Transportation Noise Assessment

1445 Wellington Street West

Ottawa, Ontario

REPORT: *GmE* 13-058 - Traffic Noise

Prepared For:

Mahdi Tajbakhsh
Mizrahi Developments
126 Hazelton Avenue
Toronto, Ontario
M5R 2E5

Prepared By:

Thomas Couper, B.Eng., Project Manager
Joshua Foster, P.Eng., Project Supervisor

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127 Walgreen Road, Ottawa, Ontario K0A 1L0
Tel.: (613) 836-0934 ♦ Fax: (613) 836-8183 ♦ www.gradientwind.com

EXECUTIVE SUMMARY

This document describes an environmental noise assessment performed for a proposed 12-storey development in Ottawa, Ontario. The building will rise 45 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 Island Park Drive, Richmond Road and Wellington Street West.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment (MOE) 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 right of way allowances; and (iv) architectural drawings received from Page+Steele Architects. All balconies are less than 4.0 meters deep and therefore are not considered to be outdoor living areas. No other outdoor living areas are associated with the development.

The results of the current study indicate that noise levels due to roadway traffic over the site will range between 43 and 69 dBA during the daytime period (07:00-23:00) and between 36 and 62 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the south side of the development, nearest to Wellington Street West. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2006). In addition, the following Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figure 5). Note the STC recommendations below are considered preliminary and will need to be verified through detailed STC calculation prior to building permit applications.

- **Bedroom Windows**

(i) Windows facing south and west will require a minimum STC of 32

(ii) All other windows are to satisfy Ontario Building Code (OBC 2006) requirements

- **Living Room Windows**

(i) Windows facing south and west will require a minimum STC of 27

(ii) All other windows are to satisfy Ontario Building Code (OBC 2006) requirements

- **Exterior Walls**

(i) Exterior wall components on the south and west façades require a minimum STC of 50 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[1]

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.

In addition to upgraded windows, the installation of individual air conditioning units (or similar mechanical system) will be required for all units. The following Warning Clause (Type D[2]) in all Agreements of Lease, Purchase and Sale will be required for all units:

> *"Dwelling units in this building have been supplied with central air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City of Ottawa's and the Ministry of the Environment's noise criteria."*

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

[2] MOE, Environmental Noise Guideline – Stationary and Transpiration Sources – Approval and Planning, Publication NPC-300, Queens Printer for Ontario, August 2013

Additionally, the following restrictive covenant shall also be included in all Agreements of Lease, Purchase and Sale:

> *"The Transferee covenants with the Transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and deeds conveying the lands described herein, which shall run with the said lands and is for the benefit of the subsequent owners of the said lands and the owner of the adjacent road."*

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1. INTRODUCTION

Gradient Microclimate Engineering Inc. (*GmE*) was retained by Mizrahi Developments to undertake a transportation noise study of the proposed residential development at 1445 Wellington Street West in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a roadway traffic noise assessment. *GmE'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[3] and Ministry of the Environment[4] guidelines. Noise calculations were based on architectural drawings received from Page+Steele Architects with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP).

2. TERMS OF REFERENCE

The focus of this environmental noise assessment is a proposed 12-storey building in Ottawa, Ontario. The development is located on the north east corner of the intersection of Island Park Drive and Wellington Street West. The major sources of roadway noise are Island Park Drive, Richmond Road and Wellington Street West. The site is surrounded by commercial and residential developments on all sides. Figure 1 illustrates a complete site plan with surrounding context.

Upon completion, the development will rise 45 meters above local grade. The ground floor will house commercial space, while the remaining 11 floors will contain up to 120 dwelling units. No outdoor living areas are associated with the development as all balconies are less than 4.0 meters deep.

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 and (ii) ensure that interior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Sections 4.2 and 4.3 of this report.

[3] City of Ottawa Environmental Noise Control Guidelines, SS Wilson Associates, May 10, 2006
[4] MOE, Environmental Noise Guideline – Stationary and Transpiration Sources – Approval and Planning, Publication NPC-300, Queens Printer for Ontario, August 2013

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{EQ}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{EQ} is commonly calculated on the basis of a 16-hour (L_{EQ16}) daytime (07:00-23:00) / 8-hour (L_{EQ8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit ranges (that are relevant to this study) are 50 dBA for retail stores, 45 dBA for living and dining areas and 40 dBA for sleeping quarters of residences. Based on *GmE*'s experience, more comfortable indoor noise levels should be targeted toward 42 dBA and 37 dBA (for living rooms and bedrooms, respectively) to control peak noise and deficiencies in building envelope construction. For outdoor living areas (OLA) the specified criteria is 55 dBA, however there are no OLA associated with this project.

Noise levels predicted at the plane of the window (POW) dictate the action required to achieve the recommended sound levels. Different mitigation measures are required when: (i) POW noise levels exceed 65 dBA daytime or 60 dBA nighttime; or (ii) when POW noise levels range

between 55 and 65 dBA daytime; or between 50 and 60 dBA nighttime. In the first case, (i) POW noise levels exceeding 65 dBA daytime or 60 dBA nighttime require a full building component review. As windows are most often the weakest point in sound transmission through a façade, when the values are close to meeting the criteria, windows with adequate Sound Transmission Class (STC) ratings must be selected to provide the required noise attenuation. Additionally in this case, units must be fitted with forced air heating and central air conditioning. For case (ii), units must be fitted with forced air ventilation systems with provisions for the future installation of air conditioning systems. Where a criterion is not met, an associated Warning Clause is required to be registered on title, as indicated in Table 1.10 of the ENCG.

4.2.2 Roadway Traffic Volumes

For future traffic noise predictions, the MOE document LU-131 requires the use of the Annual Average Daily Traffic (AADT) volumes, projected to exist ten years into the future, with an average annual growth rate of 2% per year. In contrast, the City of Ottawa's Official Plan (OP) requires that the AADT volumes should be based on roadway allowances, which are defined by the Right of Way (ROW) protection values identified in the OP for specific roadways.

To ensure compliance with the reasonable worst case situation, the following steps were taken;

- Recent counted traffic data were acquired from the City of Ottawa and the Ministry of Transportation, upon which a growth rate of 2% per year was applied and extrapolated to the City's OP horizon year of 2023
- Traffic volumes based on roadway ROW values were obtained from the City of Ottawa Official Plan[5] (Annex 1 – Road Classification and Rights of Way). For roadways where the ROW information was unavailable, the designation was assumed based on the size of the existing road and available traffic information.

In all cases, the higher of the OP versus projected values were used to calculate future noise levels. Table 1 (below) summarizes the AADT values used for each roadway included in this assessment.

[5] www.ottawa.ca/city_hall/ottawa2020/official_plan/vol_1/07_annexes/annex_01/index_en.html

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT	Available Traffic AADT From Count	Year of Traffic AADT	Projected 2022 AADT
Island Park Drive	2-UAU (Federal)	40	15,000	12,586	2009	**16,607**
Richmond Road	4-UAU	50	**30,000**	16,051	2007	22,035
Wellington Street West	2-UAU	50	**15,000**	N/A	N/A	N/A

4.2.3 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the Ministry of the Environment (MOE) 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 1, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions
- The day/night split was taken to be 92% / 8% respectively for all streets
- Absorptive 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 12 locations around the study area (see Figures 2 through 4). The initial calculations revealed that outdoor noise levels would be sufficiently high as to require investigation of indoor noise levels. As such, calculations were performed to verify the STC requirements.

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 (2006) 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 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[6] considers: (i) window type and total area as a percentage of total room floor area; (ii) exterior wall type and total area as a percentage of the total room floor area; (iii) the acoustic absorption characteristics of the room; (iv) outdoor noise source type and approach geometry; and (v) the indoor sound level criteria, which varies according to the intended use of a space. Based on published research[7], 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).

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

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

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 2 below.

TABLE 2: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

RECEPTOR NUMBER	PLANE OF WINDOW RECEPTOR LOCATION	NOISE LEVEL (dBA)	
		DAY	NIGHT
1	POW – 1st Floor – North Side	43	36
2	POW – 1st Floor – East Side	65	58
3	POW – 1st Floor – South Side	69	62
4	POW – 1st Floor – West Side	65	58
5	POW – 6th Floor – North Side	51	43
6	POW – 6th Floor – East Side	65	58
7	POW – 6th Floor – South Side	69	62
8	POW – 6th Floor – West Side	67	60
9	POW – 12th Floor – North Side	52	44
10	POW – 12th Floor – East Side	65	57
11	POW – 12th Floor – South Side	69	62
12	POW – 12th Floor – West Side	67	60

The results of the current analysis indicate that noise levels will range between 43 and 69 dBA during the daytime period (07:00-23:00) and between 36 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 69 dBA) occurs on the south side of the building (Receptors 3, 7 and 11), which are closest to Wellington Street West.

5.2 STC Requirements

The noise levels predicted due to road traffic exceed the criteria listed in Table 1.8 of the ENCG for building components. As discussed in Section 4.4 the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit

application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 5):

- **Bedroom Windows**

(i) Windows facing south and west will require a minimum STC of 32

(ii) All other windows are to satisfy Ontario Building Code (OBC 2006) requirements

- **Living Room Windows**

(i) Windows facing south and west will require a minimum STC of 27

(ii) All other windows are to satisfy Ontario Building Code (OBC 2006) requirements

- **Exterior Walls**

(i) Exterior wall components on the 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[8]

Results of the calculations also indicate that all units will require individual air conditioning units, or similar mechanical ventilation, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required be placed on all Lease, Purchase and Sale Agreements, as summarized in Table 3 below.

TABLE 3: SITE VENTILLATION AND WARNING CLAUSE REQUIREMENTS

LOCATION	VENTILATION REQUIREMENTS	WARNING CLAUSE
All Units	Central Air Conditioning	Type D

[8] 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 43 and 69 dBA during the daytime period (07:00-23:00) and between 36 and 62 dBA during the nighttime period (23:00-07:00). The highest traffic noise levels will occur along the south side of the development, nearest to Wellington Street West. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2006). In addition, the following Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figure 5). Note the STC recommendations below are considered preliminary and will need to be verified through detailed STC calculation prior to building permit applications.

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(i) Exterior wall components on the 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]

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

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

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.

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

> *"Dwelling units in this building have been supplied with central air conditioning which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City of Ottawa's and the Ministry of the Environment's noise criteria."*

Additionally, the following restrictive covenant shall also be included in all Agreements of Lease, Purchase and Sale:

> *"The Transferee covenants with the Transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and deeds conveying the lands described herein, which shall run with the said lands and is for the benefit of the subsequent owners of the said lands and the owner of the adjacent road."*

[10] MOE, Environmental Noise Guideline – Stationary and Transpiration Sources – Approval and Planning, Publication NPC-300, Queens Printer for Ontario, August 2013

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.

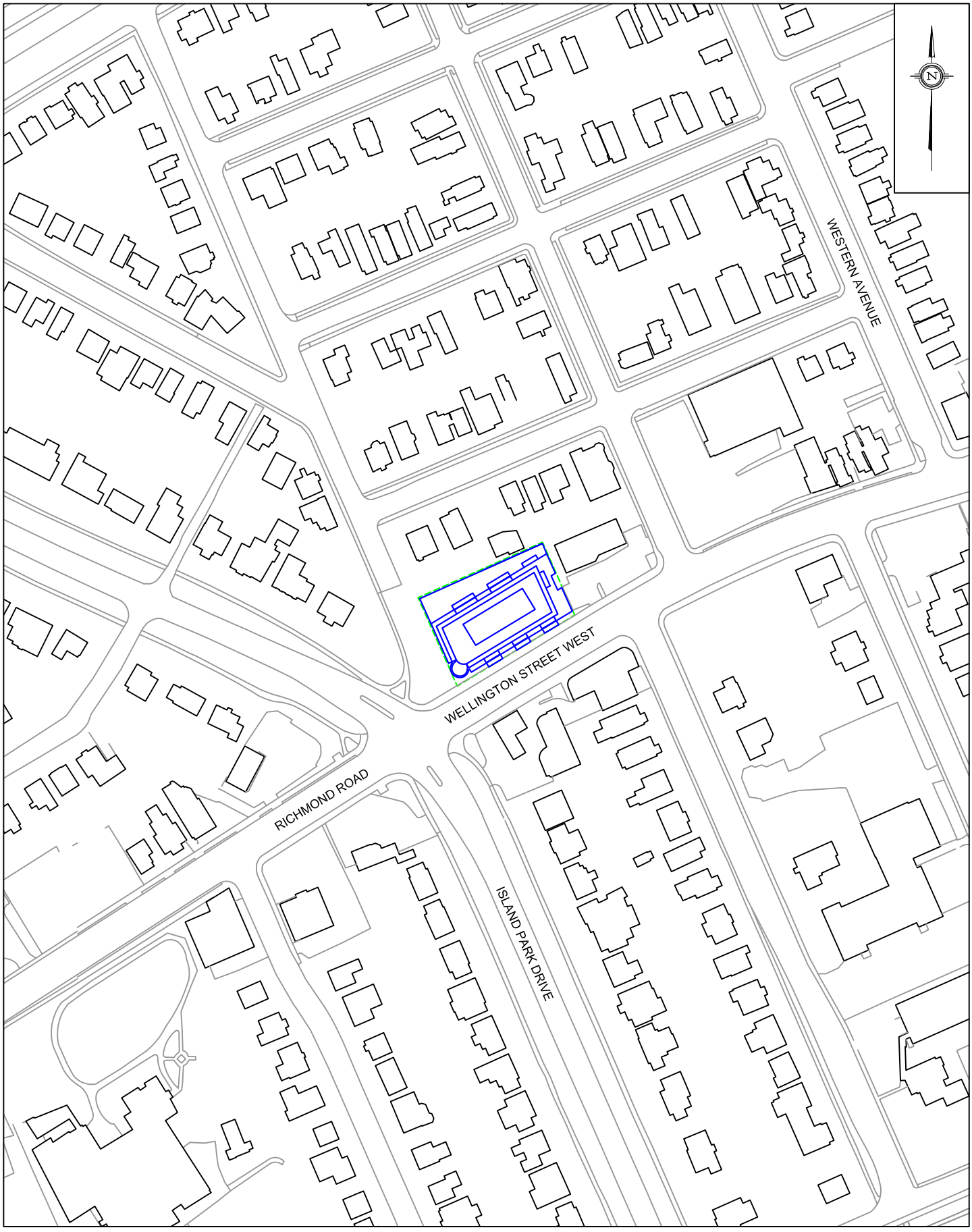
Yours truly,

Gradient Microclimate Engineering Inc.

Thomas Couper, B.Eng.
Project Manager
GmE 13-058-Traffic Noise

LICENSED PROFESSIONAL ENGINEER
J. R. FOSTER
100155655
May 9, 2013
PROVINCE OF ONTARIO

Joshua Foster., P.Eng.
Project Supervisor

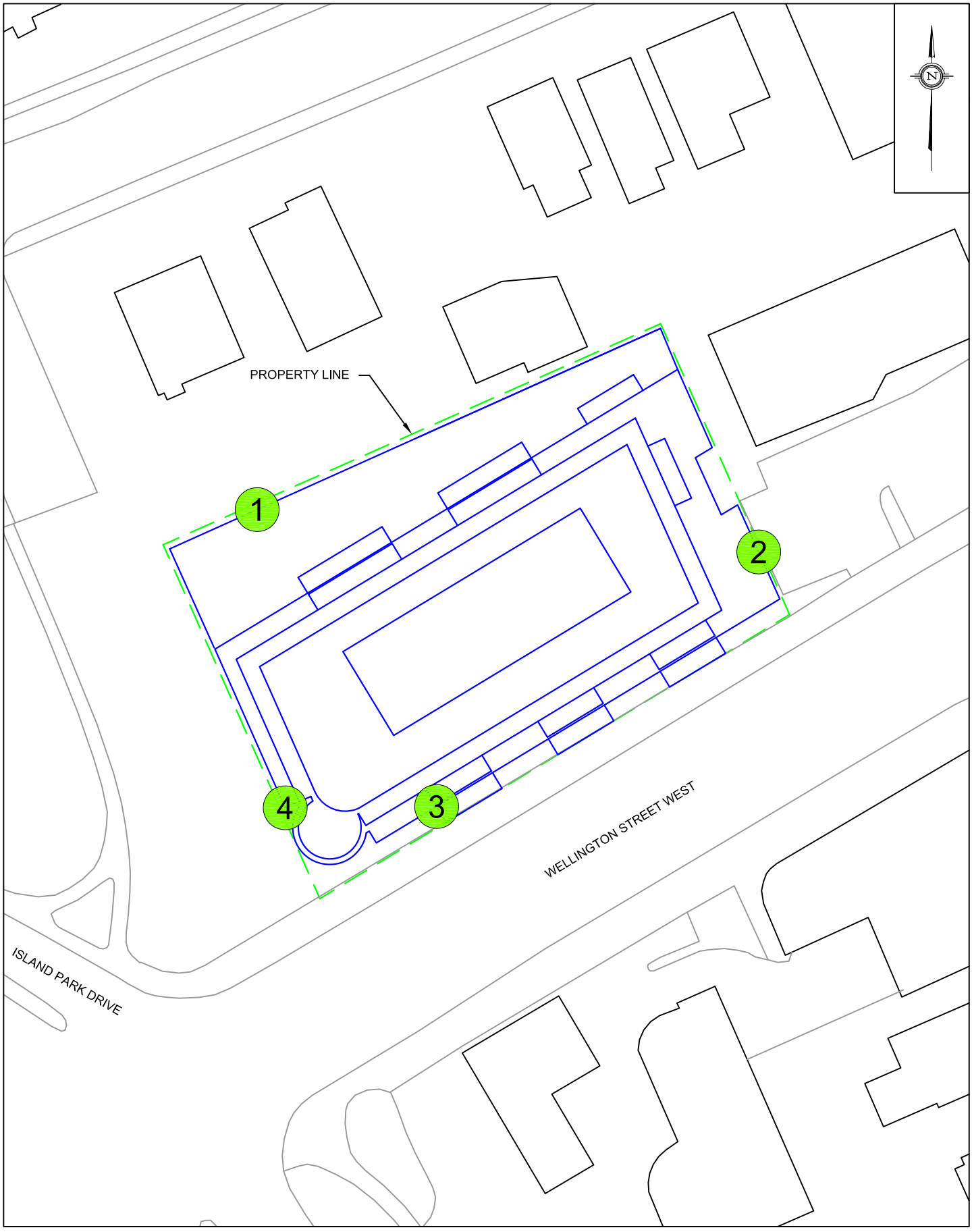


127 Walgreen Road
Ottawa, Ontario
K0A 1L0
(613) 836-0934
GmE Gradient Microclimate Engineering Inc

PROJECT	1445-1451 WELLINGTON STREET WEST - TRAFFIC NOISE STUDY
SCALE	1:2000 (APPROX.)
DRAWING NO.	GME13-058-1
DATE	SEPTEMBER 24, 2013
DRAWN BY	T.C

DESCRIPTION

FIGURE 1:
SITE PLAN & SURROUNDING CONTEXT

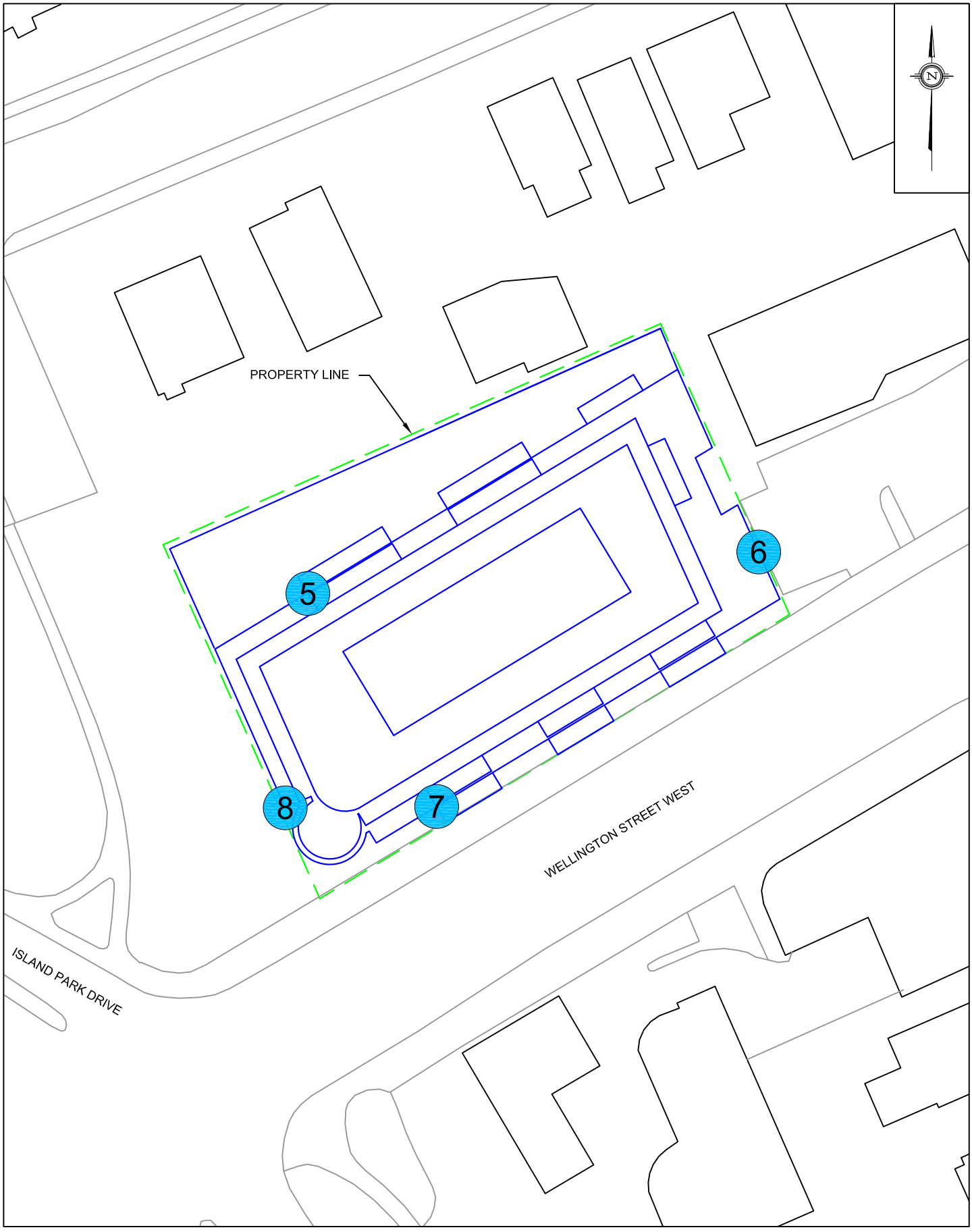


GmE Gradient Microclimate Engineering Inc
127 Walgreen Road
Ottawa, Ontario
K0A 1L0
(613) 836-0934

PROJECT	1445-1451 WELLINGTON STREET WEST - TRAFFIC NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GME13-058-2
DATE	SEPTEMBER 24, 2013
DRAWN BY	T.C

DESCRIPTION

FIGURE 2:
GROUND FLOOR RECEPTOR LOCATIONS



GmE Gradient Microclimate Engineering Inc
127 Walgreen Road
Ottawa, Ontario
K0A 1L0
(613) 836-0934

PROJECT	1445-1451 WELLINGTON STREET WEST - TRAFFIC NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GME13-058-3
DATE	SEPTEMBER 24, 2013
DRAWN BY	T.C

DESCRIPTION

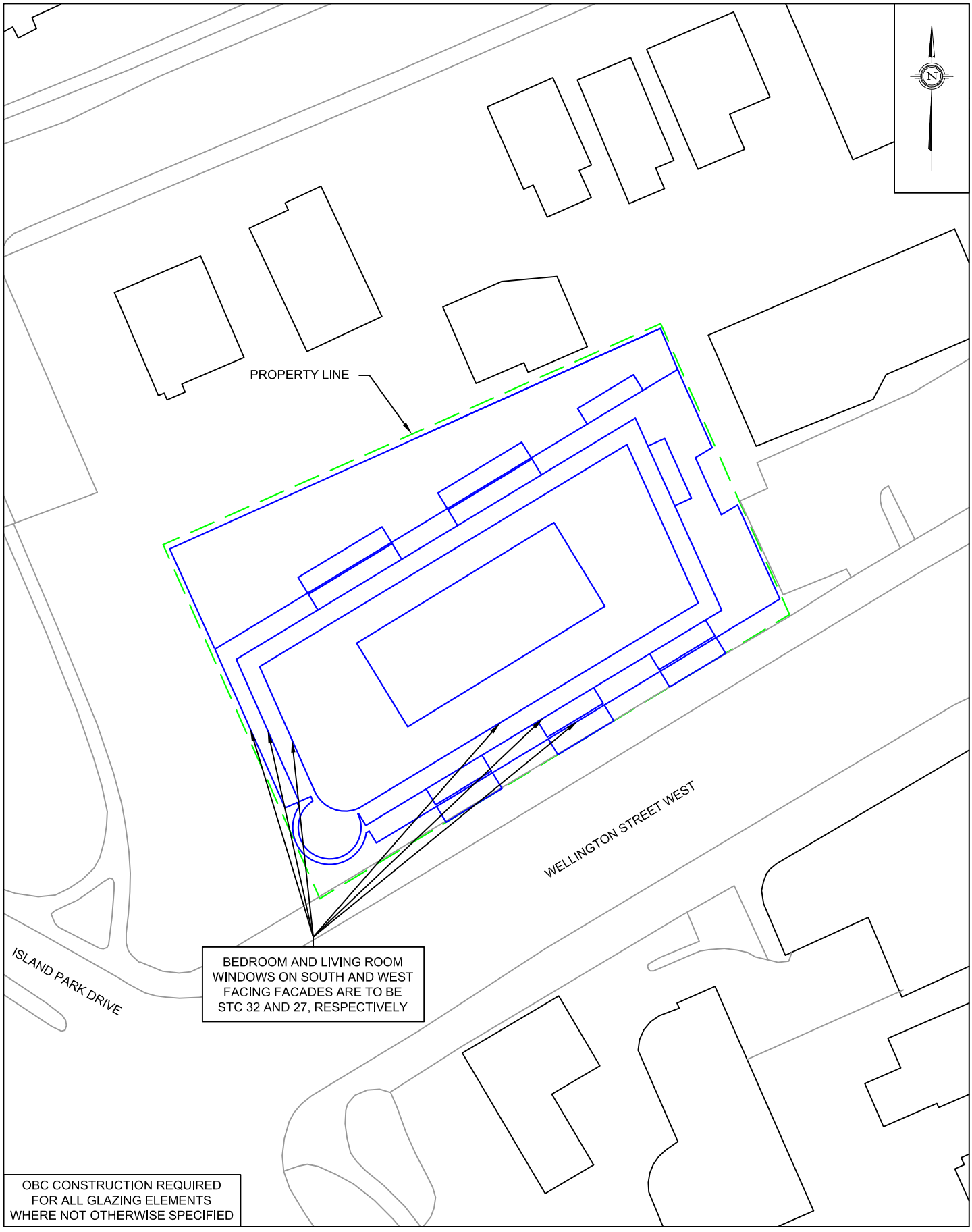
FIGURE 3:
6TH FLOOR RECEPTOR LOCATIONS

GmE Gradient Microclimate Engineering Inc
127 Walgreen Road
Ottawa, Ontario
K0A 1L0
(613) 836-0934

PROJECT	1445-1451 WELLINGTON STREET WEST - TRAFFIC NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GME13-058-4
DATE	NOVEMBER 5, 2013
DRAWN BY	T.C

DESCRIPTION

FIGURE 4:
12TH FLOOR RECEPTOR LOCATIONS



GmE Gradient Microclimate Engineering Inc
127 Walgreen Road
Ottawa, Ontario
K0A 1L0
(613) 836-0934

PROJECT	1445-1451 WELLINGTON STREET WEST - TRAFFIC NOISE STUDY		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GME13-058-5
DATE	NOVEMBER 5, 2013	DRAWN BY	T.C

FIGURE 5:
FACADE STC REQUIREMENTS

APPENDIX A

STAMSON 5.04
INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:41:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR1.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           :  40.00 deg   69.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     75 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  54.00 / 54.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 43.11 + 0.00) = 43.11 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    40     69   0.66  67.13   0.00  -9.23  -9.54   0.00  -5.24   0.00
43.11
-------------------------------------------------------------------------
--

Segment Leq : 43.11 dBA

Total Leq All Segments: 43.11 dBA


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

Source height = 1.49 m

ROAD (0.00 + 35.50 + 0.00) = 35.50 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    40     69   0.66  59.51   0.00  -9.23  -9.54   0.00  -5.24   0.00
35.50
-------------------------------------------------------------------------
--

Segment Leq : 35.50 dBA

Total Leq All Segments: 35.50 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 43.11
                           (NIGHT): 35.50
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:41:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR2.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  16.50 / 16.50  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.43 + 0.00) = 65.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      8   0.00  68.48   0.00  -0.41  -2.64   0.00   0.00   0.00
65.43
-------------------------------------------------------------------------------
--

Segment Leq : 65.43 dBA

Total Leq All Segments: 65.43 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.83 + 0.00) = 57.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90      8   0.00  60.88   0.00  -0.41  -2.64   0.00   0.00   0.00
57.83
-------------------------------------------------------------------------------
--

Segment Leq : 57.83 dBA

Total Leq All Segments: 57.83 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.43
                           (NIGHT): 57.83
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:01:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR3.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   71.00 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: IP 2 (day/night)
------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -27.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     20 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  33.00 / 33.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Richmond (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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  71.00 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
```

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

Source height = 1.50 m

ROAD (0.00 + 68.00 + 0.00) = 68.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     71   0.00  68.48   0.00   0.00  -0.48   0.00   0.00   0.00
68.00
-------------------------------------------------------------------------
--

Segment Leq : 68.00 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.24 + 0.00) = 58.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -27   0.00  67.13   0.00  -3.42  -4.56   0.00  -0.90   0.00
58.24
-------------------------------------------------------------------------
--

Segment Leq : 58.24 dBA


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

Source height = 1.50 m

ROAD (0.00 + 61.73 + 0.00) = 61.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    71     90   0.00  71.49   0.00   0.00  -9.77   0.00   0.00   0.00
61.73
-------------------------------------------------------------------------
--

Segment Leq : 61.73 dBA
```

```
Total Leq All Segments: 69.28 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.40 + 0.00) = 60.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     71   0.00  60.88   0.00   0.00  -0.48   0.00   0.00   0.00
60.40
-------------------------------------------------------------------------
--

Segment Leq : 60.40 dBA


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

Source height = 1.49 m

ROAD (0.00 + 50.63 + 0.00) = 50.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -27   0.00  59.51   0.00  -3.42  -4.56   0.00  -0.90   0.00
50.63
-------------------------------------------------------------------------
--

Segment Leq : 50.63 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 54.13 + 0.00) = 54.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
    71     90   0.00  63.89   0.00   0.00  -9.77   0.00   0.00   0.00
54.13
-------------------------------------------------------------------------------
--

Segment Leq : 54.13 dBA

Total Leq All Segments: 61.68 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 69.28
                           (NIGHT): 61.68
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:09:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR4.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           :   8.00 deg   48.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive 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 # 2: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           : -10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: IP 2 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -49.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.30 / 19.30  m
Receiver height           :   1.50 / 1.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 4: Richmond (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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  48.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive 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
```

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

Source height = 1.50 m

ROAD (0.00 + 59.45 + 0.00) = 59.45 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     48   0.66  68.48   0.00  -2.07  -6.95   0.00   0.00   0.00
59.45
-------------------------------------------------------------------------
--

Segment Leq : 59.45 dBA


Results segment # 2: IP 1 (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.53 + 0.00) = 58.53 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -10     90   0.66  67.13   0.00  -4.75  -3.84   0.00   0.00   0.00
58.53
-------------------------------------------------------------------------
--

Segment Leq : 58.53 dBA


Results segment # 3: IP 2 (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.61 + 0.00) = 59.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -49   0.00  67.13   0.00  -1.09  -6.42   0.00   0.00   0.00
59.61
-------------------------------------------------------------------------
--

Segment Leq : 59.61 dBA
```

```
Results segment # 4: Richmond (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.89 + 0.00) = 59.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    48     90   0.66  71.49   0.00  -2.07  -9.53   0.00   0.00   0.00
59.89
-------------------------------------------------------------------------
--

Segment Leq : 59.89 dBA

Total Leq All Segments: 65.42 dBA


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

Source height = 1.50 m

ROAD (0.00 + 51.86 + 0.00) = 51.86 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     48   0.66  60.88   0.00  -2.07  -6.95   0.00   0.00   0.00
51.86
-------------------------------------------------------------------------
--

Segment Leq : 51.86 dBA
```

```
Results segment # 2: IP 1 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 50.92 + 0.00) = 50.92 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -10     90   0.66  59.51   0.00  -4.75  -3.84   0.00   0.00   0.00
50.92
-------------------------------------------------------------------------
--

Segment Leq : 50.92 dBA


Results segment # 3: IP 2 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -49   0.00  59.51   0.00  -1.09  -6.42   0.00   0.00   0.00
51.99
-------------------------------------------------------------------------
--

Segment Leq : 51.99 dBA
```

```
Results segment # 4: Richmond (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 52.29 + 0.00) = 52.29 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    48     90   0.66  63.89   0.00  -2.07  -9.53   0.00   0.00   0.00
52.29
-------------------------------------------------------------------------
--

Segment Leq : 52.29 dBA

Total Leq All Segments: 57.81 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 65.42
                           (NIGHT): 57.81
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:42:00
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR5.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           :  33.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     75 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  49.00 / 49.00  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 51.00 + 0.00) = 51.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    33     90   0.08  67.13   0.00  -5.53  -5.33   0.00  -5.27   0.00
51.00
-------------------------------------------------------------------------
--

Segment Leq : 51.00 dBA

Total Leq All Segments: 51.00 dBA


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

Source height = 1.49 m

ROAD (0.00 + 43.38 + 0.00) = 43.38 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    33     90   0.08  59.51   0.00  -5.53  -5.33   0.00  -5.27   0.00
43.38
-------------------------------------------------------------------------
--

Segment Leq : 43.38 dBA

Total Leq All Segments: 43.38 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 51.00
                           (NIGHT): 43.38
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:42:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR6.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  16.50 / 16.50  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 65.43 + 0.00) = 65.43 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      8   0.00  68.48   0.00  -0.41  -2.64   0.00   0.00   0.00
65.43
-------------------------------------------------------------------------
--

Segment Leq : 65.43 dBA

Total Leq All Segments: 65.43 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.83 + 0.00) = 57.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      8   0.00  60.88   0.00  -0.41  -2.64   0.00   0.00   0.00
57.83
-------------------------------------------------------------------------
--

Segment Leq : 57.83 dBA

Total Leq All Segments: 57.83 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 65.43
                           (NIGHT): 57.83
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:01:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR7.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   71.00 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           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: IP 2 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -27.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     20 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  33.00 / 33.00  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Richmond (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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  71.00 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           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 68.00 + 0.00) = 68.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     71   0.00  68.48   0.00   0.00  -0.48   0.00   0.00   0.00
68.00
-------------------------------------------------------------------------
--

Segment Leq : 68.00 dBA


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

Source height = 1.50 m

ROAD (0.00 + 58.24 + 0.00) = 58.24 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -27   0.00  67.13   0.00  -3.42  -4.56   0.00  -0.90   0.00
58.24
-------------------------------------------------------------------------
--

Segment Leq : 58.24 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 61.73 + 0.00) = 61.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    71     90   0.00  71.49   0.00   0.00  -9.77   0.00   0.00   0.00
61.73
-------------------------------------------------------------------------
--

Segment Leq : 61.73 dBA

Total Leq All Segments: 69.28 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.40 + 0.00) = 60.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     71   0.00  60.88   0.00   0.00  -0.48   0.00   0.00   0.00
60.40
-------------------------------------------------------------------------
--

Segment Leq : 60.40 dBA
```

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

Source height = 1.49 m

ROAD (0.00 + 50.63 + 0.00) = 50.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -27   0.00  59.51   0.00  -3.42  -4.56   0.00  -0.90   0.00
50.63
-------------------------------------------------------------------------
--

Segment Leq : 50.63 dBA


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

Source height = 1.50 m

ROAD (0.00 + 54.13 + 0.00) = 54.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    71     90   0.00  63.89   0.00   0.00  -9.77   0.00   0.00   0.00
54.13
-------------------------------------------------------------------------
--

Segment Leq : 54.13 dBA

Total Leq All Segments: 61.68 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 69.28
                           (NIGHT): 61.68
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:11:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR8.te              Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           :   8.00 deg   48.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           : -10.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  29.00 / 29.00  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: IP 2 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -49.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.30 / 19.30  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 4: Richmond (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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  48.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  20.00 / 20.00  m
Receiver height           :  21.00 / 21.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 60.56 + 0.00) = 60.56 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     48   0.08  68.48   0.00  -1.34  -6.58   0.00   0.00   0.00
60.56
-------------------------------------------------------------------------
--

Segment Leq : 60.56 dBA


Results segment # 2: IP 1 (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.30 + 0.00) = 61.30 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -10     90   0.08  67.13   0.00  -3.08  -2.75   0.00   0.00   0.00
61.30
-------------------------------------------------------------------------
--

Segment Leq : 61.30 dBA
```

```
Results segment # 3: IP 2 (day)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.61 + 0.00) = 59.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -49   0.00  67.13   0.00  -1.09  -6.42   0.00   0.00   0.00
59.61
-------------------------------------------------------------------------
--

Segment Leq : 59.61 dBA


Results segment # 4: Richmond (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.40 + 0.00) = 63.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    48     90   0.08  71.49   0.00  -1.34  -6.75   0.00   0.00   0.00
63.40
-------------------------------------------------------------------------
--

Segment Leq : 63.40 dBA

Total Leq All Segments: 67.47 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 52.96 + 0.00) = 52.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     48   0.08  60.88   0.00  -1.34  -6.58   0.00   0.00   0.00
52.96
-------------------------------------------------------------------------
--

Segment Leq : 52.96 dBA


Results segment # 2: IP 1 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 53.69 + 0.00) = 53.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -10     90   0.08  59.51   0.00  -3.08  -2.75   0.00   0.00   0.00
53.69
-------------------------------------------------------------------------
--

Segment Leq : 53.69 dBA
```

```
Results segment # 3: IP 2 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 51.99 + 0.00) = 51.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -49   0.00  59.51   0.00  -1.09  -6.42   0.00   0.00   0.00
51.99
-------------------------------------------------------------------------
--

Segment Leq : 51.99 dBA


Results segment # 4: Richmond (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.80 + 0.00) = 55.80 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    48     90   0.08  63.89   0.00  -1.34  -6.75   0.00   0.00   0.00
55.80
-------------------------------------------------------------------------
--

Segment Leq : 55.80 dBA

Total Leq All Segments: 59.87 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.47
                           (NIGHT): 59.87
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:42:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR9.te              Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           :  33.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     75 %
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  47.00 / 47.00  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 51.89 + 0.00) = 51.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    33     90   0.00  67.13   0.00  -4.96  -4.99   0.00  -5.29   0.00
51.89
-------------------------------------------------------------------------
--

Segment Leq : 51.89 dBA

Total Leq All Segments: 51.89 dBA


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

Source height = 1.49 m

ROAD (0.00 + 44.27 + 0.00) = 44.27 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    33     90   0.00  59.51   0.00  -4.96  -4.99   0.00  -5.29   0.00
44.27
-------------------------------------------------------------------------
--

Segment Leq : 44.27 dBA

Total Leq All Segments: 44.27 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 51.89
                           (NIGHT): 44.27
```

```
STAMSON 5.0        NORMAL REPORT        Date: 24-09-2013 10:42:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR10.te             Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   8.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 64.81 + 0.00) = 64.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      8   0.00  68.48   0.00  -1.03  -2.64   0.00   0.00   0.00
64.81
-------------------------------------------------------------------------
--

Segment Leq : 64.81 dBA

Total Leq All Segments: 64.81 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.22 + 0.00) = 57.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90      8   0.00  60.88   0.00  -1.03  -2.64   0.00   0.00   0.00
57.22
-------------------------------------------------------------------------
--

Segment Leq : 57.22 dBA

Total Leq All Segments: 57.22 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 64.81
                           (NIGHT): 57.22
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:01:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR11.te             Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   65.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.80 / 15.80  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: IP 2 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -32.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     20 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  32.50 / 32.50  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: Richmond (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 # 3: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  65.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.80 / 15.80  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 67.60 + 0.00) = 67.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     65   0.00  68.48   0.00  -0.23  -0.65   0.00   0.00   0.00
67.60
-------------------------------------------------------------------------
--

Segment Leq : 67.60 dBA


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

Source height = 1.50 m

ROAD (0.00 + 57.95 + 0.00) = 57.95 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -32   0.00  67.13   0.00  -3.36  -4.92   0.00  -0.90   0.00
57.95
-------------------------------------------------------------------------
--

Segment Leq : 57.95 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 62.69 + 0.00) = 62.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    65     90   0.00  71.49   0.00  -0.23  -8.57   0.00   0.00   0.00
62.69
-------------------------------------------------------------------------
--

Segment Leq : 62.69 dBA

Total Leq All Segments: 69.16 dBA


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

Source height = 1.50 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     65   0.00  60.88   0.00  -0.23  -0.65   0.00   0.00   0.00
60.01
-------------------------------------------------------------------------
--

Segment Leq : 60.01 dBA
```

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

Source height = 1.49 m

ROAD (0.00 + 50.34 + 0.00) = 50.34 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -32   0.00  59.51   0.00  -3.36  -4.92   0.00  -0.90   0.00
50.34
-------------------------------------------------------------------------
--

Segment Leq : 50.34 dBA


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

Source height = 1.50 m

ROAD (0.00 + 55.09 + 0.00) = 55.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    65     90   0.00  63.89   0.00  -0.23  -8.57   0.00   0.00   0.00
55.09
-------------------------------------------------------------------------
--

Segment Leq : 55.09 dBA

Total Leq All Segments: 61.56 dBA



TOTAL Leq FROM ALL SOURCES (DAY): 69.16
                           (NIGHT): 61.56
```

```
STAMSON 5.0        NORMAL REPORT        Date: 02-10-2013 14:03:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: POR12.te             Time Period: Day/Night 16/8 hours
Description:


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

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

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

Data for Segment # 1: Wellington (day/night)
--------------------------------------------
Angle1   Angle2           :   8.00 deg   49.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  22.40 / 22.40  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: IP 1 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 1 (day/night)
--------------------------------------
Angle1   Angle2           :  -9.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  33.70 / 33.70  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 3: IP 2 (day/night)
----------------------------------------
Car traffic volume  : 13445/1169  veh/TimePeriod  *
Medium truck volume :  1069/93    veh/TimePeriod  *
Heavy truck volume  :   764/66    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):  16607
    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: IP 2 (day/night)
--------------------------------------
Angle1   Angle2           : -90.00 deg   -48.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  22.70 / 22.70  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 4: Richmond (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 # 4: Richmond (day/night)
------------------------------------------
Angle1   Angle2           :  49.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  22.40 / 22.40  m
Receiver height           :  41.00 / 41.00  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

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

Source height = 1.50 m

ROAD (0.00 + 60.31 + 0.00) = 60.31 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     49   0.00  68.48   0.00  -1.74  -6.42   0.00   0.00   0.00
60.31
-------------------------------------------------------------------------
--

Segment Leq : 60.31 dBA


Results segment # 2: IP 1 (day)
-------------------------------

Source height = 1.50 m

ROAD (0.00 + 61.02 + 0.00) = 61.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -9     90   0.00  67.13   0.00  -3.52  -2.60   0.00   0.00   0.00
61.02
-------------------------------------------------------------------------
--

Segment Leq : 61.02 dBA
```

```
Results segment # 3: IP 2 (day)
--------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.01 + 0.00) = 59.01 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -48   0.00  67.13   0.00  -1.80  -6.32   0.00   0.00   0.00
59.01
-------------------------------------------------------------------------
--

Segment Leq : 59.01 dBA


Results segment # 4: Richmond (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 63.32 + 0.00) = 63.32 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    49     90   0.00  71.49   0.00  -1.74  -6.42   0.00   0.00   0.00
63.32
-------------------------------------------------------------------------
--

Segment Leq : 63.32 dBA

Total Leq All Segments: 67.23 dBA
```

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

Source height = 1.50 m

ROAD (0.00 + 52.72 + 0.00) = 52.72 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     8     49   0.00  60.88   0.00  -1.74  -6.42   0.00   0.00   0.00
52.72
-------------------------------------------------------------------------
--

Segment Leq : 52.72 dBA


Results segment # 2: IP 1 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 53.40 + 0.00) = 53.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -9     90   0.00  59.51   0.00  -3.52  -2.60   0.00   0.00   0.00
53.40
-------------------------------------------------------------------------
--

Segment Leq : 53.40 dBA
```

```
Results segment # 3: IP 2 (night)
---------------------------------

Source height = 1.49 m

ROAD (0.00 + 51.39 + 0.00) = 51.39 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90    -48   0.00  59.51   0.00  -1.80  -6.32   0.00   0.00   0.00
51.39
-------------------------------------------------------------------------
--

Segment Leq : 51.39 dBA


Results segment # 4: Richmond (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.73 + 0.00) = 55.73 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    49     90   0.00  63.89   0.00  -1.74  -6.42   0.00   0.00   0.00
55.73
-------------------------------------------------------------------------
--

Segment Leq : 55.73 dBA

Total Leq All Segments: 59.63 dBA




TOTAL Leq FROM ALL SOURCES (DAY): 67.23
                           (NIGHT): 59.63
```