  81.00 deg   Angle2 : 90.00 deg
Barrier height            :   8.00 m
Barrier receiver distance :   5.00 / 5.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

#                     #
```

```
Results segment # 1: Morrison Dr (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.22 + 0.00) = 63.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -62     90   0.00  63.96   0.00   0.00  -0.73   0.00   0.00   0.00
63.22
-------------------------------------------------------------------------------
--

Segment Leq : 63.22 dBA


Results segment # 2: Baseline Rd (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 !        7.50 !        6.39 !         6.39

ROAD (68.97 + 53.35 + 0.00) = 69.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     81   0.00  75.00   0.00  -2.55  -3.47   0.00   0.00   0.00
68.97
-------------------------------------------------------------------------------
--
    81     90   0.00  75.00   0.00  -2.55 -13.01   0.00   0.00  -6.08
53.35
-------------------------------------------------------------------------------
--

Segment Leq : 69.09 dBA

Total Leq All Segments: 70.09 dBA

#                     #
```

```
Results segment # 1: Morrison Dr (night)
-----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.63 + 0.00) = 55.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -62     90   0.00  56.36   0.00   0.00  -0.73   0.00   0.00   0.00
55.63
-------------------------------------------------------------------------------
--

Segment Leq : 55.63 dBA


Results segment # 2: Baseline Rd (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 !        7.50 !        6.39 !         6.39

ROAD (61.38 + 45.75 + 0.00) = 61.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     81   0.00  67.40   0.00  -2.55  -3.47   0.00   0.00   0.00
61.38
-------------------------------------------------------------------------------
--
    81     90   0.00  67.40   0.00  -2.55 -13.01   0.00   0.00  -6.08
45.75
-------------------------------------------------------------------------------
--

Segment Leq : 61.50 dBA

Total Leq All Segments: 62.50 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 70.09
                           (NIGHT): 62.50
#                      #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:38:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -50.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -81.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Morrison Dr (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.37 + 0.00) = 57.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -50      0   0.00  63.96   0.00  -1.03  -5.56   0.00   0.00   0.00
57.37
-------------------------------------------------------------------------------
--

Segment Leq : 57.37 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 72.92 + 0.00) = 72.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -81     90   0.00  75.00   0.00  -1.86  -0.22   0.00   0.00   0.00
72.92
-------------------------------------------------------------------------
--

Segment Leq : 72.92 dBA

Total Leq All Segments: 73.04 dBA


Results segment # 1: Morrison Dr (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 49.77 + 0.00) = 49.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -50      0   0.00  56.36   0.00  -1.03  -5.56   0.00   0.00   0.00
49.77
-------------------------------------------------------------------------
--

Segment Leq : 49.77 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (night)
-----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.32 + 0.00) = 65.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -81     90   0.00  67.40   0.00  -1.86  -0.22   0.00   0.00   0.00
65.32
-------------------------------------------------------------------------------
--

Segment Leq : 65.32 dBA

Total Leq All Segments: 65.44 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 73.04
                           (NIGHT): 65.44
#                       #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:38:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Morrison Dr (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  :    40 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 # 1: Morrison Dr (day/night)
---------------------------------------------
Angle1   Angle2           : -17.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  75.00 / 75.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Road data, segment # 2: Baseline Rd (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: Baseline Rd (day/night)
-----------------------------------------------
Angle1   Angle2           : -76.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  23.00 / 23.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Morrison Dr (day)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.72 + 0.00) = 46.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -17      0   0.00  63.96   0.00  -6.99 -10.25   0.00   0.00   0.00
46.72
-------------------------------------------------------------------------------
--

Segment Leq : 46.72 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 72.79 + 0.00) = 72.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -76     90   0.00  75.00   0.00  -1.86  -0.35   0.00   0.00   0.00
72.79
-------------------------------------------------------------------------
--

Segment Leq : 72.79 dBA

Total Leq All Segments: 72.80 dBA


Results segment # 1: Morrison Dr (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 39.12 + 0.00) = 39.12 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -17      0   0.00  56.36   0.00  -6.99 -10.25   0.00   0.00   0.00
39.12
-------------------------------------------------------------------------
--

Segment Leq : 39.12 dBA

#                     #
```

```
Results segment # 2: Baseline Rd (night)
-----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.19 + 0.00) = 65.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -76     90   0.00  67.40   0.00  -1.86  -0.35   0.00   0.00   0.00
65.19
-------------------------------------------------------------------------------
--

Segment Leq : 65.19 dBA

Total Leq All Segments: 65.20 dBA


TOTAL Leq FROM ALL SOURCES (DAY): 72.80
                           (NIGHT): 65.20
#                      #
```

```
STAMSON 5.0        NORMAL REPORT        Date: 17-12-2018 15:38:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Baseline Rd (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 # 1: Baseline Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -80.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :   7.50 / 7.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#                     #
```

```
Results segment # 1: Baseline Rd (day)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 68.92 + 0.00) = 68.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -80      0   0.00  75.00   0.00  -2.55  -3.52   0.00   0.00   0.00
68.92
-------------------------------------------------------------------------
--

Segment Leq : 68.92 dBA

Total Leq All Segments: 68.92 dBA


Results segment # 1: Baseline Rd (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.32 + 0.00) = 61.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -80      0   0.00  67.40   0.00  -2.55  -3.52   0.00   0.00   0.00
61.32
-------------------------------------------------------------------------
--

Segment Leq : 61.32 dBA

Total Leq All Segments: 61.32 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 68.92
                           (NIGHT): 61.32
```