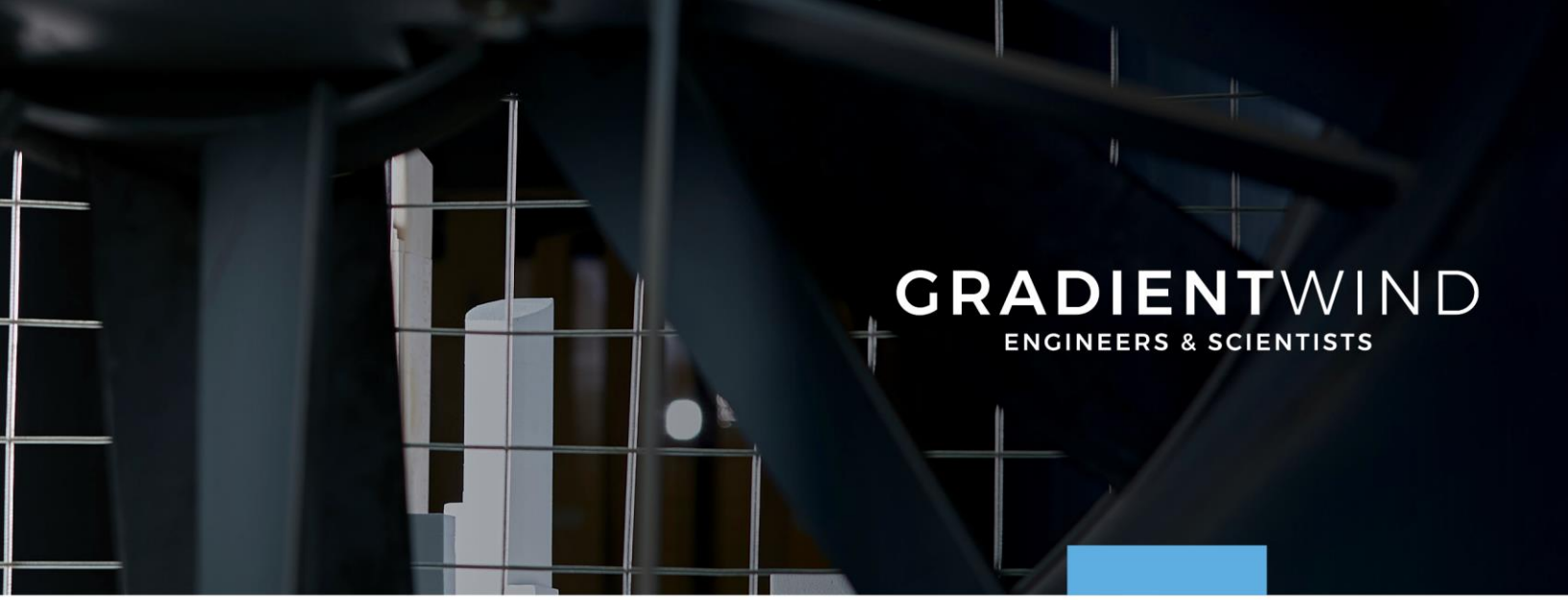

GRADIENTWIND
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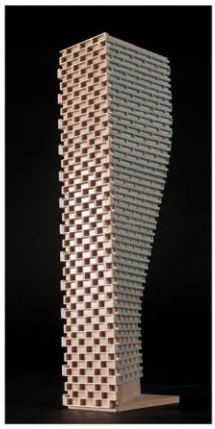
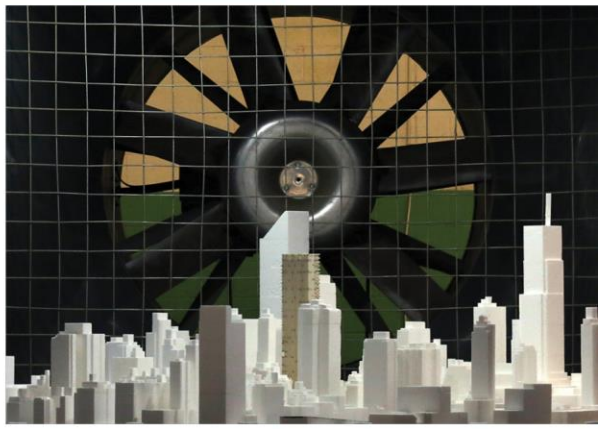
ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT

7000 Campeau Drive
Ottawa, Ontario

GRADIENT WIND REPORT: GW18-135 – Traffic Noise R2





May 14, 2020

PREPARED FOR

Beth Henderson
Senior Land Development Manager
Minto Communities - Canada
200-180 Kent Street
Ottawa, ON
K1P 0B6

On behalf of
ClubLink Corporation ULC

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist
Joshua Foster, P.Eng., Principal

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment in support of rezoning and draft plan of subdivision approval for a proposed residential development at 7000 Campeau Drive in Ottawa, Ontario. The proposed project comprises redevelopment of golf course lands for medium density, detached and townhouse residences located within an existing residential community. The development will include creation of new residential local streets feeding into existing collector corridors, as well as parks and water retention ponds. The major sources of traffic noise, existing and future, are Campeau Drive, Knudson Drive, Kanata Avenue, Weslock Way, and Beaverbrook Road. Since the development is within an existing residential area there are no significant stationary sources of noise impacting the development, nor are there any significant sources of stationary noise planned for the development. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) 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 drawings provided by Minto Communities in May 2020.

The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 30 and 70 dBA during the daytime period (07:00-23:00). The highest roadway traffic noise levels will occur nearest to the considered roadways. Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within close proximity of the existing arterial and collector roadways may require noise control measures. These measures are identified in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Minto Communities on behalf of ClubLink Corporation ULC to undertake a roadway traffic noise feasibility assessment in support of rezoning and draft plan of subdivision for a proposed residential development at 7000 Campeau Drive in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local roadway traffic.

Our work is based on 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 concept drawings provided by Minto Communities in May 2020, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed project comprises redevelopment of golf course lands for medium density, detached and townhouse residences located within an existing residential community. The development will include creation of new residential streets feeding into existing collector corridors, as well as parks and water retention ponds. The major sources of traffic noise, existing and future, are Campeau Drive, Knudson Drive, Kanata Avenue, Weslock Way, and Beaverbrook Road. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 of this report.

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

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.

4.2.2 Theoretical Roadway 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, was used. 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 MECP 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
- Absorptive/reflective ground surface based on intermediate ground characteristics
- The study site was treated as having flat or gently sloping topography
- Existing buildings included to consider blockage

4.2.3 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes for future conditions are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[3] which provide additional details on future roadway expansions. Average Annual Daily Traffic

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

(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	Type	Speed (km/h)	Future AADT
Campeau Drive	2-UAU	50	**15,000**
Kanata Avenue	2-UMCU	50	**12,000**
Walden Drive	2-UCU	40	**8,000**
Weslock Way	2-UCU	40	**8,000**
Beaverbrook Road	2-UCU	40	**8,000**
Knudson Drive	2-UCU	40	**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 Figures 3 and 4 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 2 and 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 ROADWAY TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	STAMSON 5.04 Noise Level (dBA)		Predictor-Lima Noise Level (dBA)	
		Day	Night	Day	Night
1	1.5	56	48	58	50
2	1.5	57	50	59	51
3	1.5	40	32	35	27

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 for receptors with full exposure, given human hearing cannot detect a change in sound level of less than 3 dBA. The way in which these programs model barriers can result in some variance. Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within proximity of the considered roadways may require noise control measures. These measures are identified 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 receptors, 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

By siding lots onto the collector and arterial roadways the extent of barriers are minimized. The use of earth berms or acoustic barriers will depend on the grading plan when it becomes available. Both options can reduce OLA noise levels to below 55 dBA.

Regarding Figures 3 and 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 red) require central air conditioning with an applicable extensive mitigation Warning Clause.

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 30 and 70 dBA during the daytime period (07:00-23:00). The highest roadway traffic noise levels will occur nearest to the considered roadways. Results of the roadway traffic noise calculations also indicate that outdoor living areas having direct exposure to the noise sources that are within close proximity of the existing arterial and collector roadways may require noise control measures. These measures are identified in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically, and administratively feasible.

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

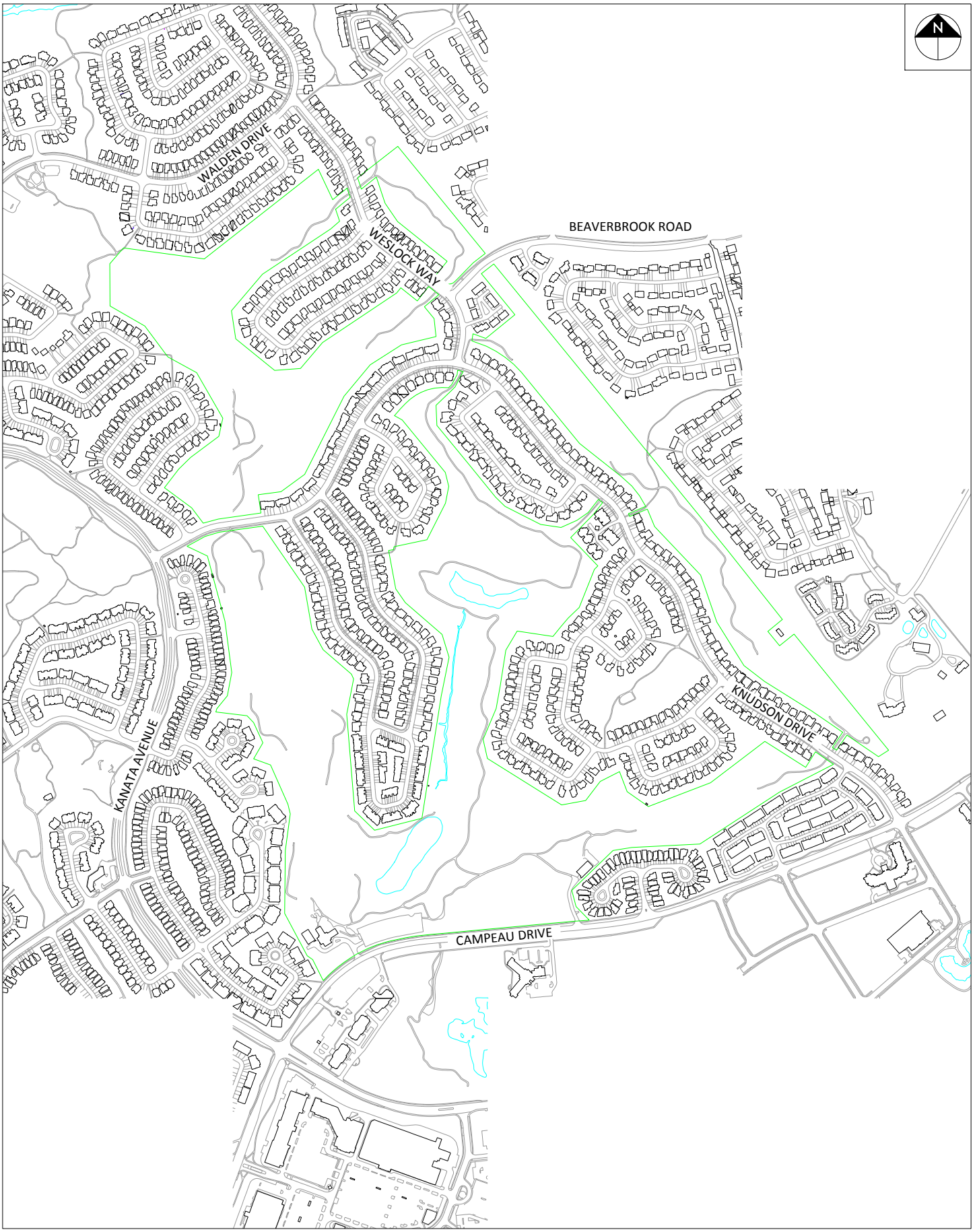
Sincerely,

Gradient Wind Engineering Inc.

Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind Project #: 18-135 – Traffic Noise R2



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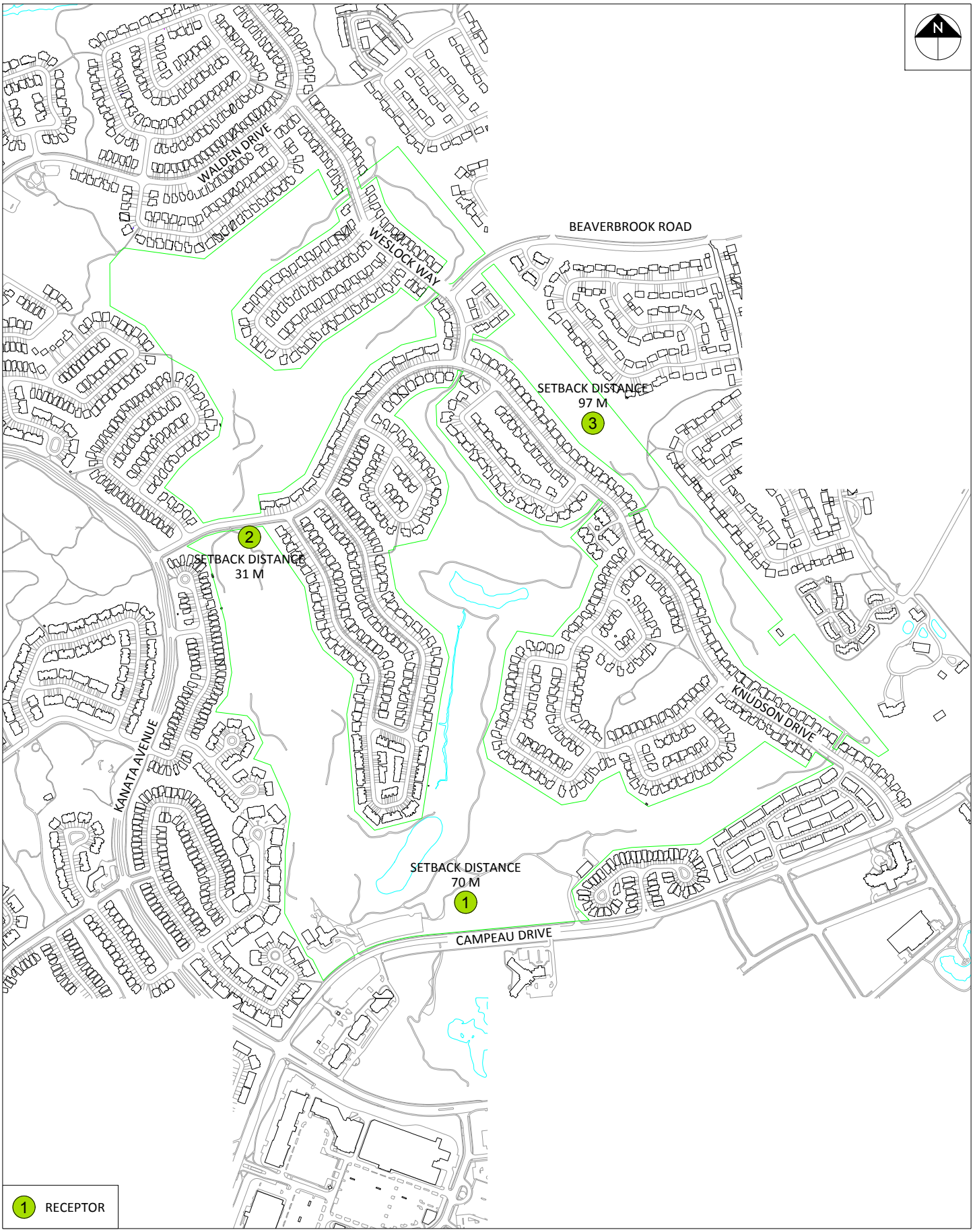
PROJECT	7000 CAMPEAU DRIVE, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		DESCRIPTION
SCALE	1:10000 (APPROX.)	DRAWING NO.	GWE18-135-1
DATE	May 14, 2020	DRAWN BY	M.L.

FIGURE 1:
STUDY AREA AND SURROUNDING CONTEXT



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PROJECT	7000 CAMPEAU DRIVE, OTTAWA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT		
SCALE	1:10000 (APPROX.)	DRAWING NO.	GWE18-135-2
DATE	May 14, 2020	DRAWN BY	M.L.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

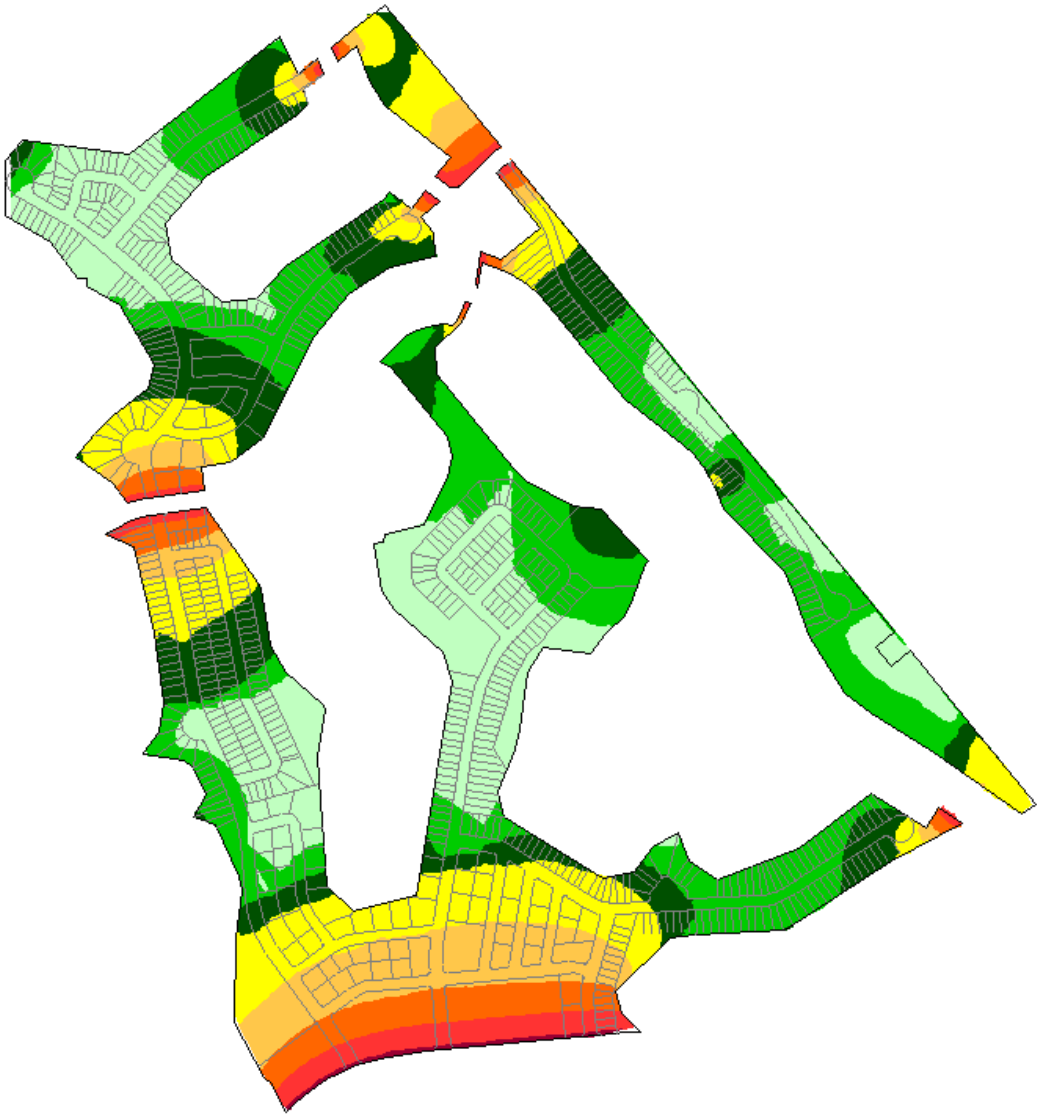


FIGURE 3: NOISE CONTOURS 1.5 M (DAYTIME PERIOD)

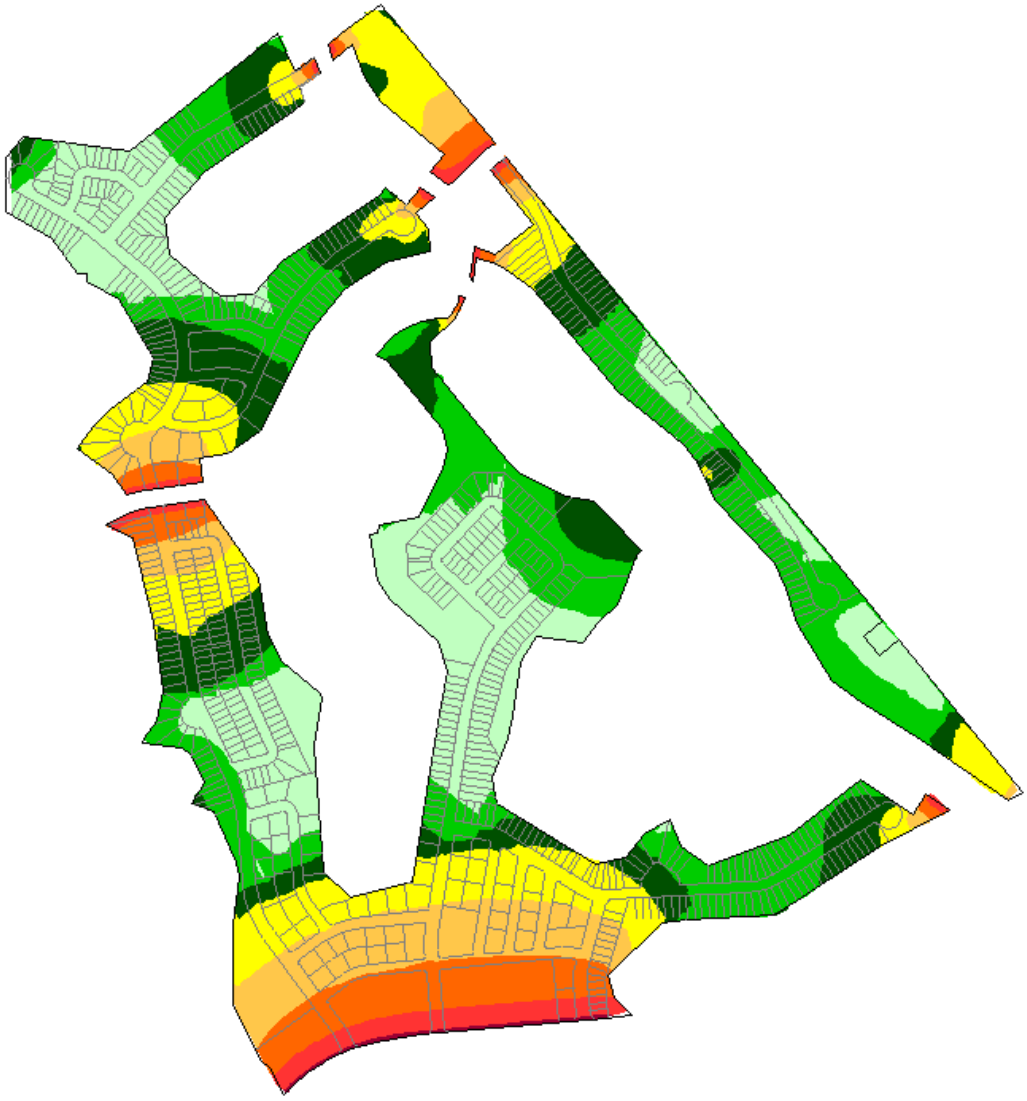
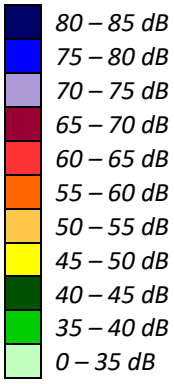


FIGURE 4: NOISE CONTOURS 4.5 M (DAYTIME PERIOD)



APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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```
STAMSON 5.0        NORMAL REPORT        Date: 23-05-2019 16:02:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Campeau (day/night)
-------------------------------------------
Car traffic volume  : 12144/1056  veh/TimePeriod  *
Medium truck volume :   966/84    veh/TimePeriod  *
Heavy truck volume  :   690/60    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  15000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Campeau (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  :  70.00 / 70.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Campeau (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.92 + 0.00) = 55.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.66  68.48   0.00 -11.11  -1.46   0.00   0.00   0.00
55.92
-------------------------------------------------------------------------
--

Segment Leq : 55.92 dBA

Total Leq All Segments: 55.92 dBA


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

Source height = 1.50 m

ROAD (0.00 + 48.32 + 0.00) = 48.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.66  60.88   0.00 -11.11  -1.46   0.00   0.00   0.00
48.32
-------------------------------------------------------------------------
--

Segment Leq : 48.32 dBA

Total Leq All Segments: 48.32 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 55.92
                           (NIGHT): 48.32
```

```
STAMSON 5.0        NORMAL REPORT        Date: 23-05-2019 16:02:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Knudson (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: Knudson (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  :  31.00 / 31.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Knudson (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.27 + 0.00) = 57.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.66  63.96   0.00  -5.23  -1.46   0.00   0.00   0.00
57.27
-------------------------------------------------------------------------
--

Segment Leq : 57.27 dBA

Total Leq All Segments: 57.27 dBA


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

Source height = 1.50 m

ROAD (0.00 + 49.67 + 0.00) = 49.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     90   0.66  56.36   0.00  -5.23  -1.46   0.00   0.00   0.00
49.67
-------------------------------------------------------------------------
--

Segment Leq : 49.67 dBA

Total Leq All Segments: 49.67 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 57.27
                           (NIGHT): 49.67
```

```
STAMSON 5.0        NORMAL REPORT        Date: 23-05-2019 16:02:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Knudson (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: Knudson (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  :  97.00 / 97.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :   7.00 m
Barrier receiver distance :  77.00 / 77.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Knudson (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 + 39.89 + 0.00) = 39.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.24  63.96   0.00 -10.05  -0.63   0.00   0.00 -13.38
39.89
-------------------------------------------------------------------------------
--

Segment Leq : 39.89 dBA

Total Leq All Segments: 39.89 dBA
```

```
Results segment # 1: Knudson (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 + 32.29 + 0.00) = 32.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90    0.24  56.36   0.00 -10.05  -0.63   0.00   0.00 -13.38
32.29
-------------------------------------------------------------------------------
--

Segment Leq : 32.29 dBA

Total Leq All Segments: 32.29 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 39.89
                           (NIGHT): 32.29
```