Transportation Noise Assessment

590 Rideau Street

Ottawa, Ontario

REPORT: GWE16-019 – Transportation Noise

Prepared For:

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EXECUTIVE SUMMARY

This document describes a transportation noise assessment performed for a proposed seven-storey mixed-use development at 590 Rideau Street in Ottawa, Ontario. The building will rise approximately 30 meters above local grade. Figure 1 illustrates a site plan with surrounding context. The major source of roadway noise affecting the development is traffic along Rideau Street and Charlotte Street.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ontario 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) architectural drawings received from Graziani + Corazza Architects Inc.

The results of the current study indicate that noise levels due to roadway traffic over the site will range between 72 and 54 dBA during the daytime period (07:00-23:00) and between 64 and 46 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the north side of the development, nearest and most exposed to Rideau Street. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figures 4-6).

In addition to upgraded windows, the installation of central air conditioning (or similar mechanical system) will be required for all units. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Richcraft Group of Companies to undertake a transportation noise study of a proposed seven-storey mixed-use development at 590 Rideau Street in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a transportation noise assessment. GWE's scope of work involved assessing exterior and interior noise levels generated by local roadway traffic. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[1] and Ontario Ministry of the Environment and Climate Change (MOECC)[2] guidelines. Noise calculations were based on architectural drawings received from Graziani + Corazza Architects 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 environmental noise assessment is a proposed seven-storey mixed-use development. The development is located on the southeast corner of the Rideau Street & Charlotte Street intersection. The major sources of roadway noise are Rideau Street and Charlotte Street. The site is surrounded on all sides with mixed-use land, specifically commercial and residential. Figure 1 illustrates a complete site plan with surrounding context.

Upon completion, the development will rise approximately 30 meters above local grade. The ground floor will house commercial and common space, while the remaining floors occupy residential space only. Two outdoor living areas (OLA's) are located on site, specifically at ground level to the rear of the building and sixth floor terrace.

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

[2] Ontario Ministry of the Environment and Climate Change – Publication NPC-300

3. OBJECTIVES

The main goals of this work are to: (i) calculate the future noise levels on the study building produced by local roadway traffic, (ii) ensure that interior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG) as outlined in Section 4.2 and 4.3 of this report.

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{EQ}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{EQ} is commonly calculated on the basis of a 16-hour (L_{EQ16}) daytime (07:00-23:00) / 8-hour (L_{EQ8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's ENCG specifies that the recommended indoor noise limit range (that is relevant to this study) is 50, 45 and 40 dBA for retail space, residential living rooms and sleeping quarters respectively, as listed in Table 1. Based on GWE's experience, more comfortable indoor noise levels should be targeted toward 47, 42 and 37 dBA to control peak noise, and deficiencies in building envelope construction.

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

Type of Space	Time Period	L_{EQ} (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50	45
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	23:00 – 07:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40	35

Predicted noise levels at the plane of window (POW) and outdoor living area (OLA) dictate the action required to achieve the recommended sound levels. When noise levels at these areas exceed the criteria outlined in Table 2, specific outdoor, ventilation and Warning Clause requirements may apply. In addition, when noise levels exceed the criteria outlined in Table 3, upgraded building components must be designed.

[3] Adapted from ENCG – Table 2.2b and c

TABLE 2: ROAD & RAIL NOISE COMBINED – OUTDOOR NOISE, VENTILATION AND WARNING CLAUSE REQUIREMENTS[4]

Time Period	L_{EQ} (dBA)	Ventilation Requirements	Outdoor Noise Control Measures	Warning Clause
Outdoor Living Area (OLA)				
Daytime (07:00 – 23:00)	$L_{EQ(16hr)} < 55$	N/A	Not required	Not required
	$55 < L_{EQ(16hr)} \leq 60$	N/A	May not be required but should be considered	Type A†
	$L_{EQ(16hr)} > 60$	N/A	Required to reduce the L_{EQ} to below 60 dBA and as close to 55 dBA where feasible	Type B††
Plane of Window (POW)				
Daytime (07:00 – 23:00)	$L_{EQ(16hr)} < 55$	Not required	N/A	Not required
	$55 < L_{EQ(16hr)} \leq 65$	Forced air heating with provision for central air conditioning	N/A	Type C
	$L_{EQ(16hr)} > 65$	Central air conditioning	N/A	Type D
Nighttime (23:00 – 07:00)	$L_{EQ(8hr)} < 50$	Not required	N/A	Not required
	$50 < L_{EQ(8hr)} \leq 60$	Forced air heating with provision for central air conditioning	N/A	Type C
	$L_{EQ(8hr)} > 60$	Central air conditioning	N/A	Type D

† - Required if resultant L_{EQ} exceeds 55 dBA

†† - Required if resultant L_{EQ} exceeds 55 dBA and if it is administratively, economically and/or technically feasible

TABLE 3: ROAD & RAIL NOISE BUILDING COMPONENT REQUIREMENTS[5]

Source	L_{EQ} (dBA)	Building Component Requirements
Road	$L_{EQ(16hr)} > 65$ (Daytime)	Building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria
	$L_{EQ(8hr)} > 60$ (Nighttime)	
Rail	$L_{EQ(16hr)} > 60$ (Daytime)	
	$L_{EQ(8hr)} > 55$(Nighttime)	

[4] Adapted from ENCG 2006 – Table 1.10

[5] Adapted from ENCG 2006 – Table 1.8

4.2.2 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[6] which provides additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table 1.7 of the ENCG for each roadway classification. Table 4 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 4: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Rideau Street	4-UAU	50	**30,000**
Charlotte Street (North of Rideau)	2-UCU	40	**8,000**
Charlotte Street (South of Rideau)	4-UMCU	50	**24,000**

4.2.3 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MOECC computerized noise assessment program, STAMSON 5.04, for road and rail analysis. 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, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 4, 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 and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics
- The study site was treated as having flat topography

Noise receptors were strategically placed at 10 locations around the study area (see Figures 2 and 3).

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

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneered walls can achieve STC 55. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40 depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

According to the ENCG, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[7] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

Based on published research[8], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

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

A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have not specified any particular window configurations, as there are several manufacturers and various combinations of window components that will offer the necessary sound attenuation rating. However, it is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors. All specified building components will require review by a qualified acoustical engineer for conformance to the recommendations of this report prior to building permit application.

5. RESULTS AND DISCUSSION

5.1 Roadway Noise Levels

Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations. The results of the roadway noise calculations are summarized in Table 5 below.

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	
		Day	Night
1	POW – Ground Level – North Façade	72	64
2	POW – Ground Level – East Façade	65	57
3	POW – Ground Level – South Façade	66	58
4	POW – Ground Level – West Façade	71	64
5	POW – 7th Floor – North Façade	72	65
6	POW – 7th Floor – East Façade	68	60
7	POW – 7th Floor – South Façade	60	52
8	POW – 7th Floor – West Façade	71	64
9	OLA – 7th Floor Terrace	54	46
10	OLA – Ground Level Yard	54	46

The results of the current analysis indicate that noise levels will range between 72 and 54 dBA during the daytime period (07:00-23:00) and between 64 and 46 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 72 dBA) occurs on the north façade (Receptor 1 and 5), which is nearest and most exposed to Rideau Street.

5.2 STC Requirements

The noise levels predicted due to road traffic exceed the criteria listed in the ENCG for building components. As discussed in Section 4.3 the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figures 4-6):

- **Bedroom Windows**

(i) Bedroom windows facing north will require a minimum STC of 35

(ii) Bedroom windows facing west will require a minimum STC of 34

(iii) Bedroom windows facing east will require a minimum STC of 31

(iv) Bedroom windows facing south will require a minimum STC of 29

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

- **Living Room Windows**

(i) Living room windows facing north will require a minimum STC of 30

(ii) Living room windows facing west will require a minimum STC of 29

(iii) Living rooms windows facing east will require a minimum STC of 26

(iv) Living room windows facing south will require a minimum STC of 24

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

- **Retail Windows**

(i) Retail windows facing north will require a minimum STC of 25

(ii) Retail windows facing west will require a minimum STC of 24

(iii) Retail windows facing south will require a minimum STC of 19

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

- **Exterior Walls**

(i) Exterior wall components on the north, east, south and west façades require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[9]

Results of the calculations also indicate that all units will require central air conditioning (or similar mechanical ventilation) which will allow occupants to keep windows closed and maintain a comfortable living environment. Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements.

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

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels due to roadway traffic over the site will range between 72 and 54 dBA during the daytime period (07:00-23:00) and between 64 and 46 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the north side of the development, nearest and most exposed to Rideau Street. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figures 4-6).

In addition to upgraded windows, the installation of central air conditioning (or similar mechanical system) will be required for all units. The following Warning Clause[10] in all Agreements of Lease, Purchase and Sale will be required for all units:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing roadway traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and Ministry of the Environment.*
>
> *To help address the need for sound attenuation, this development includes:*
>
> - *Window STC requirements*
> - *Exterior wall STC requirements*
>
> *To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features.*
>
> *This development has also been designed with central air condition (or similar mechanical system) for all units. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment."*

[10] City of Ottawa, Environmental Noise Control Guidelines, January 2016 – Table A1

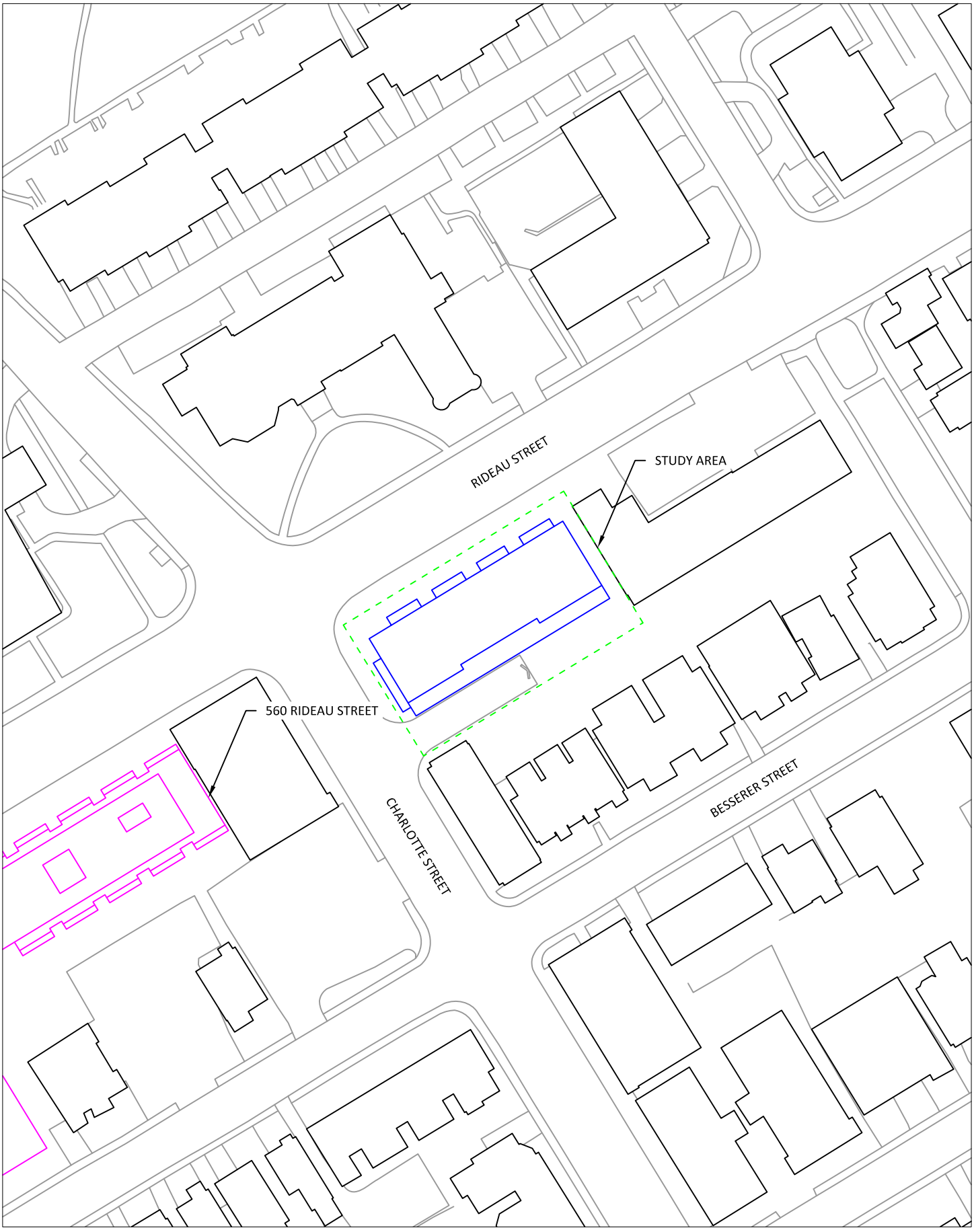
This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

Gradient Wind Engineering Inc.

Michael Lafortune
Environmental Technologist
GWE16-019 – Transportation Noise

Joshua Foster, P.Eng.
Partner



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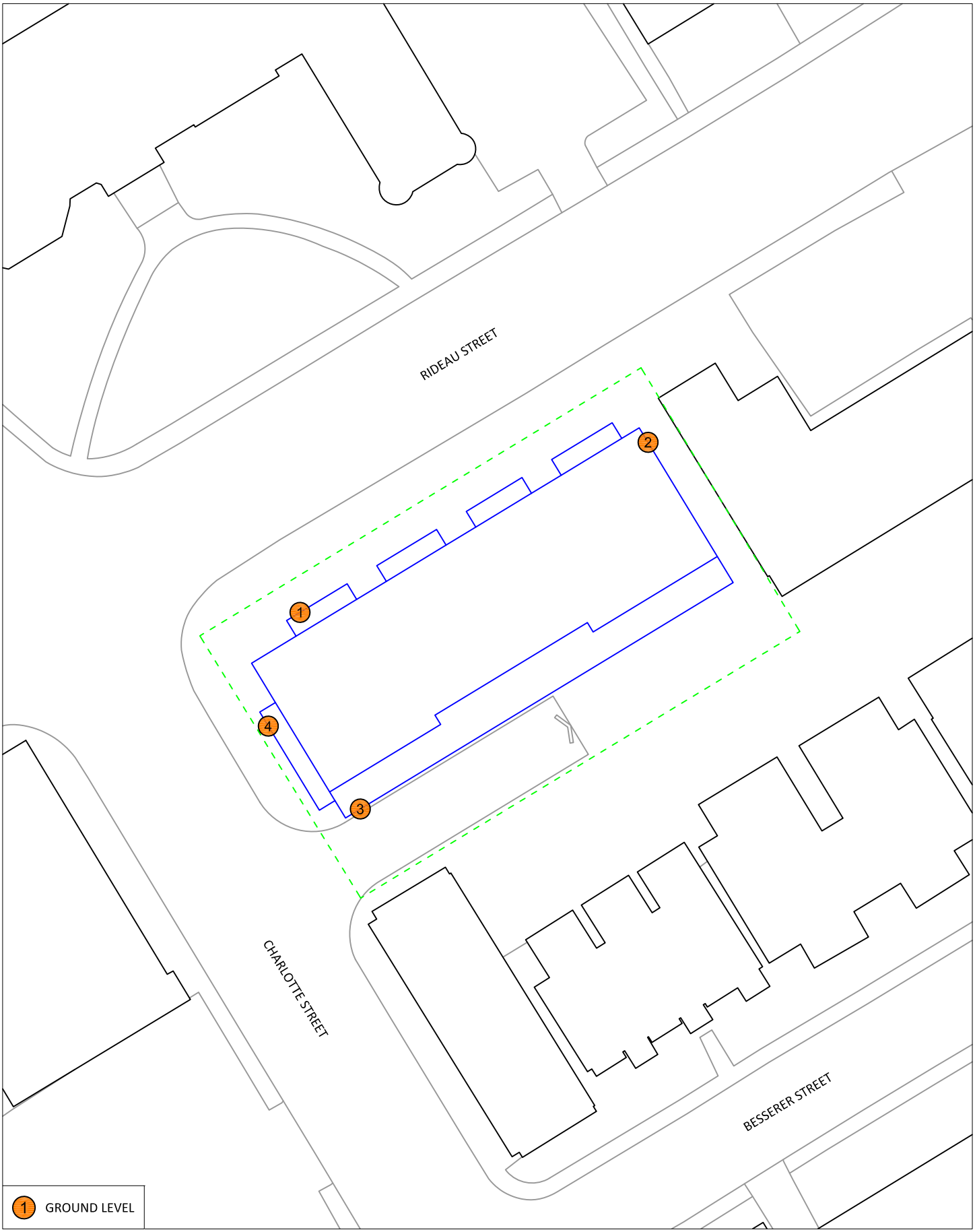
PROJECT	590 RIDEAU STREET - TRANSPORTATION NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE16-019-1
DATE	APRIL 7, 2016
DRAWN BY	M.L

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

N



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DATE	APRIL 7, 2016
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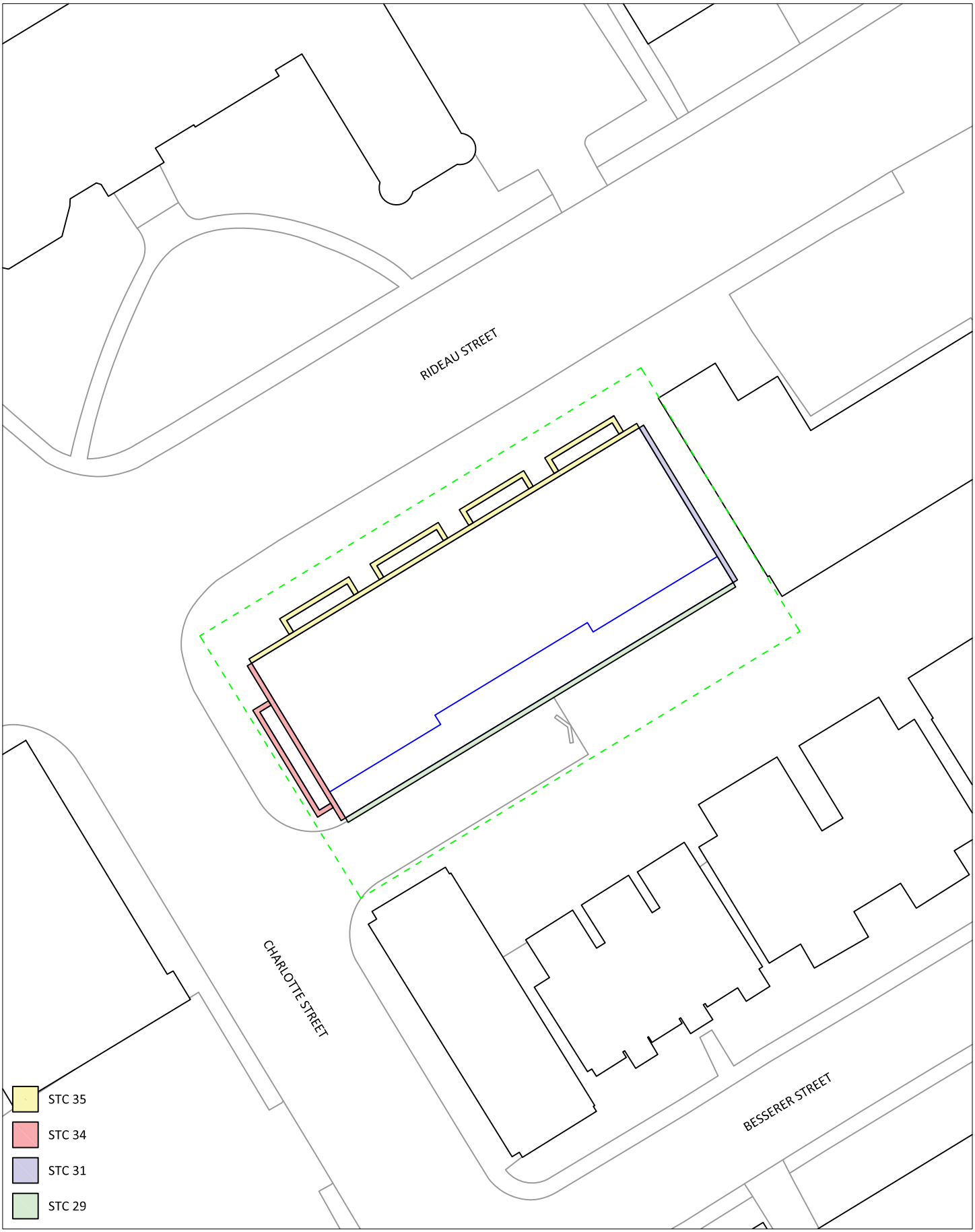
DESCRIPTION	FIGURE 3: RECEPTOR LOCATIONS



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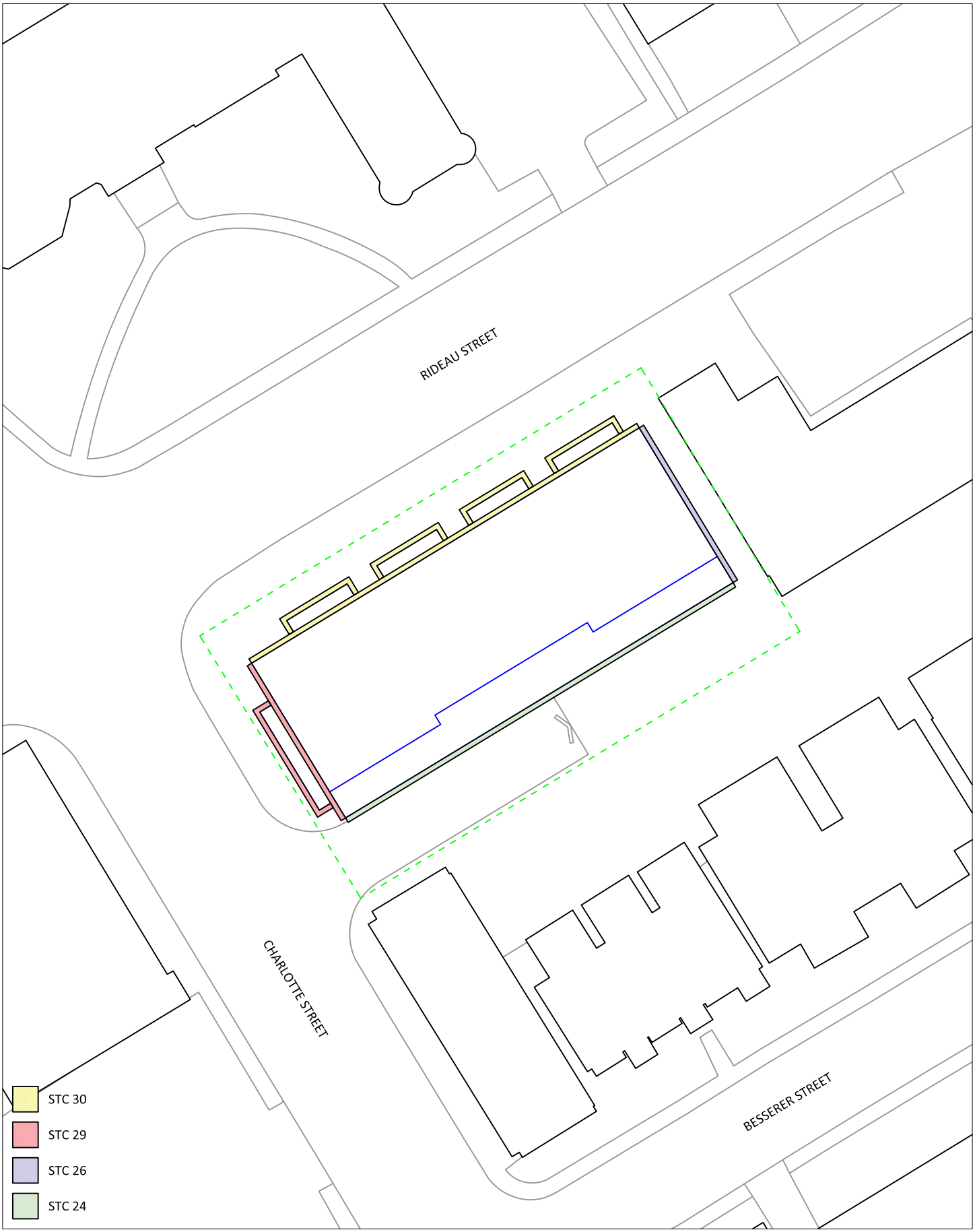
PROJECT: 590 RIDEAU STREET - TRANSPORTATION NOISE STUDY		DESCRIPTION: FIGURE 4: BEDROOM WINDOW STC REQUIREMENTS
SCALE: 1:500 (APPROX.)	DRAWING NO.: GWE16-019-4	
DATE: APRIL 7, 2016	DRAWN BY: M.L	



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PROJECT: 590 RIDEAU STREET - TRANSPORTATION NOISE STUDY		DESCRIPTION: FIGURE 5: LIVING ROOM WINDOW STC REQUIREMENTS
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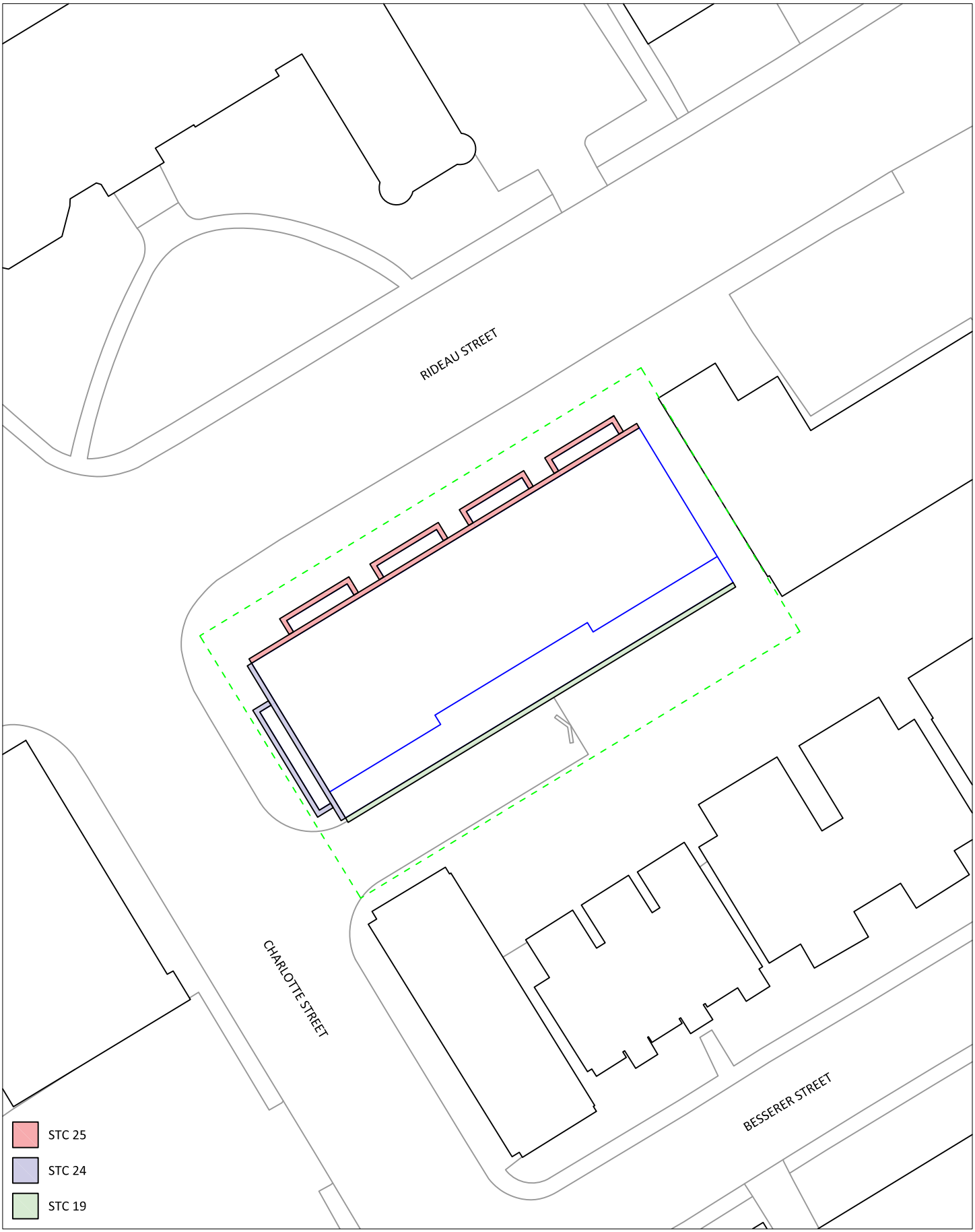
DATE: APRIL 7, 2016	DRAWN BY: M.L	



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PROJECT: 590 RIDEAU STREET - TRANSPORTATION NOISE STUDY		DESCRIPTION: FIGURE 6: RETAIL WINDOW STC REQUIREMENTS
SCALE: 1:500 (APPROX.)	DRAWING NO.: GWE16-019-6	
DATE: APRIL 7, 2016	DRAWN BY: M.L	

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:46:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-------------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (day/night)
-----------------------------------------
Angle1   Angle2           : -84.00 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: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   35.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: CharlotteR (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 # 3: CharlotteR (day/night)
------------------------------------------------
Angle1   Angle2           :  48.00 deg   81.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  16.00 / 16.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


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

Source height = 1.50 m

ROAD (0.00 + 71.34 + 0.00) = 71.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -84     90   0.00  71.49   0.00   0.00  -0.15   0.00   0.00   0.00
71.34
-------------------------------------------------------------------------------
--

Segment Leq : 71.34 dBA
```

```
Results segment # 2: CharlotteL (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.16 + 0.00) = 62.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     35   0.00  70.52   0.00  -1.25  -7.11   0.00   0.00   0.00
62.16
-------------------------------------------------------------------------
--

Segment Leq : 62.16 dBA


Results segment # 3: CharlotteR (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.31 + 0.00) = 56.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    48     81   0.00  63.96   0.00  -0.28  -7.37   0.00   0.00   0.00
56.31
-------------------------------------------------------------------------
--

Segment Leq : 56.31 dBA

Total Leq All Segments: 71.96 dBA
```

```
Results segment # 1: Rideau (night)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -84     90   0.00  63.89   0.00   0.00  -0.15   0.00   0.00   0.00
63.75
-------------------------------------------------------------------------
--

Segment Leq : 63.75 dBA


Results segment # 2: CharlotteL (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.56 + 0.00) = 54.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     35   0.00  62.92   0.00  -1.25  -7.11   0.00   0.00   0.00
54.56
-------------------------------------------------------------------------
--

Segment Leq : 54.56 dBA
```

```
Results segment # 3: CharlotteR (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.71 + 0.00) = 48.71 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    48     81   0.00  56.36   0.00  -0.28  -7.37   0.00   0.00   0.00
48.71
-------------------------------------------------------------------------------
--

Segment Leq : 48.71 dBA

Total Leq All Segments: 64.36 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 71.96
                           (NIGHT): 64.36
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:46:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (day/night)
----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  44.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 (64.83 + 51.13 + 0.00) = 65.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     44   0.00  71.49   0.00  -0.54  -6.12   0.00   0.00   0.00
64.83
-------------------------------------------------------------------------------
--
    44     90   0.00  71.49   0.00  -0.54  -5.93   0.00   0.00 -13.89
51.13
-------------------------------------------------------------------------------
--

Segment Leq : 65.01 dBA

Total Leq All Segments: 65.01 dBA
```

```
Results segment # 1: Rideau (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 (57.23 + 43.53 + 0.00) = 57.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     44   0.00  63.89   0.00  -0.54  -6.12   0.00   0.00   0.00
57.23
-------------------------------------------------------------------------------
--
    44     90   0.00  63.89   0.00  -0.54  -5.93   0.00   0.00 -13.89
43.53
-------------------------------------------------------------------------------
--

Segment Leq : 57.41 dBA

Total Leq All Segments: 57.41 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.01
                           (NIGHT): 57.41
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Charlotte (day/night)
----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: Charlotte (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -63.00 deg
Barrier height            :  13.00 m
Barrier receiver distance :   5.00 / 5.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Charlotte (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 + 44.89 + 65.96) = 66.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -63   0.00  70.52   0.00   0.00  -8.24   0.00   0.00 -17.39
44.89
-------------------------------------------------------------------------------
--
   -63      0   0.00  70.52   0.00   0.00  -4.56   0.00   0.00   0.00
65.96
-------------------------------------------------------------------------------
--

Segment Leq : 66.00 dBA

Total Leq All Segments: 66.00 dBA
```

```
Results segment # 1: Charlotte (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 + 37.29 + 58.36) = 58.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -63   0.00  62.92   0.00   0.00  -8.24   0.00   0.00 -17.39
37.29
-------------------------------------------------------------------------------
--
   -63      0   0.00  62.92   0.00   0.00  -4.56   0.00   0.00   0.00
58.36
-------------------------------------------------------------------------------
--

Segment Leq : 58.40 dBA

Total Leq All Segments: 58.40 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 66.00
                           (NIGHT): 58.40
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  21.00 / 21.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -62.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           : -85.00 deg   63.00 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 # 3: CharlotteR (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 # 3: CharlotteR (day/night)
---------------------------------------------
Angle1   Angle2           :  76.00 deg   87.00 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
```

```
Results segment # 1: Rideau (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 + 44.21 + 65.40) = 65.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -62   0.00  71.49   0.00  -1.46  -8.08   0.00   0.00 -17.74
44.21
-------------------------------------------------------------------------
--
   -62      0   0.00  71.49   0.00  -1.46  -4.63   0.00   0.00   0.00
65.40
-------------------------------------------------------------------------
--

Segment Leq : 65.43 dBA


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

Source height = 1.50 m

ROAD (0.00 + 69.67 + 0.00) = 69.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -85     63   0.00  70.52   0.00   0.00  -0.85   0.00   0.00   0.00
69.67
-------------------------------------------------------------------------
--

Segment Leq : 69.67 dBA
```

```
Results segment # 3: CharlotteR (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 51.82 + 0.00) = 51.82 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    76     87   0.00  63.96   0.00   0.00 -12.14   0.00   0.00   0.00
51.82
-------------------------------------------------------------------------
--

Segment Leq : 51.82 dBA

Total Leq All Segments: 71.11 dBA


Results segment # 1: Rideau (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 + 36.62 + 57.80) = 57.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -62   0.00  63.89   0.00  -1.46  -8.08   0.00   0.00 -17.74
36.62
-------------------------------------------------------------------------
--
   -62      0   0.00  63.89   0.00  -1.46  -4.63   0.00   0.00   0.00
57.80
-------------------------------------------------------------------------
--

Segment Leq : 57.84 dBA
```

```
Results segment # 2: CharlotteL (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.07 + 0.00) = 62.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -85     63   0.00  62.92   0.00   0.00  -0.85   0.00   0.00   0.00
62.07
-------------------------------------------------------------------------------
--

Segment Leq : 62.07 dBA


Results segment # 3: CharlotteR (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 44.22 + 0.00) = 44.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    76     87   0.00  56.36   0.00   0.00 -12.14   0.00   0.00   0.00
44.22
-------------------------------------------------------------------------------
--

Segment Leq : 44.22 dBA

Total Leq All Segments: 63.51 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 71.11
                           (NIGHT): 63.51
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (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           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -79.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :   5.00 / 5.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           :   0.00 deg   46.00 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           :  21.60 / 21.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: CharlotteR (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 # 3: CharlotteR (day/night)
---------------------------------------------
Angle1   Angle2           :  59.00 deg   84.00 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           :  21.60 / 21.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 !       21.60 !       14.90 !        14.90

ROAD (0.00 + 54.15 + 71.22) = 71.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -79   0.00  71.49   0.00   0.00 -12.14   0.00   0.00  -5.20
54.15
-------------------------------------------------------------------------------
--
   -79     90   0.00  71.49   0.00   0.00  -0.27   0.00   0.00   0.00
71.22
-------------------------------------------------------------------------------
--

Segment Leq : 71.30 dBA


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

Source height = 1.50 m

ROAD (0.00 + 64.60 + 0.00) = 64.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     46   0.00  70.52   0.00   0.00  -5.93   0.00   0.00   0.00
64.60
-------------------------------------------------------------------------------
--

Segment Leq : 64.60 dBA
```

```
Results segment # 3: CharlotteR (day)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.38 + 0.00) = 55.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    59     84   0.00  63.96   0.00   0.00  -8.57   0.00   0.00   0.00
55.38
-------------------------------------------------------------------------
--

Segment Leq : 55.38 dBA

Total Leq All Segments: 72.23 dBA

Results segment # 1: Rideau (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 !       21.60 !       14.90 !        14.90

ROAD (0.00 + 46.55 + 63.62) = 63.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -79   0.00  63.89   0.00   0.00 -12.14   0.00   0.00  -5.20
46.55
-------------------------------------------------------------------------
--
   -79     90   0.00  63.89   0.00   0.00  -0.27   0.00   0.00   0.00
63.62
-------------------------------------------------------------------------
--

Segment Leq : 63.70 dBA
```

```
Results segment # 2: CharlotteL (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.00 + 0.00) = 57.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     46   0.00  62.92   0.00   0.00  -5.93   0.00   0.00   0.00
57.00
-------------------------------------------------------------------------
--

Segment Leq : 57.00 dBA


Results segment # 3: CharlotteR (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.79 + 0.00) = 47.79 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    59     84   0.00  56.36   0.00   0.00  -8.57   0.00   0.00   0.00
47.79
-------------------------------------------------------------------------
--

Segment Leq : 47.79 dBA

Total Leq All Segments: 64.63 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 72.23
                           (NIGHT): 64.63
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (day/night)
----------------------------------------
Angle1   Angle2           :   0.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  44.00 deg   Angle2 : 90.00 deg
Barrier height            :   5.00 m
Barrier receiver distance :   3.00 / 3.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 !       21.60 !       18.05 !        18.05

ROAD (64.83 + 65.02 + 0.00) = 67.94 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     44   0.00  71.49   0.00  -0.54  -6.12   0.00   0.00   0.00
64.83
-------------------------------------------------------------------------------
--
    44     90   0.00  71.49   0.00  -0.54  -5.93   0.00   0.00  -0.03
64.99*
    44     90   0.00  71.49   0.00  -0.54  -5.93   0.00   0.00   0.00
65.02
-------------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 67.94 dBA

Total Leq All Segments: 67.94 dBA
```

```
Results segment # 1: Rideau (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 !       21.60 !       18.05 !        18.05

ROAD (57.23 + 57.42 + 0.00) = 60.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     44   0.00  63.89   0.00  -0.54  -6.12   0.00   0.00   0.00
57.23
-------------------------------------------------------------------------------
--
    44     90   0.00  63.89   0.00  -0.54  -5.93   0.00   0.00  -0.03
57.39*
    44     90   0.00  63.89   0.00  -0.54  -5.93   0.00   0.00   0.00
57.42
-------------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 60.34 dBA

Total Leq All Segments: 60.34 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 67.94
                           (NIGHT): 60.34
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Charlotte (day/night)
----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: Charlotte (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 0.00 deg
Barrier height            :  20.10 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Charlotte (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 !       21.60 !       18.92 !        18.92

ROAD (0.00 + 59.86 + 0.00) = 59.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  70.52   0.00   0.00  -3.01   0.00   0.00  -7.65
59.86
-------------------------------------------------------------------------------
--

Segment Leq : 59.86 dBA

Total Leq All Segments: 59.86 dBA
```

```
Results segment # 1: Charlotte (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 !       21.60 !       18.92 !        18.92

ROAD (0.00 + 52.26 + 0.00) = 52.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      0   0.00  62.92   0.00   0.00  -3.01   0.00   0.00  -7.65
52.26
-------------------------------------------------------------------------------
--

Segment Leq : 52.26 dBA

Total Leq All Segments: 52.26 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 59.86
                           (NIGHT): 52.26
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (day/night)
----------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  17.00 / 17.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -74.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           : -82.00 deg   53.00 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           :  21.60 / 21.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: CharlotteR (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 # 3: CharlotteR (day/night)
--------------------------------------------
Angle1   Angle2           :  66.00 deg   85.00 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           :  21.60 / 21.60  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 !       21.60 !       13.32 !        13.32

ROAD (0.00 + 53.95 + 67.09) = 67.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -74   0.00  71.49   0.00  -0.54 -10.51   0.00   0.00  -6.49
53.95
-------------------------------------------------------------------------------
--
   -74      0   0.00  71.49   0.00  -0.54  -3.86   0.00   0.00   0.00
67.09
-------------------------------------------------------------------------------
--

Segment Leq : 67.29 dBA


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

Source height = 1.50 m

ROAD (0.00 + 69.27 + 0.00) = 69.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -82     53   0.00  70.52   0.00   0.00  -1.25   0.00   0.00   0.00
69.27
-------------------------------------------------------------------------------
--

Segment Leq : 69.27 dBA
```

```
Results segment # 3: CharlotteR (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.19 + 0.00) = 54.19 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    66     85   0.00  63.96   0.00   0.00  -9.77   0.00   0.00   0.00
54.19
-------------------------------------------------------------------------
--

Segment Leq : 54.19 dBA

Total Leq All Segments: 71.48 dBA


Results segment # 1: Rideau (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 !       21.60 !       13.32 !        13.32

ROAD (0.00 + 46.35 + 59.49) = 59.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -74   0.00  63.89   0.00  -0.54 -10.51   0.00   0.00  -6.49
46.35
-------------------------------------------------------------------------
--
   -74      0   0.00  63.89   0.00  -0.54  -3.86   0.00   0.00   0.00
59.49
-------------------------------------------------------------------------
--

Segment Leq : 59.70 dBA
```

```
Results segment # 2: CharlotteL (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.67 + 0.00) = 61.67 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -82     53   0.00  62.92   0.00   0.00  -1.25   0.00   0.00   0.00
61.67
-------------------------------------------------------------------------
--

Segment Leq : 61.67 dBA


Results segment # 3: CharlotteR (night)
---------------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.60 + 0.00) = 46.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    66     85   0.00  56.36   0.00   0.00  -9.77   0.00   0.00   0.00
46.60
-------------------------------------------------------------------------
--

Segment Leq : 46.60 dBA

Total Leq All Segments: 63.89 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 71.48
                           (NIGHT): 63.89
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 35:47:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
-----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (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  :  31.00 / 31.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 90.00 deg
Barrier height            :  25.10 m
Barrier receiver distance :   2.00 / 2.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   3.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : 3.00 deg
Barrier height            :  20.10 m
Barrier receiver distance :  11.00 / 11.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: CharlotteC (day/night)
----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteC (day/night)
--------------------------------------------
Angle1   Angle2           :   3.00 deg   42.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  35.00 / 35.00  m
Receiver height           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   3.00 deg   Angle2 : 42.00 deg
Barrier height            :  25.10 m
Barrier receiver distance :  22.00 / 22.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 4: CharlotteR (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 # 4: CharlotteR (day/night)
--------------------------------------------
Angle1   Angle2           :  55.00 deg   78.00 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           :  21.60 / 21.60  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  55.00 deg   Angle2 : 78.00 deg
Barrier height            :  25.10 m
Barrier receiver distance :  21.00 / 21.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 !       21.60 !       20.30 !        20.30

ROAD (0.00 + 50.66 + 0.00) = 50.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  71.49   0.00  -3.15   0.00   0.00   0.00 -17.68
50.66
-------------------------------------------------------------------------------
--

Segment Leq : 50.66 dBA


Results segment # 2: CharlotteL (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 !       21.60 !       15.28 !        15.28

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      3   0.00  70.52   0.00  -3.68  -2.87   0.00   0.00 -13.97
50.00
-------------------------------------------------------------------------------
--

Segment Leq : 50.00 dBA
```

```
Results segment # 3: CharlotteC (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 !       21.60 !        8.96 !         8.96

ROAD (0.00 + 40.20 + 0.00) = 40.20 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     3     42   0.00  70.52   0.00  -3.68  -6.64   0.00   0.00 -20.00
40.20
-------------------------------------------------------------------------------
--

Segment Leq : 40.20 dBA


Results segment # 4: CharlotteR (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 !       21.60 !        5.96 !         5.96

ROAD (0.00 + 32.47 + 0.00) = 32.47 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    55     78   0.00  63.96   0.00  -2.55  -8.94   0.00   0.00 -20.00
32.47
-------------------------------------------------------------------------------
--

Segment Leq : 32.47 dBA

Total Leq All Segments: 53.59 dBA
```

```
Results segment # 1: Rideau (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 !       21.60 !       20.30 !        20.30

ROAD (0.00 + 43.07 + 0.00) = 43.07 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  63.89   0.00  -3.15   0.00   0.00   0.00 -17.68
43.07
-------------------------------------------------------------------------------
--

Segment Leq : 43.07 dBA


Results segment # 2: CharlotteL (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 !       21.60 !       15.28 !        15.28

ROAD (0.00 + 42.40 + 0.00) = 42.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      3   0.00  62.92   0.00  -3.68  -2.87   0.00   0.00 -13.97
42.40
-------------------------------------------------------------------------------
--

Segment Leq : 42.40 dBA
```

```
Results segment # 3: CharlotteC (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 !       21.60 !        8.96 !         8.96

ROAD (0.00 + 32.60 + 0.00) = 32.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     3     42   0.00  62.92   0.00  -3.68  -6.64   0.00   0.00 -20.00
32.60
-------------------------------------------------------------------------------
--
Segment Leq : 32.60 dBA


Results segment # 4: CharlotteR (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 !       21.60 !        5.96 !         5.96

ROAD (0.00 + 24.87 + 0.00) = 24.87 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    55     78   0.00  56.36   0.00  -2.55  -8.94   0.00   0.00 -20.00
24.87
-------------------------------------------------------------------------------
--
Segment Leq : 24.87 dBA

Total Leq All Segments: 46.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.59
                           (NIGHT): 46.00
```

```
STAMSON 5.0        NORMAL REPORT        Date: 05-04-2016 36:46:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Rideau (day/night)
----------------------------------------
Car traffic volume  : 24288/2112  veh/TimePeriod  *
Medium truck volume :  1932/168   veh/TimePeriod  *
Heavy truck volume  :  1380/120   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):  30000
    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: Rideau (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  :  37.00 / 37.00  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            :  25.10 m
Barrier receiver distance :   4.00 / 4.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 2: CharlotteL (day/night)
-----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteL (day/night)
---------------------------------------------
Angle1   Angle2           : -90.00 deg   9.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  47.00 / 47.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -8.00 deg
Barrier height            :  13.00 m
Barrier receiver distance :  37.00 / 37.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 3: CharlotteC (day/night)
----------------------------------------------
Car traffic volume  : 19430/1690  veh/TimePeriod  *
Medium truck volume :  1546/134   veh/TimePeriod  *
Heavy truck volume  :  1104/96    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):  24000
    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: CharlotteC (day/night)
--------------------------------------------
Angle1   Angle2           :   9.00 deg   38.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  47.00 / 47.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   9.00 deg   Angle2 : 38.00 deg
Barrier height            :  25.10 m
Barrier receiver distance :  34.00 / 34.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Road data, segment # 4: CharlotteR (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 # 4: CharlotteR (day/night)
---------------------------------------------
Angle1   Angle2           :  51.00 deg   74.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  38.00 / 38.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  51.00 deg   Angle2 : 74.00 deg
Barrier height            :  25.10 m
Barrier receiver distance :  32.00 / 32.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Rideau (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 + 48.04 + 0.00) = 48.04 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  71.49   0.00  -3.92   0.00   0.00   0.00 -19.53
48.04
-------------------------------------------------------------------------------
--

Segment Leq : 48.04 dBA


Results segment # 2: CharlotteL (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 + 43.90 + 52.03) = 52.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     -8   0.00  70.52   0.00  -4.96  -3.41   0.00   0.00 -18.25
43.90
-------------------------------------------------------------------------------
--
    -8      9   0.66  70.52   0.00  -8.23 -10.26   0.00   0.00   0.00
52.03
-------------------------------------------------------------------------------
--

Segment Leq : 52.65 dBA
```

```
Results segment # 3: CharlotteC (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 + 37.63 + 0.00) = 37.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     9     38   0.00  70.52   0.00  -4.96  -7.93   0.00   0.00 -20.00
37.63
-------------------------------------------------------------------------
--

Segment Leq : 37.63 dBA


Results segment # 4: CharlotteR (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 + 30.98 + 0.00) = 30.98 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    51     74   0.00  63.96   0.00  -4.04  -8.94   0.00   0.00 -20.00
30.98
-------------------------------------------------------------------------
--

Segment Leq : 30.98 dBA

Total Leq All Segments: 54.06 dBA
```

```
Results segment # 1: Rideau (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 + 40.44 + 0.00) = 40.44 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     90   0.00  63.89   0.00  -3.92   0.00   0.00   0.00 -19.53
40.44
-------------------------------------------------------------------------------
--

Segment Leq : 40.44 dBA


Results segment # 2: CharlotteL (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 + 36.30 + 44.43) = 45.05 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     -8   0.00  62.92   0.00  -4.96  -3.41   0.00   0.00 -18.25
36.30
-------------------------------------------------------------------------------
--
    -8      9   0.66  62.92   0.00  -8.23 -10.26   0.00   0.00   0.00
44.43
-------------------------------------------------------------------------------
--

Segment Leq : 45.05 dBA
```

```
Results segment # 3: CharlotteC (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 + 30.03 + 0.00) = 30.03 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     9     38   0.00  62.92   0.00  -4.96  -7.93   0.00   0.00 -20.00
30.03
-------------------------------------------------------------------------
--

Segment Leq : 30.03 dBA
```

```
Results segment # 4: CharlotteR (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 + 23.39 + 0.00) = 23.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    51     74   0.00  56.36   0.00  -4.04  -8.94   0.00   0.00 -20.00
23.39
-------------------------------------------------------------------------------
--

Segment Leq : 23.39 dBA

Total Leq All Segments: 46.46 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 54.06
                           (NIGHT): 46.46
```