Roadway Traffic Noise Feasibility Assessment

2159 Mer Bleue Road

Ottawa, Ontario

REPORT: GWE17-185 - Traffic Noise Feasibility

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EXECUTIVE SUMMARY

This document describes a traffic noise feasibility assessment of the proposed multi-building development located at 2159 Mer Bleue Road in Ottawa, Ontario. The initial draft plan being considered, comprises of approximately 10 buildings. However, the road network and arrangement of land uses may be subject to change through the development approval process. The major sources of roadway noise are Mer Bleue Road the future Vanguard Road collector running north of the site. 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 and Climate Change (MOECC) 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) concept plan of the development received from Holzman Consultants Inc dated July 26, 2017.

As the site plan may be subject to change, GWE took the approach to establish noise contours around the site. The contours, based on the City of Ottawa noise criteria, were used to determine what level of noise control for various areas on site would be required. No building massing considerations are included in the calculations to serve as potential screening elements other than existing buildings and homes. The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 52 and 73 dBA during the daytime period (07:00-23:00). The highest roadway traffic noise levels will occur nearest to Mer Bleue Road.

Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within approximately 130 metres of the existing arterial roadway, may require noise control measures. These measures are in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible. Based on the current concept plan, this would include buffering noise sensitive residential and retirement homes with retail buildings.

A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Holzman Consultants Inc. to undertake a roadway traffic noise feasibility assessment of the proposed multi-building development located at 2159 Mer Bleue Road in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a roadway traffic noise feasibility assessment, and was prepared in support of the Zoning By-law Amendment. GWE's scope of work involved assessing exterior noise levels throughout the site, generated by local roadway traffic. The report also quantitatively addresses any potential noise impacts. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment and Climate Change[2] guidelines. Noise calculations were based on an initial concept plan received from Holzman Consultants 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 feasibility assessment is a proposed multi-building development located at 2159 Mer Bleue Road in Ottawa, Ontario. The concept plan is expected to comprise parcels for retail use, residential use, a retired living residence and a sports complex. Mer Bleue Road is located directly west of the proposed development. The noise sensitive components of the proposed development are buffered by retail buildings adjacent to Mer Bleue Road. The study site is surrounded in the near-field by low-rise developments to the north and south, and vacant land to the northeast and southeast. Beyond 100-metres of vacant land to the southeast, low-rise residential developments are located. The closest residential areas to the site are existing dwellings north and south of the proposed development fronting onto Mer Bleue Road. Figure 1 illustrates a site plan with the surrounding context. As the residential areas proposed are multi-storey building developments, including retirement homes and short-term residential uses, Outdoor Living Areas (OLA) are not expected to be provided as part of this development.

Due to the current state of the development, the final site configuration is uncertain and may be subject to change. Therefore, GWE took the approach to establish noise contours around the site as per the concept plan. The contours, based on the City of Ottawa noise criteria, were used to determine what level

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Publication NPC-300

of noise control would be required for various areas on site. No massing considerations are included in the calculations to serve as potential screening elements other than existing buildings and homes.

Based on the City of Ottawa's Official Plan Schedule E, the major sources of roadway noise are Mer Bleue Road west of the development, and the future Vanguard Road Collector north of the development. There are no other planned Collectors, Major Collectors, or Arterial roadways interior of the site, therefore all local roadways internal to the site have been treated as local roads, which are considered insignificant sources of noise and were not included in the analysis.

3. OBJECTIVES

The principal objective of this work is to calculate the future noise levels on the study site produced by local roadway traffic and explore potential for noise mitigation where required.

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise

Control Guidelines (ENCG) specifies that the recommended Outdoor Living Area (OLA) noise limit is 55 dBA during the daytime period. OLA do not need to be considered during the nighttime period.

Predicted noise levels at the outdoor living area dictate the action required to achieve the recommended sound levels. According to the ENCG, if an area is to be used as an outdoor living area (OLA), noise control measures are required to reduce the L_{eq} to 55 dBA. This is typically done with noise control measures outlined in Section 5.2. When noise levels at these areas exceed the criteria, specific Warning Clause requirements may apply. As this is a preliminary assessment, noise control recommendations are of a general nature; specific mitigation requirements would be the work of a future study.

4.3 Roadway Noise Assessment

4.3.1 Theoretical Roadway Traffic Noise Predictions

Noise predictions were determined by computer modelling using two programs. To provide a general sense of noise across the site, the software program *Predictor-Lima*, which incorporates the United States Federal Highway Administration's (FHWA) Transportation Noise Model (TNM) 2.5. This computer program is capable of representing three-dimensional surface and first reflections of sound waves over a suitable spectrum for human hearing. A receptor grid with 5 × 5 m spacing was placed across the study site, along with a number of discrete receptors at key sensitive areas. This program outputs noise contours, however, is not the approved model for roadway predictions by the City of Ottawa. Therefore, the results were confirmed by performing discrete noise calculations with the Ministry of the Environment and Climate Change's (MOECC) computerized noise assessment program, STAMSON 5.04, at key receptor locations coinciding with receptor locations in Predictor as shown in Figure 2. Appendix A includes the STAMSON 5.04 input and output data.

Roadway noise calculations were performed by treating each road segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 1, 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
- Grassland is taken as absorptive ground, while hard ground and existing roadways are taken as reflective ground

- The study site was treated as having flat or gently sloping topography
- No building massing considered in calculations, other than existing dwellings

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[3] (TMP) which provides 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 1 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Mer Bleu Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**
Proposed Vanguard Road	2-Lane Collector (2-UCU)	50	**8,000**

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations for the daytime period are shown in Figure 3-4 respectively, which cover the entire study site. Discrete receptors were also placed at ground level at key locations throughout the site. The noise contours were generated using *Predictor-Lima* and verified with discrete receptors using STAMSON 5.04 as shown in Figure 3-4 and summarized in Table 2 below. Receptors 1-4 are located near Mer Bleue Road, with Receptor 4 being nearest to the future Vanguard Road Collector. Receptors 5-6 are located near Vanguard Road. Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations.

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

TABLE 2: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Location	STAMSON 5.04 Noise Level (dBA)	Predictor-Lima Noise Level (dBA)
		Day (07:00-23:00)	Day (07:00-23:00)
1	Southwest corner	59	61
2	Western Side	73	70
3	Western Side	73	70
4	Northwest Corner	60	61
5	Central	54	56
6	Eastern Side	52	52

As shown above, the results calculated from *Predictor-Lima* generally have good correlation with calculations performed in STAMSON 5.04. A tolerance of 3 dBA between models is generally considered acceptable given human hearing cannot detect a change in sound level of less than 3 dBA. Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within approximately 130 metres of the existing arterial roadway, may require noise control measures. These measures are in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible.

5.2 Summary of Noise Control Measures

The OLA noise levels predicted due to roadway traffic, at a number of locations, exceed the criteria listed in the ENCG for outdoor living areas, as discussed in Section 4.2. Therefore, noise control measures as described below from Table 2.3a in the ENCG, in order of preference, will be required to reduce the L_{eq} to 55 dBA:

- Distance setback with soft ground
- Insertion of noise insensitive land uses between the source and sensitive points of reception
- Orientation of buildings to provide sheltered zones in rear yards
- Shared outdoor amenity areas
- Earth berms (sound barriers)
- Acoustic barriers

Examining the noise control measures listed above, and based on the current concept plan, noise sensitive residential and retirement homes are buffered by retail buildings. The next feasible measures are distance setback between the source and sensitive points of reception. Otherwise, the insertion of sound barriers (earth berms or acoustic) are the recommended control measure. The use of earth berms or acoustic barriers will depend on the grading plan when it becomes available. These options can reduce OLA noise levels to 55 dBA.

Regarding Figure 3-4, the area(s) with noise levels under 55 dBA (yellow and light orange) have no ventilation or mitigation requirements. The area(s) with noise levels between 55 and 65 dBA (orange and red) require forced air heating with provision for central air conditioning with an applicable generic Warning Clause. Finally, the area(s) that represent noise levels above 65 dBA (maroon) require central air conditioning with an applicable extensive mitigation Warning Clause. Figure 3-4 illustrate the blocks where noise control measures are expected to be required.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 52 and 73 dBA during the daytime period (07:00-23:00). The highest roadway traffic noise levels will occur nearest to Mer Bleue Road.

Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within approximately 130 metres of the existing arterial roadway, may require noise control measures. These measures are in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible. Based on the current concept plan, this would include buffering noise sensitive residential and retirement homes with retail buildings.

A detailed roadway traffic noise study will be required at the time of site plan approval to determine specific noise control measures for the development.

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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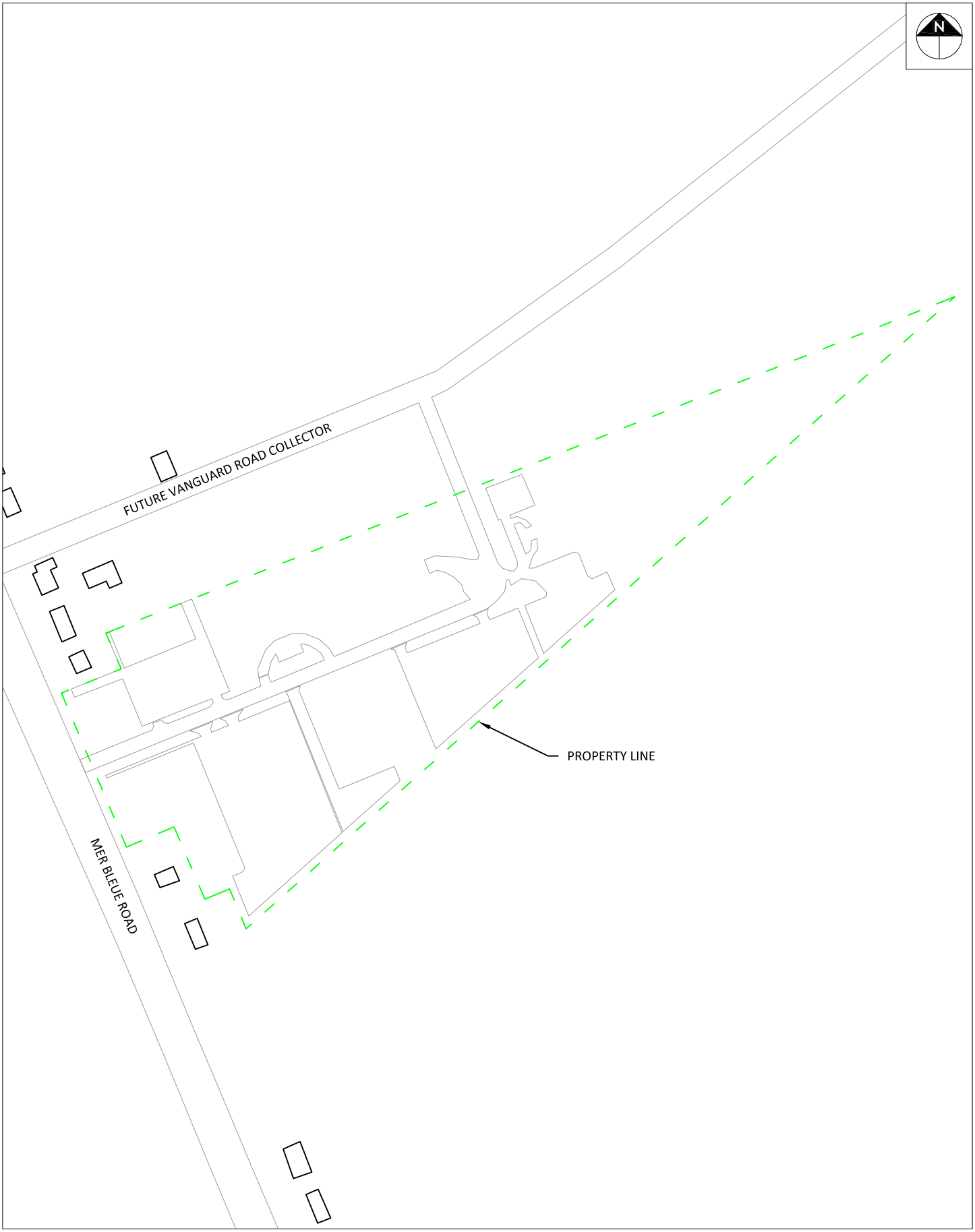

127 Walgreen Road
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GRADIENT WIND ENGINEERING INC

PROJECT	2159 MER BLEUE ROAD - TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:3000 (APPROX.)
DRAWING NO.	GWE17-185-1
DATE	DECEMBER 18, 2017
DRAWN BY	O.D.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	2159 MER BLEUE ROAD - TRAFFIC NOISE FEASIBILITY ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE17-185-2
DATE	DECEMBER 18, 2017
DRAWN BY	O.D.
DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS

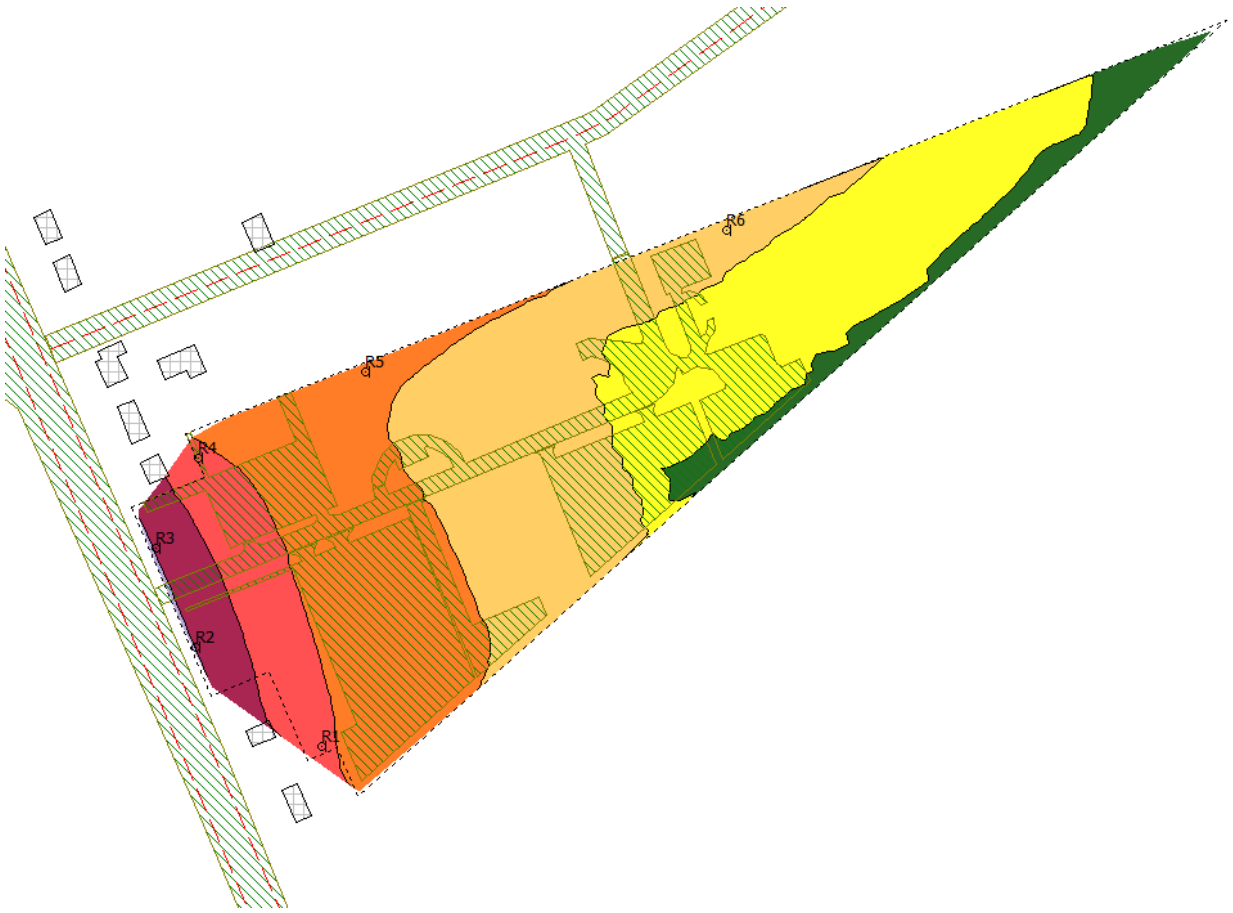

FIGURE 3: GROUND LEVEL NOISE CONTOURS (DAYTIME PERIOD)

80 – 85 dB
75 – 80 dB
70 – 75 dB
65 – 70 dB
60 – 65 dB
55 – 60 dB
50 – 55 dB
45 – 50 dB
40 – 45 dB
35 – 40 dB
0 – 35 dB

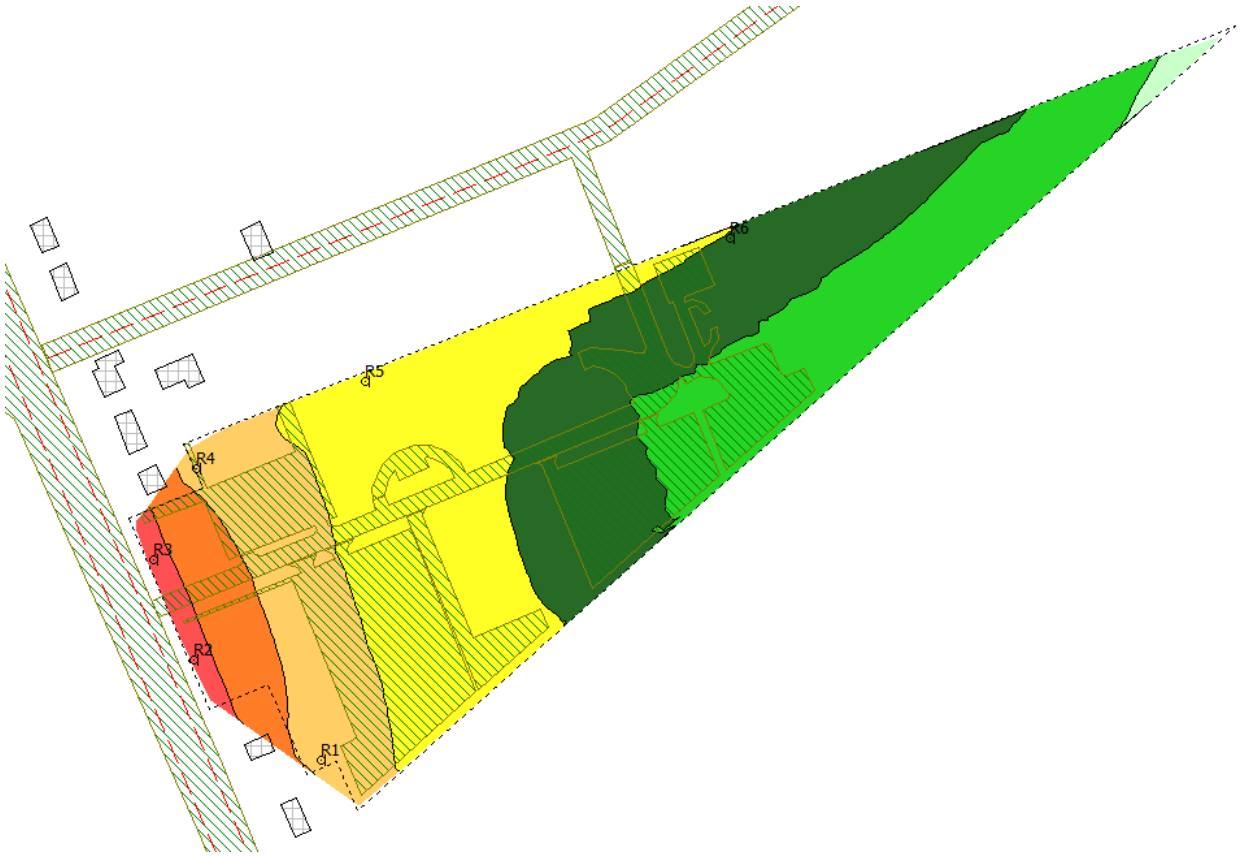

FIGURE 4: GROUND LEVEL NOISE CONTOURS (NIGHTTIME PERIOD)

APPENDIX A

TRAFFIC MODELLING INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:58:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Mer BleueN (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer BleueN (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   23.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -25.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  26.00 / 26.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Mer BleueN2 (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer BleueN2 (day/night)
---------------------------------------------
Angle1   Angle2           :  23.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  23.00 deg   Angle2 : 49.00 deg
Barrier height            :   9.00 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
```

```
Road data, segment # 3: Mer BleueS (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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 # 3: Mer BleueS (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   23.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.00 / 63.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 23.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  26.00 / 26.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 4: Mer BleueS2 (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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 # 4: Mer BleueS2 (day/night)
---------------------------------------------
Angle1   Angle2           :  23.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.00 / 63.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  23.00 deg   Angle2 : 49.00 deg
Barrier height            :   9.00 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: Mer BleueN (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 45.64 + 56.16) = 56.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -25   0.24  70.67   0.00  -6.48  -5.31   0.00   0.00 -13.23  45.64
-------------------------------------------------------------------------------
   -25     23   0.66  70.67   0.00  -8.68  -5.83   0.00   0.00   0.00  56.16
-------------------------------------------------------------------------------

Segment Leq : 56.53 dBA


Results segment # 2: Mer BleueN2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 36.36 + 52.29) = 52.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    23     49   0.12  70.67   0.00  -5.86  -8.52   0.00   0.00 -19.93  36.36
-------------------------------------------------------------------------------
    49     90   0.66  70.67   0.00  -8.68  -9.70   0.00   0.00   0.00  52.29
-------------------------------------------------------------------------------

Segment Leq : 52.40 dBA
```

```
Results segment # 3: Mer BleueS (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 46.35 + 0.00) = 46.35 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     23   0.24  70.67   0.00  -7.73  -2.53   0.00   0.00 -14.06  46.35
-------------------------------------------------------------------------------

Segment Leq : 46.35 dBA


Results segment # 4: Mer BleueS2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 36.07 + 50.62) = 50.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    23     49   0.12  70.67   0.00  -6.98  -8.52   0.00   0.00 -19.09  36.07
-------------------------------------------------------------------------------
    49     90   0.66  70.67   0.00 -10.35  -9.70   0.00   0.00   0.00  50.62
-------------------------------------------------------------------------------

Segment Leq : 50.77 dBA

Total Leq All Segments: 58.95 dBA
```

```
Results segment # 1: Mer BleueN (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 38.04 + 48.56) = 48.93 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -25   0.24  63.07   0.00  -6.48  -5.31   0.00   0.00 -13.23  38.04
-------------------------------------------------------------------------------
   -25     23   0.66  63.07   0.00  -8.68  -5.83   0.00   0.00   0.00  48.56
-------------------------------------------------------------------------------

Segment Leq : 48.93 dBA


Results segment # 2: Mer BleueN2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 28.76 + 44.69) = 44.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    23     49   0.12  63.07   0.00  -5.86  -8.52   0.00   0.00 -19.93  28.76
-------------------------------------------------------------------------------
    49     90   0.66  63.07   0.00  -8.68  -9.70   0.00   0.00   0.00  44.69
-------------------------------------------------------------------------------

Segment Leq : 44.80 dBA
```

```
Results segment # 3: Mer BleueS (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 38.75 + 0.00) = 38.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     23   0.24  63.07   0.00  -7.73  -2.53   0.00   0.00 -14.06  38.75
-------------------------------------------------------------------------------

Segment Leq : 38.75 dBA


Results segment # 4: Mer BleueS2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 28.48 + 43.03) = 43.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    23     49   0.12  63.07   0.00  -6.98  -8.52   0.00   0.00 -19.09  28.48
-------------------------------------------------------------------------------
    49     90   0.66  63.07   0.00 -10.35  -9.70   0.00   0.00   0.00  43.03
-------------------------------------------------------------------------------

Segment Leq : 43.18 dBA

Total Leq All Segments: 51.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.95
                           (NIGHT): 51.36
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:59:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Mer Bleue N (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer Bleue N (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Mer Bleue S (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer Bleue S (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  :  26.00 / 26.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Mer Bleue N (day)

Source height = 1.50 m

ROAD (0.00 + 70.67 + 0.00) = 70.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.67	0.00	0.00	0.00	0.00	0.00	0.00	70.67

Segment Leq : 70.67 dBA

Results segment # 2: Mer Bleue S (day)

Source height = 1.50 m

ROAD (0.00 + 68.28 + 0.00) = 68.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.67	0.00	-2.39	0.00	0.00	0.00	0.00	68.28

Segment Leq : 68.28 dBA

Total Leq All Segments: 72.65 dBA

```
Results segment # 1: Mer Bleue N (night)
----------------------------------------

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
-------------------------------------------------------------------------------
   -90     90   0.00  63.07   0.00   0.00   0.00   0.00   0.00   0.00  63.07
-------------------------------------------------------------------------------

Segment Leq : 63.07 dBA


Results segment # 2: Mer Bleue S (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.68 + 0.00) = 60.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.07   0.00  -2.39   0.00   0.00   0.00   0.00  60.68
-------------------------------------------------------------------------------

Segment Leq : 60.68 dBA

Total Leq All Segments: 65.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.65
                           (NIGHT): 65.05
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:59:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Mer Bleue N (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer Bleue N (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Mer Bleue S (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer Bleue S (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  27.00 / 27.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

Results segment # 1: Mer Bleue N (day)

Source height = 1.50 m

ROAD (0.00 + 70.67 + 0.00) = 70.67 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.67	0.00	0.00	0.00	0.00	0.00	0.00	70.67

Segment Leq : 70.67 dBA

Results segment # 2: Mer Bleue S (day)

Source height = 1.50 m

ROAD (0.00 + 68.11 + 0.00) = 68.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.67	0.00	-2.55	0.00	0.00	0.00	0.00	68.11

Segment Leq : 68.11 dBA

Total Leq All Segments: 72.59 dBA

```
Results segment # 1: Mer Bleue N (night)
----------------------------------------

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
-------------------------------------------------------------------------------
   -90     90   0.00  63.07   0.00   0.00   0.00   0.00   0.00   0.00  63.07
-------------------------------------------------------------------------------

Segment Leq : 63.07 dBA


Results segment # 2: Mer Bleue S (night)
----------------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.52 + 0.00) = 60.52 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.00  63.07   0.00  -2.55   0.00   0.00   0.00   0.00  60.52
-------------------------------------------------------------------------------

Segment Leq : 60.52 dBA

Total Leq All Segments: 64.99 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.59
                           (NIGHT): 64.99
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:59:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Mer BleueN (day/night)
----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer BleueN (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   34.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -7.00 deg   Angle2 : 28.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  26.00 / 26.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: Mer BleueN2 (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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: Mer BleueN2 (day/night)
---------------------------------------------
Angle1   Angle2           :  34.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  50.00 / 50.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  34.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 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
```

```
Road data, segment # 3: Mer BleueS (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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 # 3: Mer BleueS (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   34.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.00 / 63.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -7.00 deg   Angle2 : 28.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :  26.00 / 26.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 4: Mer BleueS2 (day/night)
-----------------------------------------------
Car traffic volume  : 14168/1232  veh/TimePeriod  *
Medium truck volume :  1127/98    veh/TimePeriod  *
Heavy truck volume  :   805/70    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):  17500
    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 # 4: Mer BleueS2 (day/night)
---------------------------------------------
Angle1   Angle2           :  34.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.00 / 63.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  34.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 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
```

```
Road data, segment # 5: Vanguard 1 (day/night)
-----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 5: Vanguard 1 (day/night)
--------------------------------------------
Angle1   Angle2           : -32.00 deg   -1.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  75.00 / 75.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -32.00 deg   Angle2 : -12.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  66.00 / 66.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 6: Vanguard 2 (day/night)
-----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 6: Vanguard 2 (day/night)
--------------------------------------------
Angle1   Angle2           :  -1.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  75.00 / 75.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -1.00 deg   Angle2 : 27.00 deg
Barrier height            :   4.00 m
Barrier receiver distance :  51.00 / 51.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Mer BleueN (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 !        1.50 !        1.50 !         1.50

ROAD (57.02 + 41.97 + 46.77) = 57.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -7   0.66  70.67   0.00  -8.68  -4.97   0.00   0.00   0.00  57.02
-------------------------------------------------------------------------------
    -7     28   0.36  70.67   0.00  -7.11  -7.16   0.00   0.00 -14.42  41.97
-------------------------------------------------------------------------------
    28     34   0.66  70.67   0.00  -8.68 -15.21   0.00   0.00   0.00  46.77
-------------------------------------------------------------------------------

Segment Leq : 57.53 dBA


Results segment # 2: Mer BleueN2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 46.69 + 0.00) = 46.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    34     90   0.36  70.67   0.00  -7.11  -6.54   0.00   0.00 -10.32  46.69
-------------------------------------------------------------------------------

Segment Leq : 46.69 dBA
```

```
Results segment # 3: Mer BleueS (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 !        1.50 !        1.50 !         1.50

ROAD (55.35 + 41.44 + 45.11) = 55.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -7   0.66  70.67   0.00 -10.35  -4.97   0.00   0.00   0.00  55.35
-------------------------------------------------------------------------------
    -7     28   0.36  70.67   0.00  -8.48  -7.16   0.00   0.00 -13.59  41.44
-------------------------------------------------------------------------------
    28     34   0.66  70.67   0.00 -10.35 -15.21   0.00   0.00   0.00  45.11
-------------------------------------------------------------------------------

Segment Leq : 55.90 dBA


Results segment # 4: Mer BleueS2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 46.08 + 0.00) = 46.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    34     90   0.36  70.67   0.00  -8.48  -6.54   0.00   0.00  -9.56  46.08
-------------------------------------------------------------------------------

Segment Leq : 46.08 dBA
```

```
Results segment # 5: Vanguard 1 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 32.86 + 41.99) = 42.49 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -32    -12   0.42  65.75   0.00  -9.93  -9.69   0.00   0.00 -13.28  32.86
-------------------------------------------------------------------------------
   -12     -1   0.66  65.75   0.00 -11.60 -12.16   0.00   0.00   0.00  41.99
-------------------------------------------------------------------------------

Segment Leq : 42.49 dBA


Results segment # 6: Vanguard 2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 36.95 + 47.39) = 47.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -1     27   0.42  65.75   0.00  -9.93  -8.15   0.00   0.00 -10.73  36.95
-------------------------------------------------------------------------------
    27     90   0.66  65.75   0.00 -11.60  -6.75   0.00   0.00   0.00  47.39
-------------------------------------------------------------------------------

Segment Leq : 47.77 dBA

Total Leq All Segments: 60.49 dBA
```

```
Results segment # 1: Mer BleueN (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 !        1.50 !        1.50 !         1.50

ROAD (49.42 + 34.37 + 39.17) = 49.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -7   0.66  63.07   0.00  -8.68  -4.97   0.00   0.00   0.00  49.42
-------------------------------------------------------------------------------
    -7     28   0.36  63.07   0.00  -7.11  -7.16   0.00   0.00 -14.42  34.37
-------------------------------------------------------------------------------
    28     34   0.66  63.07   0.00  -8.68 -15.21   0.00   0.00   0.00  39.17
-------------------------------------------------------------------------------

Segment Leq : 49.94 dBA


Results segment # 2: Mer BleueN2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 39.09 + 0.00) = 39.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    34     90   0.36  63.07   0.00  -7.11  -6.54   0.00   0.00 -10.32  39.09
-------------------------------------------------------------------------------

Segment Leq : 39.09 dBA
```

```
Results segment # 3: Mer BleueS (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 !        1.50 !        1.50 !         1.50

ROAD (47.76 + 33.84 + 37.51) = 48.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     -7   0.66  63.07   0.00 -10.35  -4.97   0.00   0.00   0.00  47.76
-------------------------------------------------------------------------------
    -7     28   0.36  63.07   0.00  -8.48  -7.16   0.00   0.00 -13.59  33.84
-------------------------------------------------------------------------------
    28     34   0.66  63.07   0.00 -10.35 -15.21   0.00   0.00   0.00  37.51
-------------------------------------------------------------------------------

Segment Leq : 48.31 dBA


Results segment # 4: Mer BleueS2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 38.48 + 0.00) = 38.48 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    34     90   0.36  63.07   0.00  -8.48  -6.54   0.00   0.00  -9.56  38.48
-------------------------------------------------------------------------------

Segment Leq : 38.48 dBA
```

```
Results segment # 5: Vanguard 1 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 25.26 + 34.39) = 34.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -32    -12   0.42  58.16   0.00  -9.93  -9.69   0.00   0.00 -13.28  25.26
-------------------------------------------------------------------------------
   -12     -1   0.66  58.16   0.00 -11.60 -12.16   0.00   0.00   0.00  34.39
-------------------------------------------------------------------------------

Segment Leq : 34.89 dBA


Results segment # 6: Vanguard 2 (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 !        1.50 !        1.50 !         1.50

ROAD (0.00 + 29.35 + 39.80) = 40.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -1     27   0.42  58.16   0.00  -9.93  -8.15   0.00   0.00 -10.73  29.35
-------------------------------------------------------------------------------
    27     90   0.66  58.16   0.00 -11.60  -6.75   0.00   0.00   0.00  39.80
-------------------------------------------------------------------------------

Segment Leq : 40.18 dBA

Total Leq All Segments: 52.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.49
                           (NIGHT): 52.90
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:59:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Vanguard Rd (day/night)
-----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Vanguard Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  67.00 / 67.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 53.50 + 0.00) = 53.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  65.75   0.00 -10.79  -1.46   0.00   0.00   0.00  53.50
-------------------------------------------------------------------------------

Segment Leq : 53.50 dBA

Total Leq All Segments: 53.50 dBA

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

Source height = 1.50 m

ROAD (0.00 + 45.91 + 0.00) = 45.91 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90     90   0.66  58.16   0.00 -10.79  -1.46   0.00   0.00   0.00  45.91
-------------------------------------------------------------------------------

Segment Leq : 45.91 dBA

Total Leq All Segments: 45.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.50
                           (NIGHT): 45.91
```

```
STAMSON 5.0        NORMAL REPORT        Date: 12-12-2017 11:59:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Vanguard Rd (day/night)
-----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Vanguard Rd (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   -21.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  73.00 / 73.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: Vanguard Rd2 (day/night)
-----------------------------------------------
Car traffic volume  :  6477/563   veh/TimePeriod  *
Medium truck volume :   515/45    veh/TimePeriod  *
Heavy truck volume  :   368/32    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):   8000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 2: Vanguard Rd2 (day/night)
-----------------------------------------------
Angle1   Angle2           :  11.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  76.00 / 76.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Vanguard Rd (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.19 + 0.00) = 48.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -21   0.66  65.75   0.00 -11.41  -6.15   0.00   0.00   0.00  48.19
-------------------------------------------------------------------------------

Segment Leq : 48.19 dBA
```

```
Results segment # 2: Vanguard Rd2 (day)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.77 + 0.00) = 48.77 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    11     90   0.66  65.75   0.00 -11.70  -5.28   0.00   0.00   0.00  48.77
-------------------------------------------------------------------------------

Segment Leq : 48.77 dBA

Total Leq All Segments: 51.50 dBA


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

Source height = 1.50 m

ROAD (0.00 + 40.60 + 0.00) = 40.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90    -21   0.66  58.16   0.00 -11.41  -6.15   0.00   0.00   0.00  40.60
-------------------------------------------------------------------------------

Segment Leq : 40.60 dBA


Results segment # 2: Vanguard Rd2 (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 41.18 + 0.00) = 41.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    11     90   0.66  58.16   0.00 -11.70  -5.28   0.00   0.00   0.00  41.18
-------------------------------------------------------------------------------

Segment Leq : 41.18 dBA

Total Leq All Segments: 43.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.50
                           (NIGHT): 43.91
```