



Roadway Traffic Noise Assessment

Petrie's Landing Blocks 6, 7, & 8

Orleans, Ontario

REPORT: GWE17-139 - Traffic Noise

Prepared For:

Jean-Luc Rivard
Director – Land Development
Brigil
98 Rue Lois
Gatineau, QB J8Y 3R7

Prepared By:

Joshua Foster, P.Eng., Partner
Omar Daher, B.Eng., EIT, Junior Environmental Scientist

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EXECUTIVE SUMMARY

This document describes a roadway traffic noise assessment performed for a proposed residential development referred to as “Petrie’s Landing” in Orleans, Ontario. The assessment analyzed traffic noise impacts on three buildings in the development referred to as Blocks 6, 7, and 8. A previous traffic noise assessment dated August 6, 2013 (GWE File: 12-022-Noise Rev 3) investigated impacts on Phases 1 and 2. Since the release of this report, the massing of Blocks 6 and 7 (Phase 2) have underwent significant changes, and the scope of study has now been expanded to include Block 8 (Phase 3). The major source of noise impacting the site is roadway traffic along North Service Road to the north, and Highway 174 to the south. Figure 1 illustrates the complete site plan and surrounding context.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment and Climate Change (MOECC) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa’s Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa’s Official Plan roadway classifications; and (iv) site plan drawings prepared by NEUF Architect(e)s.

The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 48 and 74 dBA during the daytime period (07:00-23:00), and between 41 and 67 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 74 dBA) occurs on the south façade of Block 6 (Receptor 2), which is nearest and most exposed to Highway 174 to the south. Predicted noise levels due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Therefore, upgraded building components are required where noise levels exceed 65 dBA as shown in Figure 4.

Results also indicate that Blocks 6 and 7 will require central air conditioning (or a similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. As for Block 8, forced air heating with provision for central air conditioning (or similar mechanical system) will be required. In addition to ventilation requirements, Warning Clauses will be required in all Lease, Purchase and Sale Agreements.

Noise levels at the rooftop terrace for Block 8 are not expected to exceed 55 dBA during the daytime period. Therefore, no mitigation measures are required. As for Blocks 6 and 7, noise levels are expected to exceed 55 dBA during the daytime period. According to the ENCG, if these areas are to be used as outdoor living areas, noise control measures (barriers) are required to reduce the L_{eq} to 55 dBA where technically and administratively feasible. Currently, there will be a 1.1-metre glass railing above the roof, which is required to be a noise screen. Investigation into the application of a taller noise barrier for the rooftop terraces for Blocks 6 and 7 proved that noise levels can only be reduced to 60 and 55 dBA, respectively, with the application of a 3.0-metre tall barrier (see Figures 2-3). A 3.0-metre barrier is impractical and aesthetically unpleasing, and since other noise control measures such as increased setback distances and building orientation are not feasible, noise levels cannot be mitigated for Block 6. As for Block 7, the minimum barrier height (1.1-metre) reduces noise levels to below 60 dBA. Therefore, applicable warning clauses will be required, as stated in Section 6. The barrier is required to be a noise screen. The barrier must be constructed from materials having a minimum surface density of 20 kg/m^2 or having an Sound Transmission Class (STC) rating of 30 and must be continuous with no gaps. This can be achieved using 6 mm thick monolithic glass panels.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Brigil to undertake a roadway traffic noise assessment for the proposed residential development referred to as “Petrie’s Landing” in Orleans, Ontario. The study includes three proposed buildings referred to as Blocks 6, 7, and 8, representing Phases 2 and 3 of the overall development. A previous noise assessment dated August 6, 2013 (GWE File: 12-022-Noise Rev 3) investigated impacts on Phases 1 and 2. Since the release of this report, the massing of Blocks 6 and 7 (Phase 2) have underwent significant changes. Therefore, the scope of study has been expanded to include the revised Blocks 6 and 7 (Phase 2), along with Block 8 (Phase 3). Previous phases on the development have been completed. This report summarizes the methodology, results and recommendations related to a roadway traffic noise assessment. GWE’s scope of work involved assessing indoor and outdoor noise levels across the site, generated by local roadway traffic. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa¹ and Ministry of the Environment and Climate Change (MOECC)² guidelines. Noise calculations were based on site plan drawings produced by NEUF Architect(e)s, dated August 31, 2017, with future traffic volumes corresponding to the City of Ottawa’s Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is a proposed residential development located in Orleans, Ontario. The full development contains Phase 1, which has already been constructed and is located on the western half of the site, along with the proposed Phases 2 and 3. The scope of this study encompasses Phases 2 and 3, which are located on the eastern half of the site. Phase 2 is located in the south-eastern side of the site and contains two buildings referred to as Blocks 6 and 7. Phase 3 is located in the north-eastern side of the site and contains one building referred to as Block 8. Blocks 6-7 rise approximately 13 metres above grade and Block 8 is expected to rise 13 metres above grade as well. Outdoor amenity space is located throughout the development, in the form of rooftop common terraces on Blocks 6-8 and a large public park in the middle of the development. The public park is not considered a noise sensitive space. The site is surrounded by small residential developments west, east, and south, while the north contains grasslands. The site is bordered by North Service Road north of the development and

¹ City of Ottawa Environmental Noise Control Guidelines, January 2016

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

Brigil – Petrie’s Landing Blocks 6, 7, & 8

Roadway Traffic Noise Assessment

Highway 174 south of the development. The major source of noise impacting the site is roadway traffic along North Service Road and Highway 174. Figure 1 illustrates a complete site plan and surrounding context.

3. OBJECTIVES

The main objective of this work is to calculate the future noise levels on the study building produced by local roadway traffic, to 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 Section 4 of this report.

4. METHODOLOGY

4.1 Background

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

4.2 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 range (that is relevant to this study) is 45, and 40 dBA for residence living rooms and sleeping quarters respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD)³

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

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction⁴. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which normally triggers the need for central air conditioning (or similar systems). Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, building components will require higher levels of sound attenuation⁵.

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

³ Adapted from ENCG 2016 – Tables 2.2b and 2.2c

⁴ Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125

⁵ MOECC, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

Brigil – Petrie's Landing Blocks 6, 7, & 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 Plan⁶, which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Highway 174 EB (East of Trim Road)	Freeway	100	36,666
Highway 174 WB (East of Trim Road)	Freeway		36,666
North Service Road	2-UMCU	60	12,000

4.2.3 Theoretical Roadway Traffic Noise Predictions

Noise predictions were performed with the aid of the MOECC computerized noise assessment program, STAMSON 5.04, for road analysis. 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 2, 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
- Topography considered as a flat/gentle slope

⁶ City of Ottawa Transportation Master Plan, November 2013
Brigil – Petrie's Landing Blocks 6, 7, & 8

- Surrounding buildings and proposed buildings in some cases used as barrier where the line of sight between the source and receiver is broken by the building
- Rooftop terrace noise-screen taken as 1.1 metres (above roof) from drawings for Blocks 6-7 and as an assumed height of 1.1 metres for Block 8
- Noise receptors were strategically placed at 14 locations around the study area, as shown in Figures 2 and 3.

4.3 Indoor Noise Calculations

As per Section 4.2, when daytime noise levels from road sources at the plane of the window exceed 65 dBA during the daytime or 60 dBA during the nighttime, building components should be evaluated to ensure acceptable indoor noise levels can be achieved. The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope, measured as sound transmission. According to common industry practice, complete walls and individual wall elements are rated according to 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 walls can achieve STC 50 or more. 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.

The performance of the windows and walls was evaluated using a software program called INSUL by Marshal Day Acoustics. The program provides estimates of STC ratings of individual building elements, such as walls and windows. It also predicts indoor sound levels in a room based on the sound transmission data of the components and the outdoor noise levels. The indoor noise calculations are based on the International Standards Organization (ISO) Standard 12354-3⁷. The calculations for indoor noise consider: (i) window type and transmission loss; (ii) exterior wall type and transmission loss; (iii) room volume and the acoustic absorption characteristics of the room; (iv) outdoor noise levels; and (v) the indoor sound level criteria, which varies according to the intended use of a space as per Table 1. Outdoor noise levels were predicted by STAMSON. The sound spectrum was assumed based on ISO (717)⁸.

⁷ ISO, Standard 12354-3, Estimations of Acoustic Performance of Buildings from the Performance of Elements – Part 3 Airborne Sound Insulation Against Outdoor Sound

⁸ ISO 717-1:2013 (en), Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne Sound Insulation

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

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

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC

Receptor Number	Receptor Location	Noise Level (dBA)	
		Daytime Period (07:00-23:00)	Nighttime Period (23:00-07:00)
1	POW – Block 6 – West Facade	71	63
2	POW – Block 6 – South Facade	74	67
3	POW – Block 6 – East Facade	71	63
4	POW – Block 7 – West Facade	61	53
5	POW – Block 7 – South Facade	68	60
6	POW – Block 7 – East Facade	66	58
7	POW – Block 7 – North Facade	51	43
8	POW – Block 8 – South Facade	56	49
9	POW – Block 8 – West Facade	62	54
10	POW – Block 8 – East Facade	62	54
11	POW – Block 8 – North Facade	65	58
12	OLA – Block 6 – Rooftop Terrace	71	63
13	OLA – Block 7 – Rooftop Terrace	61	53
14	OLA – Block 8 – Rooftop Terrace	48	41

The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 48 and 74 dBA during the daytime period (07:00-23:00) and between 41 and 67 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 74 dBA) occurs on the south façade of Block 6 (Receptor 2), which is nearest and most exposed to Highway 174 to the south. Noise levels at the rooftop terrace were below 55 dBA for Block 8; therefore, there are no mitigation requirements. However, noise levels at the rooftop terraces of Blocks 6 and 7 exceeded 55 dBA. Section 5.4 addresses the noise barrier investigation.

5.2 Noise Control Measures

The noise levels predicted due to transportation sources exceed the criteria listed in Section 4.2 for upgraded building components. As discussed in Section 4.3, the anticipated STC requirements for windows, walls, and doors have been estimated using the *INSUL* program. Detailed STC calculations show that common architecturally specified wall construction⁹ and window details will provide the necessary attenuation to control interior noise levels, as discussed in the following paragraphs. Details of *INSUL* calculations and STC estimates can be found in Appendix B.

EXTERIOR WALL STC REVIEW

The exterior wall assemblies for the development have been assumed based on previous GWE experience and standard exterior residential wall assemblies. Acoustical performance has been evaluated by *INSUL* and comparison of similar assemblies based on NRC test data¹⁰.

Exterior Wall:

- 57 mm Brick Veneer
- 25 mm Air Space
- 13 mm Glass Faced Gypsum Board (Modeled as DensGlass Sheathing Georgia PA in *INSUL*)
- 92 mm Metal Studs
- 89 mm Wool Batt Insulation
- 13 mm Type C Gypsum Board (minimum)

INSUL Predicted STC rating 59

Alternatively, the following assembly could be used for exterior walls:

Exterior Wall:

- 19 mm Metal / vinyl siding
- 13 mm Glass Faced Gypsum Board (Modeled as DensGlass Sheathing Georgia PA in *INSUL*)
- 92 mm Metal Studs
- 89 mm Wool Batt Insulation
- 13 mm Type C Gypsum Board (minimum)

INSUL Predicted STC rating 48

⁹ Based on the Architectural drawings and common residential building practices.

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

Note the use of stone or brick veneer on exterior wall assemblies can provide more than STC 50. Therefore, the noted wall assembly above was considered as a worst-case example.

WINDOW AND DOOR STC REQUIREMENTS

Common and typical exterior window and door assemblies, listed below, have been rated for a particular STC rating based on *INSUL* estimates. Window STC requirements, as shown below and on Figure 4, indicate Blocks that require upgraded windows to mitigate noise levels below the criteria specified in Table 1.

- **Bedroom Windows**

- (i) Bedroom windows for Block 7 facing east and south will require a minimum STC of 31
- (ii) Bedroom windows for Block 6 facing east, west, and south will require a minimum STC of 38
- (iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

- **Living Room Windows**

- (iv) Living room windows for Block 7 facing east and south will require a minimum STC of 31
- (v) Living room windows for Block 6 facing east, west, and south will require a minimum STC of 33
- (vi) All other bedroom windows are to satisfy Ontario Building Code (OBC 2012) requirements

Common and typical exterior window and door assemblies, listed below, have been rated for a particular STC rating based on *INSUL* estimates. The window specifications below indicate a general composition of the windows in order to achieve the required STC ratings stated above.

Block 6 Bedroom Windows

- 6 mm Laminated Inner Pane with 0.045 mm Interlayer
- 24 mm Air Space
- 4 mm Outer Pane

INSUL Predicted STC rating 38

Block 6 Living Room Window/Doors

- 6 mm Inner Pane
- 13 mm Air Space
- 6 mm Outer Pane

INSUL Predicted STC rating 33

Block 7 Bedroom/Living Room Windows/Doors

- 5 mm Inner Pane
- 6 mm Air Space
- 5 mm Outer Pane

INSUL Predicted STC rating 31

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.

5.3 Ventilation Requirements

Results of the calculations do indicate that a number of blocks will require central air conditioning, while others require forced air heating with provision for central air conditioning (or similar mechanical systems). If installed, air conditioning will allow occupants to keep windows closed and maintain a comfortable living environment during the warmer months. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Table 4 below.

TABLE 4: SITE VENTILATION AND WARNING CLAUSE REQUIREMENTS

Location	Ventilation Requirements	Warning Clause
Block 6, 7	Central Air Conditioning	Yes
Block 8	Forced Air Heating with Provisions for Central Air Conditioning	Yes

5.4 Noise Barrier Calculation

Noise levels at the rooftop terrace for Block 8 are not expected to exceed 55 dBA during the daytime period. Therefore, no mitigation measures are required. As for Blocks 6 and 7, noise levels are expected to exceed 55 dBA during the daytime period. According to the ENCG, if these areas are to be used as outdoor living areas, noise control measures (barriers) are required to reduce the L_{eq} to 55 dBA where technically and administratively feasible. Currently, there will be a 1.1-metre glass railing above the roof, *Brigil – Petrie's Landing Blocks 6, 7, & 8*

which is required to be a noise screen. Investigation into the application of a taller noise barrier for the rooftop terraces for Blocks 6 and 7 proved that noise levels can only be reduced to 60 and 55 dBA, respectively, with the application of a 3.0-metre tall barrier (see Figures 2-3). A 3.0-metre barrier is impractical and aesthetically unpleasing, and since other noise control measures such as increased setback distances and building orientation are not feasible, noise levels cannot be mitigated for Block 6. As for Block 7, the minimum barrier height (1.1-metre) reduces noise levels to below 60 dBA. Therefore, applicable warning clauses will be required, as stated in Section 6. The barrier is required to be a noise screen. The barrier must be constructed from materials having a minimum surface density of 20 kg/m² or having an STC rating of 30 and must be continuous with no gaps. This can be achieved using 6 mm thick monolithic glass panels.

TABLE 5: RESULTS OF NOSIE BARRIER INVESTIGATION

Location	Reference Receptor	Barrier Height (m)	Daytime L _{eq} Noise Levels (dBA)	
			With Barrier	Without Barrier
OLA – Block 6 – Rooftop Terrace	12	1.1	65	71
		3.0	60	
OLA – Block 7 – Rooftop Terrace	13	1.1	59	61
		3.0	55	

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels due to roadway traffic over the site will range between approximately 48 and 74 dBA during the daytime period (07:00-23:00) and between 41 and 67 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 74 dBA) occurs on the south façade of Block 6 (Receptor 2), which is nearest and most exposed to Highway 174 to the south. Predicted noise levels due to roadway traffic exceed the criteria listed in Section 4.2 for building components. Therefore, upgraded building components are required where noise levels exceed 65 dBA as shown in Figure 4.

Results of the calculations also indicate that Blocks 6 and 7 will require central air conditioning (or a similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will be required in all Lease, Purchase and Sale Agreements as summarized below:

“Purchasers 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 occupants as the sound levels exceed the sound level limits of the City of Ottawa and Ministry of the Environment and Climate Change. To help address the need for sound attenuation, this development includes:

- *STC multi-pane glass glazing elements*
 - *Block 6 west, south, and east façade bedroom: STC 38*
 - *Block 6 west, south, and east façade living room: STC 33*
 - *Block 7 east, and south bedroom/living room: STC 31*
- *STC rated exterior walls*
 - *Block 6 west, south, and east facades: STC 59/48*
 - *Block 7 east, and south facades: STC 59/48*

Additionally, with respect to the Outdoor Living Area, Purchasers/tenants are advised that sound levels due to road traffic may, on occasion, interfere with some activities of the occupants as the sound levels exceed the sound level limits of the City of Ottawa and Ministry of the Environment and Climate Change.

This development has also been designed with central air conditioning (or similar mechanical systems) and other measures which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City of Ottawa and the Ministry of the Environment and Climate Change.”

As for Block 8, forced air heating with provision for central air conditioning (or similar mechanical system) will be required, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will be required in all Lease, Purchase and Sale Agreements as summarized below:

“Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the home, sound levels due to increasing roadway traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment and Climate Change.

To ensure that provincial sound level limits are not exceeded, this dwelling unit has been designed with forced air heating and the provision for central air conditioning (or similar mechanical systems). The 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 and Climate Change.”

Noise levels at the rooftop terrace for Block 8 are not expected to exceed 55 dBA during the daytime period. Therefore, no mitigation measures are required. As for Blocks 6 and 7, noise levels are expected to exceed 55 dBA during the daytime period. According to the ENCG, if these areas are to be used as outdoor living areas, noise control measures (barriers) are required to reduce the L_{eq} to 55 dBA where technically and administratively feasible. Currently, there will be a 1.1-metre glass railing above the roof, which is required to be a noise screen. Investigation into the application of a taller noise barrier for the rooftop terraces for Blocks 6 and 7 proved that noise levels can only be reduced to 60 and 55 dBA, respectively, with the application of a 3.0-metre tall barrier (see Figures 2-3). A 3.0-metre barrier is impractical and aesthetically unpleasing, and since other noise control measures such as increased setback distances and building orientation are not feasible, noise levels cannot be mitigated for Block 6. As for Block 7, the minimum barrier height (1.1-metre) reduces noise levels to below 60 dBA. Therefore,

applicable warning clauses will be required, as stated in Section 6. The barrier is required to be a noise screen. The barrier must be constructed from materials having a minimum surface density of 20 kg/m² or having an STC rating of 30, and must be continuous with no gaps. This can be achieved using 6 mm thick monolithic glass panels.

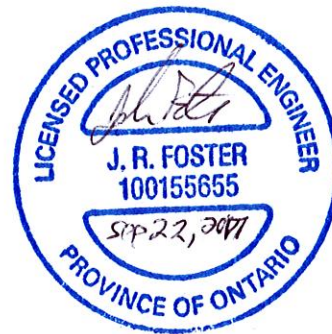
This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

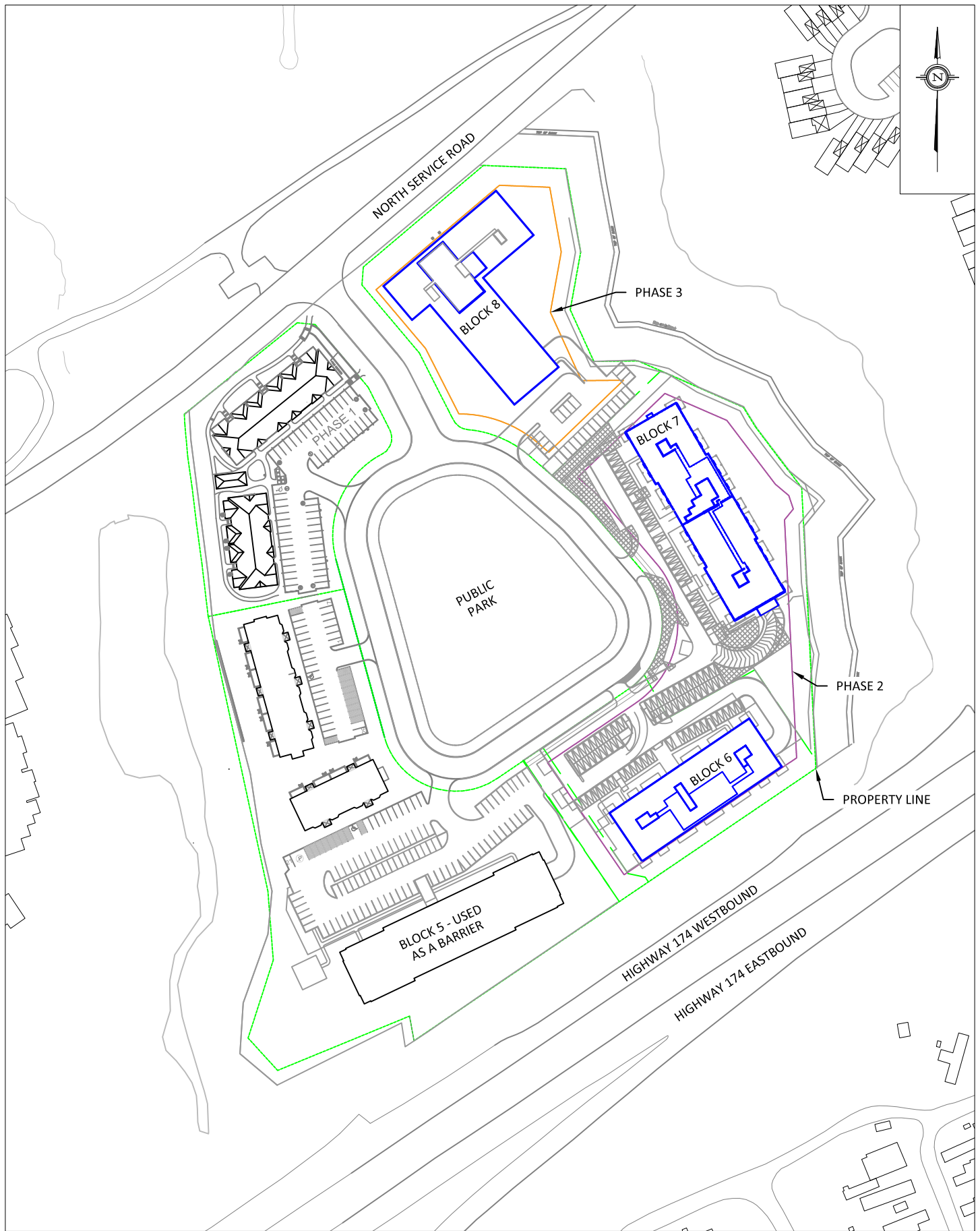
Gradient Wind Engineering Inc.

A handwritten signature in blue ink, appearing to read 'Omar Daher'.

Omar Daher, B.Eng., EIT
Junior Environmental Scientist
GWE17-139 – Traffic Noise



Joshua Foster, P.Eng.
Partner

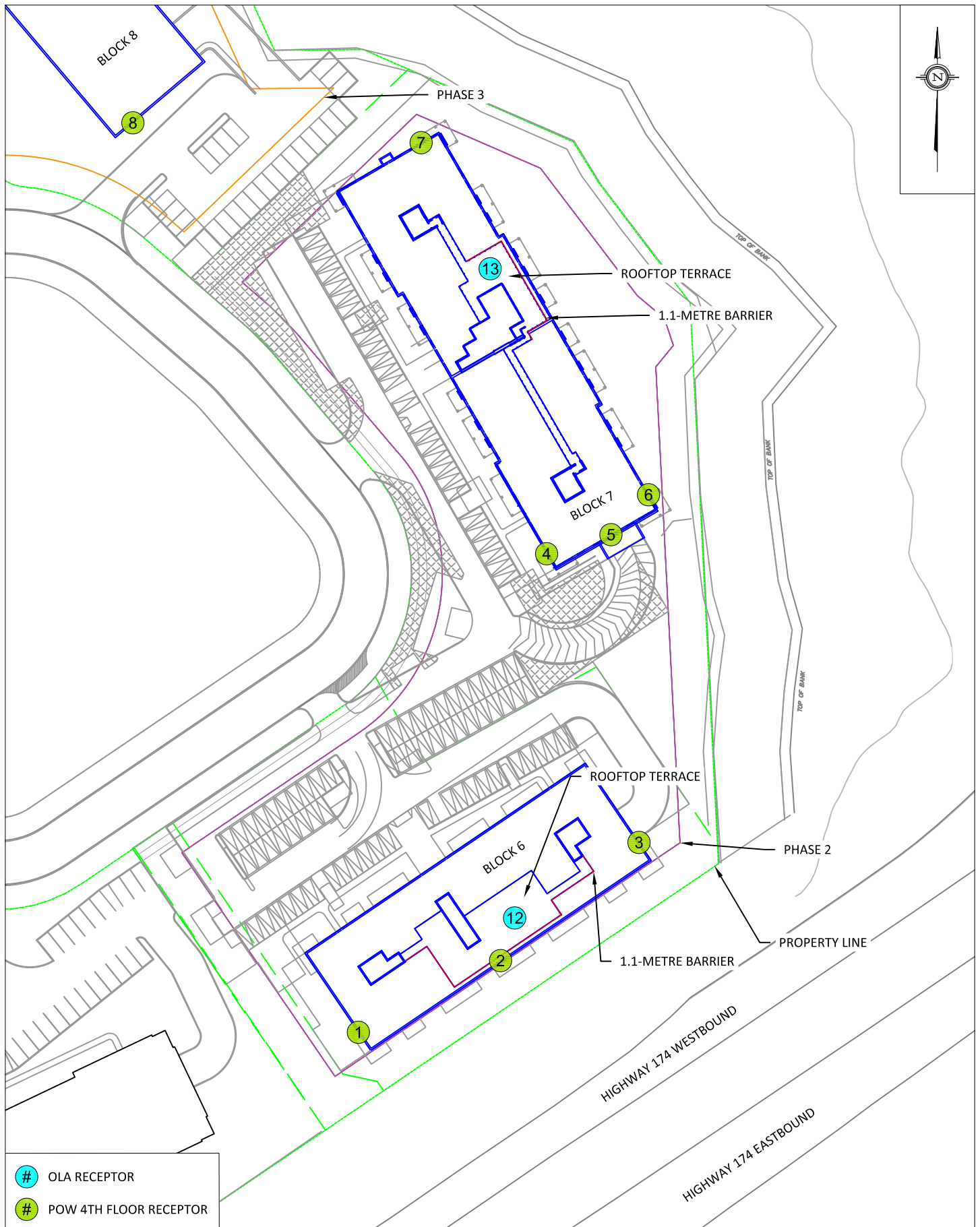


127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND
ENGINEERING INC

PROJECT			
PETRIE'S LANDING BLOCKS 6, 7, AND 8 - TRAFFIC NOISE ASSESSMENT			
SCALE	1:2000 (APPROX)	DRAWING NO.	GWE17-139-1
DATE	SEPTEMBER 22, 2017	DRAWN BY	O.D.

DESCRIPTION
FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT



GRADIENT WIND
ENGINEERING INC

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

PROJECT
PETRIE'S LANDING BLOCKS 6, 7, AND 8 - TRAFFIC NOISE ASSESSMENT

SCALE
1:1000 (APPROX)

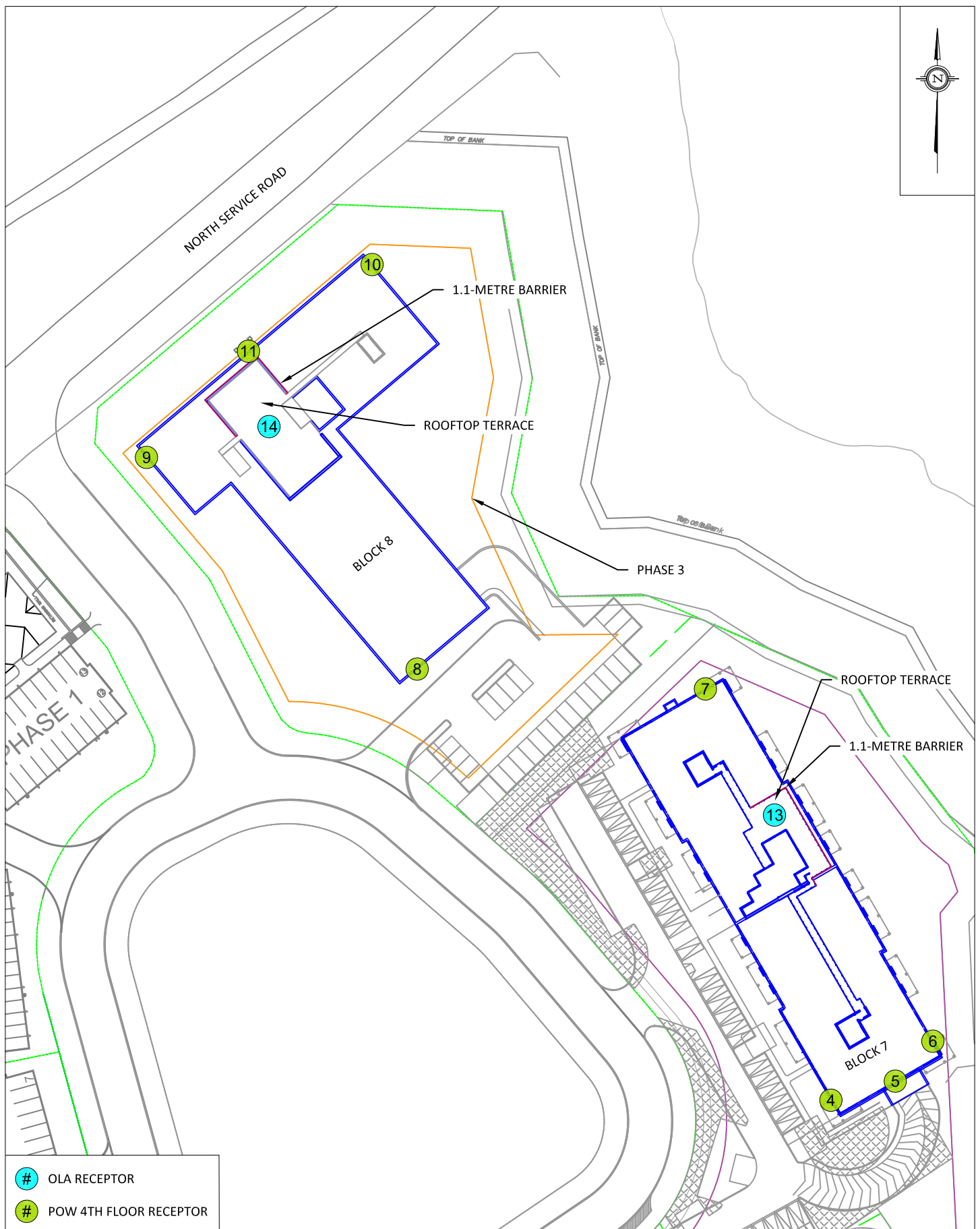
DATE
SEPTEMBER 22, 2017

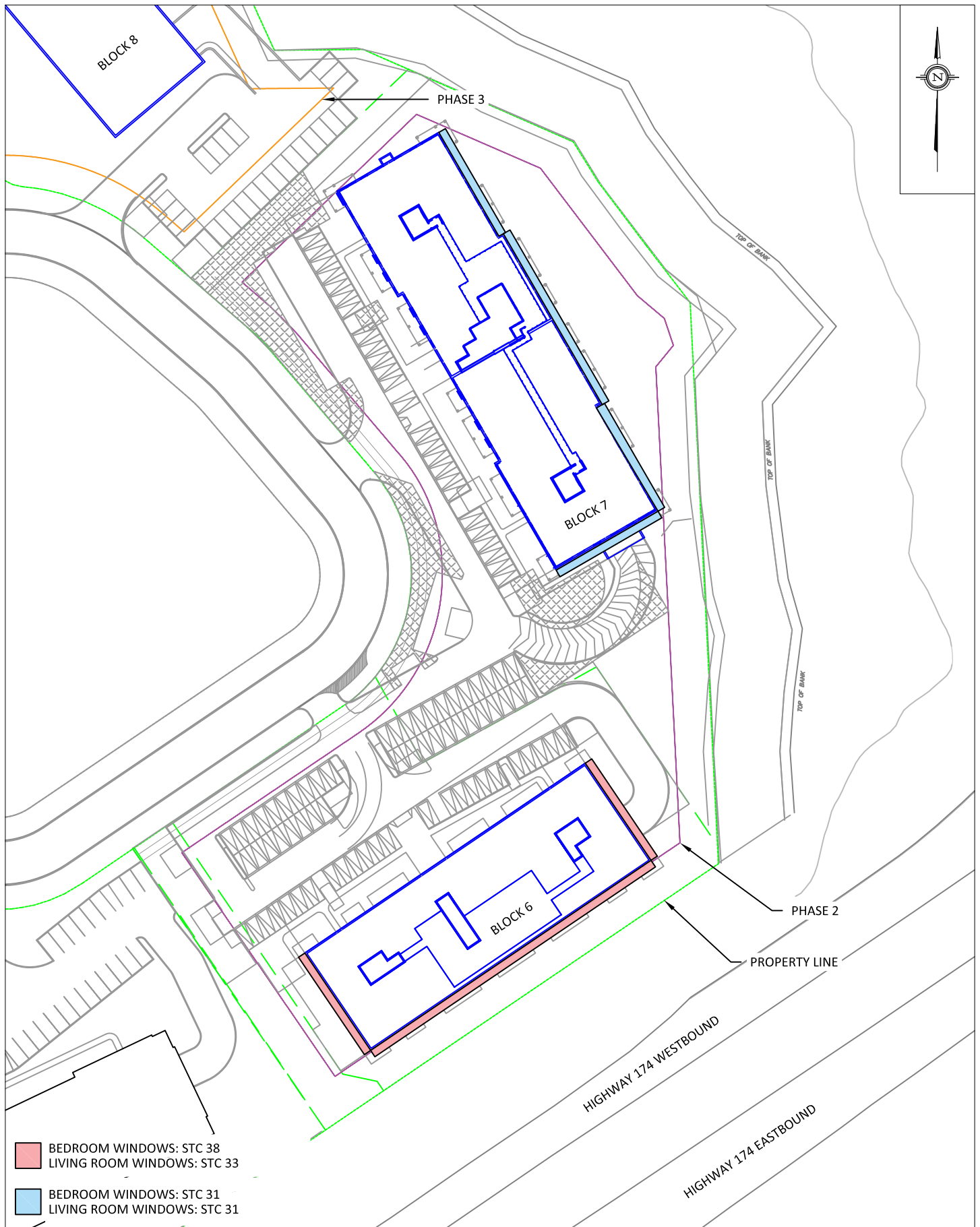
DRAWING NO.
GWE17-139-2

DRAWN BY
O.D.

DESCRIPTION

**FIGURE 2:
RECEPTOR LOCATIONS**





127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND
ENGINEERING INC

PROJECT
PETRIE'S LANDING BLOCKS 6, 7, AND 8 - TRAFFIC NOISE ASSESSMENT

SCALE
1:1000 (APPROX)

DATE
SEPTEMBER 22, 2017

DRAWING NO.
GWE17-139-4

DRAWN BY
O.D.

DESCRIPTION

**FIGURE 4:
BEDROOM AND LIVING ROOM WINDOW STC
REQUIREMENTS**

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:28:23
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 61.00 / 61.00 m
 Receiver height : 11.29 / 11.29 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 38.00 / 38.00 m
 Receiver height : 11.29 / 11.29 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00



Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

ROAD (0.00 + 66.14 + 0.00) = 66.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.37	78.39	0.00	-8.32	-3.92	0.00	0.00	0.00	66.14

Segment Leq : 66.14 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

ROAD (0.00 + 68.95 + 0.00) = 68.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.37	78.39	0.00	-5.52	-3.92	0.00	0.00	0.00	68.95

Segment Leq : 68.95 dBA

Total Leq All Segments: 70.78 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

ROAD (0.00 + 58.54 + 0.00) = 58.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.37	70.79	0.00	-8.32	-3.92	0.00	0.00	0.00	58.54

Segment Leq : 58.54 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

ROAD (0.00 + 61.35 + 0.00) = 61.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.37	70.79	0.00	-5.52	-3.92	0.00	0.00	0.00	61.35

Segment Leq : 61.35 dBA

Total Leq All Segments: 63.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.78
(NIGHT): 63.18

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:29:10
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 57.00 / 57.00 m
 Receiver height : 11.29 / 11.29 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 33.00 / 33.00 m

Receiver height : 11.29 / 11.29 m

Topography : 1 (Flat/gentle slope; no barrier)

Reference angle : 0.00



Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

ROAD (0.00 + 69.55 + 0.00) = 69.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.37	78.39	0.00	-7.92	-0.91	0.00	0.00	0.00	69.55

Segment Leq : 69.55 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

ROAD (0.00 + 72.80 + 0.00) = 72.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.37	78.39	0.00	-4.68	-0.91	0.00	0.00	0.00	72.80

Segment Leq : 72.80 dBA

Total Leq All Segments: 74.48 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

ROAD (0.00 + 61.96 + 0.00) = 61.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.37	70.79	0.00	-7.92	-0.91	0.00	0.00	0.00	61.96

Segment Leq : 61.96 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

ROAD (0.00 + 65.20 + 0.00) = 65.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.37	70.79	0.00	-4.68	-0.91	0.00	0.00	0.00	65.20

Segment Leq : 65.20 dBA

Total Leq All Segments: 66.89 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 74.48
(NIGHT): 66.89

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:30:07
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   0.00 deg
Wood depth      : 0           (No woods.)
No of house rows : 0 / 0
Surface         : 1           (Absorptive ground surface)
Receiver source distance : 61.00 / 61.00 m
Receiver height  : 11.29 / 11.29 m
Topography      : 1           (Flat/gentle slope; no barrier)
Reference angle  : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume  : 2361/205    veh/TimePeriod  *
Heavy truck volume   : 1687/147    veh/TimePeriod  *
Posted speed limit   : 100 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): 36666
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: HWY 174 WB (day/night)

```
-----
Angle1 Angle2      : -90.00 deg  0.00 deg
Wood depth          : 0          (No woods.)
No of house rows    : 0 / 0
Surface             : 1          (Absorptive ground surface)
Receiver source distance : 37.00 / 37.00 m
Receiver height     : 11.29 / 11.29 m
Topography          : 1          (Flat/gentle slope; no barrier)
Reference angle     : 0.00
```

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

ROAD (0.00 + 66.14 + 0.00) = 66.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	78.39	0.00	-8.32	-3.92	0.00	0.00	0.00	66.14

Segment Leq : 66.14 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

ROAD (0.00 + 69.11 + 0.00) = 69.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	78.39	0.00	-5.36	-3.92	0.00	0.00	0.00	69.11

Segment Leq : 69.11 dBA

Total Leq All Segments: 70.88 dBA



Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

ROAD (0.00 + 58.54 + 0.00) = 58.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	70.79	0.00	-8.32	-3.92	0.00	0.00	0.00	58.54

Segment Leq : 58.54 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

ROAD (0.00 + 61.51 + 0.00) = 61.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	70.79	0.00	-5.36	-3.92	0.00	0.00	0.00	61.51

Segment Leq : 61.51 dBA

Total Leq All Segments: 63.28 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.88
(NIGHT): 63.28

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:40:06
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 118.00 / 118.00 m
 Receiver height : 11.22 / 11.22 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 15.00 deg Angle2 : 90.00 deg
 Barrier height : 13.00 m
 Barrier receiver distance : 61.00 / 61.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 94.00 / 94.00 m
 Receiver height : 11.22 / 11.22 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 15.00 deg Angle2 : 90.00 deg
 Barrier height : 13.00 m
 Barrier receiver distance : 61.00 / 61.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	6.19	6.19

ROAD (55.32 + 53.37 + 0.00) = 57.46 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	15	0.37	78.39	0.00	-12.26	-10.81	0.00	0.00	0.00	55.32
15	90	0.00	78.39	0.00	-8.96	-3.80	0.00	0.00	-12.26	53.37

Segment Leq : 57.46 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	4.91	4.91

ROAD (56.67 + 52.30 + 0.00) = 58.02 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	15	0.37	78.39	0.00	-10.91	-10.81	0.00	0.00	0.00	56.67
15	90	0.00	78.39	0.00	-7.97	-3.80	0.00	0.00	-14.31	52.30

Segment Leq : 58.02 dBA

Total Leq All Segments: 60.76 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	6.19	6.19

ROAD (47.72 + 45.77 + 0.00) = 49.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	15	0.37	70.79	0.00	-12.26	-10.81	0.00	0.00	0.00	47.72
15	90	0.00	70.79	0.00	-8.96	-3.80	0.00	0.00	-12.26	45.77

Segment Leq : 49.87 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	4.91	4.91

ROAD (49.07 + 44.71 + 0.00) = 50.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	15	0.37	70.79	0.00	-10.91	-10.81	0.00	0.00	0.00	49.07
15	90	0.00	70.79	0.00	-7.97	-3.80	0.00	0.00	-14.31	44.71

Segment Leq : 50.43 dBA

Total Leq All Segments: 53.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.76
(NIGHT): 53.17

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:40:51
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth      : 0 (No woods.)
No of house rows : 0 / 0
Surface        : 1 (Absorptive ground surface)
Receiver source distance : 114.00 / 114.00 m
Receiver height  : 11.22 / 11.22 m
Topography      : 2 (Flat/gentle slope; with barrier)
Barrier angle1   : 27.00 deg   Angle2 : 90.00 deg
Barrier height   : 13.00 m
Barrier receiver distance : 57.00 / 57.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle  : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 90.00 / 90.00 m
 Receiver height : 11.22 / 11.22 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 27.00 deg Angle2 : 90.00 deg
 Barrier height : 13.00 m
 Barrier receiver distance : 57.00 / 57.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: HWY 174 EB (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 !	11.22 !	6.36 !	6.36

ROAD (63.76 + 53.28 + 0.00) = 64.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-90	27	0.37	78.39	0.00	-12.05	-2.57	0.00	0.00	0.00	63.76
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
27	90	0.00	78.39	0.00	-8.81	-4.56	0.00	0.00	-11.74	53.28
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Segment Leq : 64.13 dBA

Results segment # 2: HWY 174 WB (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 !	11.22 !	5.06 !	5.06

ROAD (65.16 + 52.29 + 0.00) = 65.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-90	27	0.37	78.39	0.00	-10.65	-2.57	0.00	0.00	0.00	65.16
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
27	90	0.00	78.39	0.00	-7.78	-4.56	0.00	0.00	-13.75	52.29
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Segment Leq : 65.38 dBA

Total Leq All Segments: 67.81 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	6.36	6.36

ROAD (56.16 + 45.68 + 0.00) = 56.54 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	27	0.37	70.79	0.00	-12.05	-2.57	0.00	0.00	0.00	56.16
27	90	0.00	70.79	0.00	-8.81	-4.56	0.00	0.00	-11.74	45.68

Segment Leq : 56.54 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	11.22	5.06	5.06

ROAD (57.57 + 44.70 + 0.00) = 57.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	27	0.37	70.79	0.00	-10.65	-2.57	0.00	0.00	0.00	57.57
27	90	0.00	70.79	0.00	-7.78	-4.56	0.00	0.00	-13.75	44.70

Segment Leq : 57.79 dBA

Total Leq All Segments: 60.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.81
(NIGHT): 60.22

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:41:10
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 116.00 / 116.00 m
 Receiver height : 11.22 / 11.22 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 93.00 / 93.00 m
 Receiver height : 11.22 / 11.22 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00



Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

ROAD (0.00 + 62.30 + 0.00) = 62.30 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	78.39	0.00	-12.16	-3.93	0.00	0.00	0.00	62.30

Segment Leq : 62.30 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

ROAD (0.00 + 63.62 + 0.00) = 63.62 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	78.39	0.00	-10.84	-3.93	0.00	0.00	0.00	63.62

Segment Leq : 63.62 dBA

Total Leq All Segments: 66.02 dBA



Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

ROAD (0.00 + 54.71 + 0.00) = 54.71 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	70.79	0.00	-12.16	-3.93	0.00	0.00	0.00	54.71

Segment Leq : 54.71 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

ROAD (0.00 + 56.02 + 0.00) = 56.02 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.37	70.79	0.00	-10.84	-3.93	0.00	0.00	0.00	56.02

Segment Leq : 56.02 dBA

Total Leq All Segments: 58.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.02
(NIGHT): 58.42

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:51:49
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: NorthServRD (day/night)

```
-----
Car traffic volume   : 9715/845   veh/TimePeriod  *
Medium truck volume : 773/67    veh/TimePeriod  *
Heavy truck volume  : 552/48    veh/TimePeriod  *
Posted speed limit  : 60 km/h
Road gradient       : 0 %
Road pavement       : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 12000
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: NorthServRD (day/night)

```
-----
Angle1   Angle2       : -57.00 deg   -3.00 deg
Wood depth      : 0           (No woods.)
No of house rows : 0 / 0
Surface         : 1           (Absorptive ground surface)
Receiver source distance : 132.00 / 132.00 m
Receiver height  : 11.22 / 11.22 m
Topography      : 1           (Flat/gentle slope; no barrier)
Reference angle  : 0.00
```

Results segment # 1: NorthServRD (day)

Source height = 1.50 m

ROAD (0.00 + 50.57 + 0.00) = 50.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	-3	0.37	69.03	0.00	-12.93	-5.53	0.00	0.00	0.00	50.57

Segment Leq : 50.57 dBA

Total Leq All Segments: 50.57 dBA

Results segment # 1: NorthServRD (night)

Source height = 1.50 m

ROAD (0.00 + 42.97 + 0.00) = 42.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-57	-3	0.37	61.43	0.00	-12.93	-5.53	0.00	0.00	0.00	42.97

Segment Leq : 42.97 dBA

Total Leq All Segments: 42.97 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.57
(NIGHT): 42.97

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:56:49
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -54.00 deg   0.00 deg
Wood depth      : 0           (No woods.)
No of house rows : 0 / 0
Surface         : 1           (Absorptive ground surface)
Receiver source distance : 234.00 / 234.00 m
Receiver height  : 10.50 / 10.50 m
Topography      : 2           (Flat/gentle slope; with barrier)
Barrier angle1   : -54.00 deg   Angle2 : -9.00 deg
Barrier height   : 13.00 m
Barrier receiver distance : 119.00 / 119.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle  : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : -54.00 deg 0.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 210.00 / 210.00 m

Receiver height : 10.50 / 10.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : -54.00 deg Angle2 : -9.00 deg

Barrier height : 13.00 m

Barrier receiver distance : 119.00 / 119.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 3: HWY 174 EB 2 (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 EB 2 (day/night)

Angle1 Angle2 : 0.00 deg 29.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 234.00 / 234.00 m

Receiver height : 10.50 / 10.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : 0.00 deg Angle2 : 22.00 deg

Barrier height : 13.00 m

Barrier receiver distance : 177.00 / 177.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 4: HWY 174 WB 2 (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB 2 (day/night)

Angle1 Angle2 : 0.00 deg 29.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 210.00 / 210.00 m
 Receiver height : 10.50 / 10.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 22.00 deg
 Barrier height : 13.00 m
 Barrier receiver distance : 177.00 / 177.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 5: HWY 174 EB 3 (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 5: HWY 174 EB 3 (day/night)

Angle1 Angle2 : 29.00 deg 52.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 234.00 / 234.00 m

Receiver height : 10.50 / 10.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : 29.00 deg Angle2 : 52.00 deg

Barrier height : 13.00 m

Barrier receiver distance : 174.00 / 174.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 6: HWY 174 WB 3 (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume  : 2361/205    veh/TimePeriod  *
Heavy truck volume   : 1687/147    veh/TimePeriod  *
Posted speed limit   : 100 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): 36666
Percentage of Annual Growth         : 0.00
Number of Years of Growth           : 0.00
Medium Truck % of Total Volume      : 7.00
Heavy Truck % of Total Volume       : 5.00
Day (16 hrs) % of Total Volume      : 92.00
```

Data for Segment # 6: HWY 174 WB 3 (day/night)

```
-----
Angle1   Angle2      : 29.00 deg   52.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface     : 1 (Absorptive ground surface)
Receiver source distance : 210.00 / 210.00 m
Receiver height : 10.50 / 10.50 m
Topography    : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 29.00 deg   Angle2 : 52.00 deg
Barrier height : 13.00 m
Barrier receiver distance : 174.00 / 174.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00
```

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	5.92	5.92

ROAD (0.00 + 47.28 + 48.78) = 51.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-54	-9	0.00	78.39	0.00	-11.93	-6.02	0.00	0.00	-13.16	47.28
-9	0	0.39	78.39	0.00	-16.59	-13.02	0.00	0.00	0.00	48.78

Segment Leq : 51.11 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	5.40	5.40

ROAD (0.00 + 46.65 + 49.44) = 51.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-54	-9	0.00	78.39	0.00	-11.46	-6.02	0.00	0.00	-14.25	46.65
-9	0	0.39	78.39	0.00	-15.93	-13.02	0.00	0.00	0.00	49.44

Segment Leq : 51.27 dBA

Results segment # 3: HWY 174 EB 2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)			
1.50	!	10.50	!	3.69	!	3.69

ROAD (0.00 + 39.83 + 47.52) = 48.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	22	0.00	78.39	0.00	-11.93	-9.13	0.00	0.00	-17.50	39.83
22	29	0.39	78.39	0.00	-16.59	-14.28	0.00	0.00	0.00	47.52

Segment Leq : 48.21 dBA

Results segment # 4: HWY 174 WB 2 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	10.50	2.91	2.91

ROAD (0.00 + 37.84 + 48.18) = 48.56 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	22	0.00	78.39	0.00	-11.46	-9.13	0.00	0.00	-19.96	37.84
22	29	0.39	78.39	0.00	-15.93	-14.28	0.00	0.00	0.00	48.18

Segment Leq : 48.56 dBA

Results segment # 5: HWY 174 EB 3 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	3.80	3.80

ROAD (0.00 + 41.42 + 0.00) = 41.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
29	52	0.00	78.39	0.00	-11.93	-8.94	0.00	0.00	-16.10	41.42

Segment Leq : 41.42 dBA

Results segment # 6: HWY 174 WB 3 (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	3.04	3.04

ROAD (0.00 + 39.53 + 0.00) = 39.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
29	52	0.00	78.39	0.00	-11.46	-8.94	0.00	0.00	-18.46	39.53

Segment Leq : 39.53 dBA

Total Leq All Segments: 56.27 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	5.92	5.92

ROAD (0.00 + 39.69 + 41.19) = 43.51 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-54	-9	0.00	70.79	0.00	-11.93	-6.02	0.00	0.00	-13.15	39.69
-9	0	0.39	70.79	0.00	-16.59	-13.02	0.00	0.00	0.00	41.19

Segment Leq : 43.51 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	5.40	5.40

ROAD (0.00 + 39.06 + 41.84) = 43.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-54	-9	0.00	70.79	0.00	-11.46	-6.02	0.00	0.00	-14.25	39.06
-9	0	0.39	70.79	0.00	-15.93	-13.02	0.00	0.00	0.00	41.84

Segment Leq : 43.68 dBA

Results segment # 3: HWY 174 EB 2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	3.69	3.69

ROAD (0.00 + 32.24 + 39.93) = 40.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	22	0.00	70.79	0.00	-11.93	-9.13	0.00	0.00	-17.50	32.24
22	29	0.39	70.79	0.00	-16.59	-14.28	0.00	0.00	0.00	39.93

Segment Leq : 40.61 dBA

Results segment # 4: HWY 174 WB 2 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	2.91	2.91

ROAD (0.00 + 30.24 + 40.58) = 40.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	22	0.00	70.79	0.00	-11.46	-9.13	0.00	0.00	-19.96	30.24
22	29	0.39	70.79	0.00	-15.93	-14.28	0.00	0.00	0.00	40.58

Segment Leq : 40.97 dBA

Results segment # 5: HWY 174 EB 3 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	3.80	3.80

ROAD (0.00 + 33.83 + 0.00) = 33.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
29	52	0.00	70.79	0.00	-11.93	-8.94	0.00	0.00	-16.10	33.83

Segment Leq : 33.83 dBA

Results segment # 6: HWY 174 WB 3 (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	10.50	3.04	3.04

ROAD (0.00 + 31.94 + 0.00) = 31.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
29	52	0.00	70.79	0.00	-11.46	-8.94	0.00	0.00	-18.46	31.94

Segment Leq : 31.94 dBA

Total Leq All Segments: 48.68 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.27
(NIGHT): 48.68

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 08:00:59
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: NorthServRD (day/night)

```
-----
Car traffic volume   : 9715/845   veh/TimePeriod  *
Medium truck volume : 773/67    veh/TimePeriod  *
Heavy truck volume  : 552/48    veh/TimePeriod  *
Posted speed limit  : 60 km/h
Road gradient       : 0 %
Road pavement      : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 12000
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: NorthServRD (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   0.00 deg
Wood depth : 0         (No woods.)
No of house rows : 0 / 0
Surface    : 1         (Absorptive ground surface)
Receiver source distance : 26.00 / 26.00 m
Receiver height : 10.50 / 10.50 m
Topography   : 1         (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Results segment # 1: NorthServRD (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
-90	0	0.39	69.03	0.00	-3.32	-3.97	0.00	0.00	0.00	61.73

Segment Leq : 61.73 dBA

Total Leq All Segments: 61.73 dBA

Results segment # 1: NorthServRD (night)

Source height = 1.50 m

ROAD (0.00 + 54.14 + 0.00) = 54.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.39	61.43	0.00	-3.32	-3.97	0.00	0.00	0.00	54.14

Segment Leq : 54.14 dBA

Total Leq All Segments: 54.14 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.73
(NIGHT): 54.14

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 08:01:15
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

Road data, segment # 1: NorthServRD (day/night)

```
-----
Car traffic volume   : 9715/845   veh/TimePeriod  *
Medium truck volume : 773/67    veh/TimePeriod  *
Heavy truck volume  : 552/48    veh/TimePeriod  *
Posted speed limit  : 60 km/h
Road gradient       : 0 %
Road pavement      : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 12000
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: NorthServRD (day/night)

```
-----
Angle1  Angle2      : 0.00 deg  90.00 deg
Wood depth          : 0          (No woods.)
No of house rows    : 0 / 0
Surface            : 1          (Absorptive ground surface)
Receiver source distance : 26.00 / 26.00 m
Receiver height     : 10.50 / 10.50 m
Topography          : 1          (Flat/gentle slope; no barrier)
Reference angle     : 0.00
```

Results segment # 1: NorthServRD (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
0	90	0.39	69.03	0.00	-3.32	-3.97	0.00	0.00	0.00	61.73

Segment Leq : 61.73 dBA

Total Leq All Segments: 61.73 dBA

Results segment # 1: NorthServRD (night)

Source height = 1.50 m

ROAD (0.00 + 54.14 + 0.00) = 54.14 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.39	61.43	0.00	-3.32	-3.97	0.00	0.00	0.00	54.14

Segment Leq : 54.14 dBA

Total Leq All Segments: 54.14 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.73
(NIGHT): 54.14

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 08:01:30
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11.te Time Period: Day/Night 16/8 hours
 Description:

Road data, segment # 1: NorthServRD (day/night)

```
-----
Car traffic volume   : 9715/845   veh/TimePeriod  *
Medium truck volume : 773/67    veh/TimePeriod  *
Heavy truck volume  : 552/48    veh/TimePeriod  *
Posted speed limit  : 60 km/h
Road gradient       : 0 %
Road pavement      : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 12000
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: NorthServRD (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth : 0         (No woods.)
No of house rows : 0 / 0
Surface     : 1         (Absorptive ground surface)
Receiver source distance : 24.00 / 24.00 m
Receiver height : 10.50 / 10.50 m
Topography    : 1         (Flat/gentle slope; no barrier)
Reference angle : 0.00
```


Results segment # 1: NorthServRD (day)

Source height = 1.50 m

ROAD (0.00 + 65.23 + 0.00) = 65.23 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	69.03	0.00	-2.84	-0.96	0.00	0.00	0.00	65.23

Segment Leq : 65.23 dBA

Total Leq All Segments: 65.23 dBA

Results segment # 1: NorthServRD (night)

Source height = 1.50 m

ROAD (0.00 + 57.63 + 0.00) = 57.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.39	61.43	0.00	-2.84	-0.96	0.00	0.00	0.00	57.63

Segment Leq : 57.63 dBA

Total Leq All Segments: 57.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.23
(NIGHT): 57.63

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:32:53
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12.te Time Period: Day/Night 16/8 hours
 Description: Without 1.1 m barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth      : 0 (No woods.)
No of house rows : 0 / 0
Surface         : 1 (Absorptive ground surface)
Receiver source distance : 62.00 / 62.00 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    : 13.00 m
Barrier receiver distance : 6.00 / 6.00 m
Source elevation  : 0.00 m
Receiver elevation : 13.00 m
Barrier elevation  : 0.00 m
Reference angle   : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 39.00 / 39.00 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 : 13.00 m

Barrier receiver distance : 6.00 / 6.00 m

Source elevation : 0.00 m

Receiver elevation : 13.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	13.24	13.24

ROAD (0.00 + 66.70 + 0.00) = 66.70 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	78.39	0.00	-6.16	0.00	0.00	0.00	-4.83	67.40*
-90	90	0.66	78.39	0.00	-10.23	-1.46	0.00	0.00	0.00	66.70

* Bright Zone !

Segment Leq : 66.70 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	12.50	12.50

ROAD (0.00 + 68.57 + 0.00) = 68.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	78.39	0.00	-4.15	0.00	0.00	0.00	-5.67	68.57

Segment Leq : 68.57 dBA

Total Leq All Segments: 70.75 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	13.24	13.24

ROAD (0.00 + 59.10 + 0.00) = 59.10 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.79	0.00	-6.16	0.00	0.00	0.00	-4.83	59.80*
-90	90	0.66	70.79	0.00	-10.23	-1.46	0.00	0.00	0.00	59.10

* Bright Zone !

Segment Leq : 59.10 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	12.50	12.50

ROAD (0.00 + 60.98 + 0.00) = 60.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	70.79	0.00	-4.15	0.00	0.00	0.00	-5.67	60.98

Segment Leq : 60.98 dBA

Total Leq All Segments: 63.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 70.75
(NIGHT): 63.15

STAMSON 5.0 NORMAL REPORT Date: 19-09-2017 14:34:57
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12b1.te Time Period: Day/Night 16/8 hours
 Description: 1.1 metre barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth      : 0 (No woods.)
No of house rows : 0 / 0
Surface         : 1 (Absorptive ground surface)
Receiver source distance : 62.00 / 62.00 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    : 1.10 m
Barrier receiver distance : 5.00 / 5.00 m
Source elevation  : 0.00 m
Receiver elevation : 13.00 m
Barrier elevation  : 13.00 m
Reference angle   : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 39.00 / 39.00 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 : 1.10 m
 Barrier receiver distance : 5.00 / 5.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.45	13.45

ROAD (0.00 + 60.96 + 0.00) = 60.96 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	78.39	0.00	-9.82	-1.34	0.00	0.00	-6.25	60.96

Segment Leq : 60.96 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-0.17	12.83

ROAD (0.00 + 61.97 + 0.00) = 61.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	78.39	0.00	-6.62	-1.34	0.00	0.00	-8.45	61.97

Segment Leq : 61.97 dBA

Total Leq All Segments: 64.50 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.45	13.45

ROAD (0.00 + 53.37 + 0.00) = 53.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	70.79	0.00	-9.82	-1.34	0.00	0.00	-6.25	53.37

Segment Leq : 53.37 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-0.17	12.83

ROAD (0.00 + 54.38 + 0.00) = 54.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	70.79	0.00	-6.62	-1.34	0.00	0.00	-8.45	54.38

Segment Leq : 54.38 dBA

Total Leq All Segments: 56.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.50
(NIGHT): 56.91

STAMSON 5.0 NORMAL REPORT Date: 19-09-2017 14:33:44
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12b2.te Time Period: Day/Night 16/8 hours
 Description: 3.00 metre barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth      : 0 (No woods.)
No of house rows : 0 / 0
Surface         : 1 (Absorptive ground surface)
Receiver source distance : 62.00 / 62.00 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    : 3.00 m
Barrier receiver distance : 5.00 / 5.00 m
Source elevation  : 0.00 m
Receiver elevation : 13.00 m
Barrier elevation  : 13.00 m
Reference angle   : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 39.00 / 39.00 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 : 3.00 m
 Barrier receiver distance : 5.00 / 5.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.45	13.45

ROAD (0.00 + 55.76 + 0.00) = 55.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	78.39	0.00	-9.12	-1.14	0.00	0.00	-12.37	55.76

Segment Leq : 55.76 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-0.17	12.83

ROAD (0.00 + 57.28 + 0.00) = 57.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	78.39	0.00	-6.14	-1.14	0.00	0.00	-13.83	57.28

Segment Leq : 57.28 dBA

Total Leq All Segments: 59.60 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.45	13.45

ROAD (0.00 + 48.16 + 0.00) = 48.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	70.79	0.00	-9.12	-1.14	0.00	0.00	-12.37	48.16

Segment Leq : 48.16 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-0.17	12.83

ROAD (0.00 + 49.68 + 0.00) = 49.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.48	70.79	0.00	-6.14	-1.14	0.00	0.00	-13.83	49.68

Segment Leq : 49.68 dBA

Total Leq All Segments: 52.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.60
(NIGHT): 52.00

STAMSON 5.0 NORMAL REPORT Date: 15-09-2017 07:46:13
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13.te Time Period: Day/Night 16/8 hours
 Description: Without 1.1 m barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

```
-----
Car traffic volume   : 29685/2581   veh/TimePeriod  *
Medium truck volume : 2361/205    veh/TimePeriod  *
Heavy truck volume  : 1687/147    veh/TimePeriod  *
Posted speed limit  : 100 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): 36666
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: HWY 174 EB (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   0.00 deg
Wood depth      : 0 (No woods.)
No of house rows : 0 / 0
Surface         : 1 (Absorptive ground surface)
Receiver source distance : 171.00 / 171.00 m
Receiver height  : 1.50 / 1.50 m
Topography      : 2 (Flat/gentle slope; with barrier)
Barrier angle1   : -90.00 deg   Angle2 : 0.00 deg
Barrier height   : 13.00 m
Barrier receiver distance : 6.00 / 6.00 m
Source elevation : 0.00 m
Receiver elevation : 13.00 m
Barrier elevation : 0.00 m
Reference angle  : 0.00
```

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 147.00 / 147.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 0.00 deg
 Barrier height : 13.00 m
 Barrier receiver distance : 6.00 / 6.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 3: HWY 174 EB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 171.00 / 171.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
 Barrier height : 3.00 m
 Barrier receiver distance : 15.00 / 15.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 4: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 147.00 / 147.00 m

Receiver height : 1.50 / 1.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : 0.00 deg Angle2 : 90.00 deg

Barrier height : 3.00 m

Barrier receiver distance : 15.00 / 15.00 m

Source elevation : 0.00 m

Receiver elevation : 13.00 m

Barrier elevation : 13.00 m

Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		14.04	!
			14.04

ROAD (0.00 + 56.37 + 0.00) = 56.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	78.39	0.00	-10.57	-3.01	0.00	0.00	-1.07	63.74*
-90	0	0.66	78.39	0.00	-17.54	-4.47	0.00	0.00	0.00	56.37

* Bright Zone !

Segment Leq : 56.37 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		13.97	!
			13.97

ROAD (0.00 + 57.47 + 0.00) = 57.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	78.39	0.00	-9.91	-3.01	0.00	0.00	-1.31	64.16*
-90	0	0.66	78.39	0.00	-16.45	-4.47	0.00	0.00	0.00	57.47

* Bright Zone !

Segment Leq : 57.47 dBA

Results segment # 3: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 49.11 + 0.00) = 49.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-15.64	-4.15	0.00	0.00	-9.48	49.11

Segment Leq : 49.11 dBA

Results segment # 4: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 49.69 + 0.00) = 49.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-14.67	-4.15	0.00	0.00	-9.88	49.69

Segment Leq : 49.69 dBA

Total Leq All Segments: 60.67 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	14.04	14.04

ROAD (0.00 + 48.78 + 0.00) = 48.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	70.79	0.00	-10.57	-3.01	0.00	0.00	-1.07	56.14*
-90	0	0.66	70.79	0.00	-17.54	-4.47	0.00	0.00	0.00	48.78

* Bright Zone !

Segment Leq : 48.78 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	13.97	13.97

ROAD (0.00 + 49.87 + 0.00) = 49.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	70.79	0.00	-9.91	-3.01	0.00	0.00	-1.30	56.56*
-90	0	0.66	70.79	0.00	-16.45	-4.47	0.00	0.00	0.00	49.87

* Bright Zone !

Segment Leq : 49.87 dBA

Results segment # 3: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 41.52 + 0.00) = 41.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-15.64	-4.15	0.00	0.00	-9.48	41.52

Segment Leq : 41.52 dBA

Results segment # 4: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 42.09 + 0.00) = 42.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-14.67	-4.15	0.00	0.00	-9.88	42.09

Segment Leq : 42.09 dBA

Total Leq All Segments: 53.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.67
(NIGHT): 53.07

STAMSON 5.0 NORMAL REPORT Date: 19-09-2017 14:22:34
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13b1.te Time Period: Day/Night 16/8 hours
 Description: 1.1 metre barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 171.00 / 171.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 0.00 deg
 Barrier height : 1.10 m
 Barrier receiver distance : 5.00 / 5.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 147.00 / 147.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 0.00 deg
 Barrier height : 1.10 m
 Barrier receiver distance : 5.00 / 5.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 3: HWY 174 EB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 171.00 / 171.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
 Barrier height : 3.00 m
 Barrier receiver distance : 15.00 / 15.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 4: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 WB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 147.00 / 147.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
 Barrier height : 3.00 m
 Barrier receiver distance : 15.00 / 15.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		1.12	!
			14.12

ROAD (0.00 + 56.37 + 0.00) = 56.37 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.59	78.39	0.00	-16.85	-4.36	0.00	0.00	-5.00	52.18*
-90	0	0.66	78.39	0.00	-17.54	-4.47	0.00	0.00	0.00	56.37

* Bright Zone !

Segment Leq : 56.37 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		1.06	!
			14.06

ROAD (0.00 + 53.22 + 0.00) = 53.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.59	78.39	0.00	-15.80	-4.36	0.00	0.00	-5.01	53.22

Segment Leq : 53.22 dBA

Results segment # 3: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 49.11 + 0.00) = 49.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-15.64	-4.15	0.00	0.00	-9.48	49.11

Segment Leq : 49.11 dBA

Results segment # 4: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 49.69 + 0.00) = 49.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-14.67	-4.15	0.00	0.00	-9.88	49.69

Segment Leq : 49.69 dBA

Total Leq All Segments: 59.13 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.12	14.12

ROAD (0.00 + 48.78 + 0.00) = 48.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.59	70.79	0.00	-16.85	-4.36	0.00	0.00	-5.00	44.59*
-90	0	0.66	70.79	0.00	-17.54	-4.47	0.00	0.00	0.00	48.78

* Bright Zone !

Segment Leq : 48.78 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.06	14.06

ROAD (0.00 + 45.63 + 0.00) = 45.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.59	70.79	0.00	-15.80	-4.36	0.00	0.00	-5.01	45.63

Segment Leq : 45.63 dBA

Results segment # 3: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 41.52 + 0.00) = 41.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-15.64	-4.15	0.00	0.00	-9.48	41.52

Segment Leq : 41.52 dBA

Results segment # 4: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 42.09 + 0.00) = 42.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-14.67	-4.15	0.00	0.00	-9.88	42.09

Segment Leq : 42.09 dBA

Total Leq All Segments: 51.54 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.13
(NIGHT): 51.54

STAMSON 5.0 NORMAL REPORT Date: 19-09-2017 14:22:48
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13b3.te Time Period: Day/Night 16/8 hours
 Description: 3.00 metre barrier above roof

Road data, segment # 1: HWY 174 EB (day/night)

 Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

 Angle1 Angle2 : -90.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 171.00 / 171.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -90.00 deg Angle2 : 0.00 deg
 Barrier height : 3.00 m
 Barrier receiver distance : 5.00 / 5.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 2: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : -90.00 deg 0.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 147.00 / 147.00 m

Receiver height : 1.50 / 1.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : -90.00 deg Angle2 : 0.00 deg

Barrier height : 3.00 m

Barrier receiver distance : 5.00 / 5.00 m

Source elevation : 0.00 m

Receiver elevation : 13.00 m

Barrier elevation : 13.00 m

Reference angle : 0.00

Road data, segment # 3: HWY 174 EB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *
 Medium truck volume : 2361/205 veh/TimePeriod *
 Heavy truck volume : 1687/147 veh/TimePeriod *
 Posted speed limit : 100 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): 36666
 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: HWY 174 EB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 1 (Absorptive ground surface)
 Receiver source distance : 171.00 / 171.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 90.00 deg
 Barrier height : 3.00 m
 Barrier receiver distance : 15.00 / 15.00 m
 Source elevation : 0.00 m
 Receiver elevation : 13.00 m
 Barrier elevation : 13.00 m
 Reference angle : 0.00

Road data, segment # 4: HWY 174 WB (day/night)

Car traffic volume : 29685/2581 veh/TimePeriod *

Medium truck volume : 2361/205 veh/TimePeriod *

Heavy truck volume : 1687/147 veh/TimePeriod *

Posted speed limit : 100 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): 36666

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: HWY 174 WB (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 1 (Absorptive ground surface)

Receiver source distance : 147.00 / 147.00 m

Receiver height : 1.50 / 1.50 m

Topography : 2 (Flat/gentle slope; with barrier)

Barrier angle1 : 0.00 deg Angle2 : 90.00 deg

Barrier height : 3.00 m

Barrier receiver distance : 15.00 / 15.00 m

Source elevation : 0.00 m

Receiver elevation : 13.00 m

Barrier elevation : 13.00 m

Reference angle : 0.00

Results segment # 1: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.12	14.12

ROAD (0.00 + 48.18 + 0.00) = 48.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.48	78.39	0.00	-15.64	-4.15	0.00	0.00	-10.42	48.18

Segment Leq : 48.18 dBA

Results segment # 2: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	1.06	14.06

ROAD (0.00 + 48.95 + 0.00) = 48.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.48	78.39	0.00	-14.67	-4.15	0.00	0.00	-10.62	48.95

Segment Leq : 48.95 dBA

Results segment # 3: HWY 174 EB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 49.11 + 0.00) = 49.11 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-15.64	-4.15	0.00	0.00	-9.48	49.11

Segment Leq : 49.11 dBA

Results segment # 4: HWY 174 WB (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 49.69 + 0.00) = 49.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	78.39	0.00	-14.67	-4.15	0.00	0.00	-9.88	49.69

Segment Leq : 49.69 dBA

Total Leq All Segments: 55.04 dBA

Results segment # 1: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		1.12	!
			14.12

ROAD (0.00 + 40.58 + 0.00) = 40.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.48	70.79	0.00	-15.64	-4.15	0.00	0.00	-10.42	40.58

Segment Leq : 40.58 dBA

Results segment # 2: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	! Receiver ! Height (m)	! Barrier ! Height (m)	! Elevation of ! Barrier Top (m)
1.50	!	1.50	!
		1.06	!
			14.06

ROAD (0.00 + 41.36 + 0.00) = 41.36 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.48	70.79	0.00	-14.67	-4.15	0.00	0.00	-10.62	41.36

Segment Leq : 41.36 dBA

Results segment # 3: HWY 174 EB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.36	13.36

ROAD (0.00 + 41.52 + 0.00) = 41.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-15.64	-4.15	0.00	0.00	-9.48	41.52

Segment Leq : 41.52 dBA

Results segment # 4: HWY 174 WB (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	0.17	13.17

ROAD (0.00 + 42.09 + 0.00) = 42.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.48	70.79	0.00	-14.67	-4.15	0.00	0.00	-9.88	42.09

Segment Leq : 42.09 dBA

Total Leq All Segments: 47.44 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.04
(NIGHT): 47.44

STAMSON 5.0 NORMAL REPORT Date: 19-09-2017 14:28:59
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r14.te Time Period: Day/Night 16/8 hours
 Description: 1.1 metre barrier above roof

Road data, segment # 1: NorthServRD (day/night)

```
-----
Car traffic volume   : 9715/845   veh/TimePeriod  *
Medium truck volume : 773/67    veh/TimePeriod  *
Heavy truck volume  : 552/48    veh/TimePeriod  *
Posted speed limit  : 60 km/h
Road gradient       : 0 %
Road pavement      : 1 (Typical asphalt or concrete)
```

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

```
24 hr Traffic Volume (AADT or SADT): 12000
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: NorthServRD (day/night)

```
-----
Angle1   Angle2       : -90.00 deg   90.00 deg
Wood depth      : 0           (No woods.)
No of house rows : 0 / 0
Surface         : 1           (Absorptive ground surface)
Receiver source distance : 24.00 / 24.00 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   : 1.10 m
Barrier receiver distance : 12.00 / 12.00 m
Source elevation : 0.00 m
Receiver elevation : 13.00 m
Barrier elevation : 13.00 m
Reference angle  : 0.00
```

Results segment # 1: NorthServRD (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-5.00	8.00

ROAD (0.00 + 48.45 + 0.00) = 48.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	69.03	0.00	-3.25	-1.34	0.00	0.00	-15.98	48.45

Segment Leq : 48.45 dBA

Total Leq All Segments: 48.45 dBA

Results segment # 1: NorthServRD (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)
1.50	1.50	-5.00	8.00

ROAD (0.00 + 40.85 + 0.00) = 40.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.59	61.43	0.00	-3.25	-1.34	0.00	0.00	-15.98	40.85

Segment Leq : 40.85 dBA

Total Leq All Segments: 40.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.45
(NIGHT): 40.85

APPENDIX B

INSUL CALCULATIONS

Sound Insulation Prediction (v8.0.4)

According to EN12354/3

Title :Block 6 Bedroom

Comments :

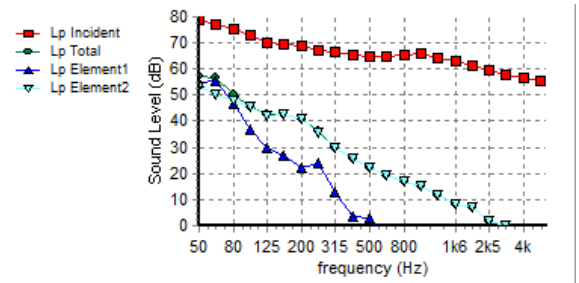
South Facade

Block 6 Bedroom on Ground floor

Date: 19 Sep 17

Initials:ENG12

File Name: Bedroom Traffic ISO.inz



Octave Band Centre Frequency (Hz)																						Overall dBA	
Source	63		125		250		500		1k		2k		4k										
Incident sound level (freefield)	79	77	75	73	70	69	69	67	66	66	65	65	66	66	64	63	62	60	58	57	55	74	
Path																							
Element 1 ,Brick STL	-25 -22 -29 -37 -41 -43 -47 -44 -54 -63 -63 -70 -77 -84 -90 -97 -1E2-1.1E2-1.1E2-1.2E2-1.2E2																						32
Facade Shape Level diff.	0 0																						
Area (+10Log A) [10 m2]	10 10																						
Element sound level contribution	55 56 47 37 30 27 22 24 13 3.3 2.7 -4.6-11 -18 -25 -34 -39 -45 -49 -60 -68																						
Element 2 ,Window STL	-19 -20 -21 -21 -21 -20 -21 -25 -30 -33 -36 -39 -42 -44 -46 -48 -48 -51 -51 -56 -61																						37
Facade Shape Level diff.	0 0																						
Area (+10Log A) [1.9 m2]	3 3																						
Element sound level contribution	53 50 48 45 42 43 41 36 30 26 22 19 17 15 12 8.2 7 1.9 -0.043.8-12																						
Receiver																							
Room volume (-10Log V) [33 m3]	-15 -15																						38
Reveberation time (s)	0.3 0.3																						
RT (+10Log T)	-5.2																						
Equation Constant	11 11																						
Room sound level	57 57 50 46 42 43 41 36 30 26 22 19 17 15 12 8.2 7 1.9 -0.043.8-12																						

Sound Insulation Prediction (v8.0.4)

According to EN12354/3

Title :Block 6 Living Room

Comments :

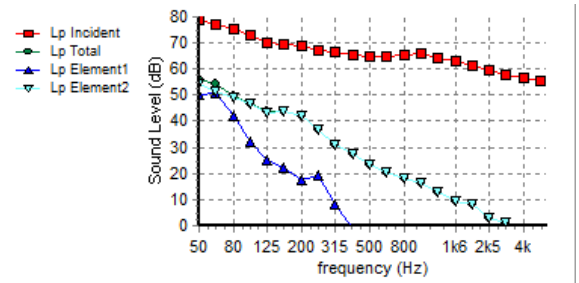
South Facade

Block 6 Living Room on Ground floor

Date: 19 Sep 17

Initials:ENG12

File Name: Living Room Traffic ISO.inz



Octave Band Centre Frequency (Hz)																				Overall dBA	
Source	63		125		250		500		1k		2k		4k								
Incident sound level (freefield)	79	77	75	73	70	69	69	67	66	66	65	65	66	64	63	62	60	58	57	55	74
Path																					
Element 1 ,Brick STL	-25 -22 -29 -37 -41 -43 -47 -44 -54 -63 -63 -70 -77 -84 -90 -97 -1E2-1.1E2-1.1E2-1.2E2-1.2E2																				27
Facade Shape Level diff.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0																				
Area (+10Log A) [5.0 m2]	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7																				
Element sound level contribution	50 51 42 32 25 22 18 19 8.4 -1.4-2 -9.3-15 -22 -30 -38 -43 -50 -53 -64 -73																				
Element 2 ,Window STL	-19 -20 -21 -21 -21 -20 -21 -25 -30 -33 -36 -39 -42 -44 -46 -48 -48 -51 -51 -56 -61																				38
Facade Shape Level diff.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0																				
Area (+10Log A) [3.6 m2]	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6																				
Element sound level contribution	55 52 49 46 43 44 42 37 31 27 24 20 18 16 13 9.4 8.2 3.1 1.2 -4.6-11																				
Receiver																					
Room volume (-10Log V) [78 m3]	-19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19 -19																				38
Reveberation time (s)	0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5																				
RT (+10Log T)	-3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3 -3																				
Equation Constant	11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11																				
Room sound level	56 54 50 47 44 44 42 37 31 27 24 20 18 16 13 9.4 8.2 3.1 1.2 -4.6-11																				

Sound Insulation Prediction (v8.0.4)

Program copyright Marshall Day Acoustics 2014

- Key No. 4807

Margin of error is generally within STC +/- 3 dB

Job Name:

Job No.:

Date: 20 Sep 17

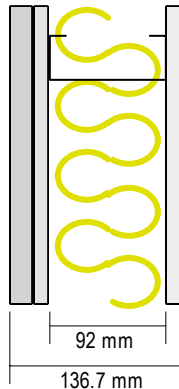
File Name: Metal Siding.ixl

Page No.:

Initials:ENG12

Notes:

Metal/Vinyl Siding



STC 48

OITC 39

System description

Panel 1 : 1 x 19.0 mm Aluminium (p:2900 kg/m³,E:85GPa, η :0.01)

+ 1 x 13.0 mm DensGlass® Sheathing Georgia Pa

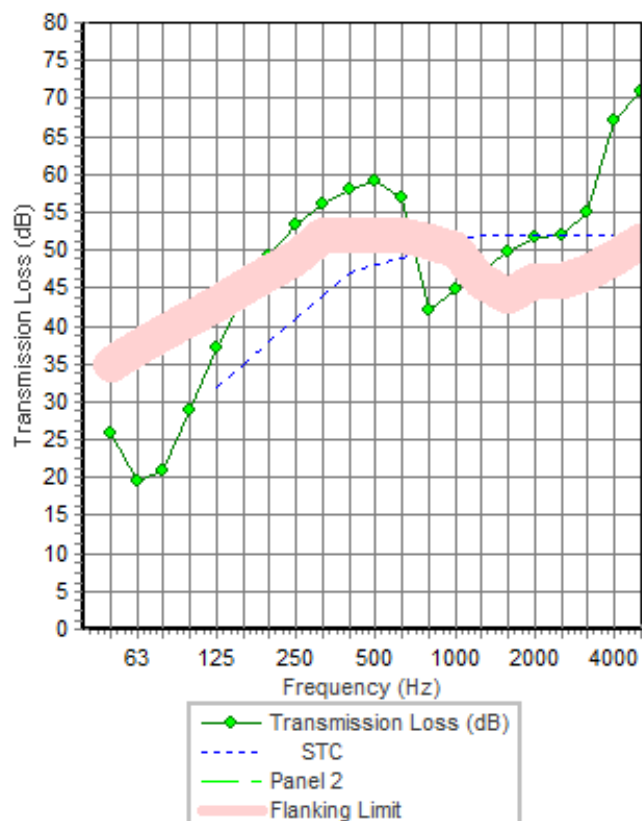
Cavity : Steel stud (0.55mm): Stud spacing 406 mm , Infill Mineral wool I (3.8 lb/ft³) Thickness 89 mm (p:60.9 kg/m³, Rf:24100 Pa.s/m²)

Panel 2 + 1 x 12.7 mm Type C Gypsum Board (p:776 kg/m³,E:2.3GPa, η :0.01)

Mass-air-mass resonant frequency =57 Hz

Panel Size 2.7x4 m; Mass 79.6 kg/m²

frequency (Hz)	TL(dB)	TL(dB)
50	26	
63	19	21
80	21	
100	29	
125	37	33
160	44	
200	49	
250	53	52
315	56	
400	58	
500	59	58
630	57	
800	42	
1000	45	44
1250	47	
1600	50	
2000	52	51
2500	52	
3150	55	
4000	67	59
5000	71	



Sound Insulation Prediction (v8.0.4)

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- Key No. 4807

Margin of error is generally within STC +/- 3 dB

Job Name:gwe17-139

Job No.:

Page No.:

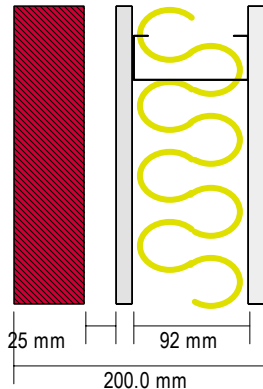
Notes:

Date: 19 Sep 17

Initials:

General Brick Exterior Wall Assembly

File Name: Window - Assumed.ixl



STC 59

OITC 46

System description

Panel 1 : 1 x 57.0 mm Brick (ρ :1600 kg/m³, E :8.9GPa, η :0.01)

Cavity : None: Stud spacing 600 mm

Panel 2 + 1 x 13.0 mm DensGlass® Sheathing Georgia Pa (ρ :710 kg/m³, E :2GPa, η :0.01)

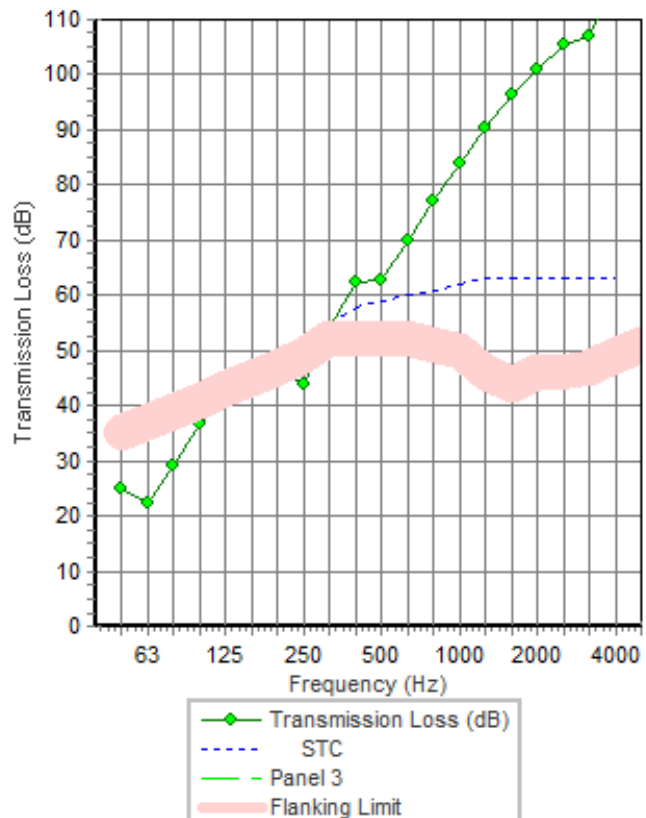
Cavity : Steel stud (0.55mm): Stud spacing 406 mm , Infill Mineral wool I (3.8 lb/ft³) Thickness 89 mm (ρ :61 kg/m³, R_f :24100 Pa.s/m²)

Panel 3 + 1 x 13.0 mm Type C Gypsum Board (ρ :776 kg/m³, E :2.3GPa, η :0.01)

Mass-air-mass resonant frequency =60 Hz , 169 Hz

Panel Size 2.7x4 m; Mass 115.9 kg/m²

frequency (Hz)	TL(dB)	TL(dB)
50	25	
63	22	25
80	29	
100	37	
125	41	39
160	43	
200	47	
250	44	46
315	54	
400	63	
500	63	64
630	70	
800	77	
1000	84	81
1250	90	
1600	97	
2000	101	100
2500	105	
3150	107	
4000	117	111
5000	124	



Sound Insulation Prediction (v8.0.4)

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- Key No. 4807

Margin of error is generally within STC +/- 3 dB

Job Name:gwe17-139

Job No.:

Page No.:

Notes:

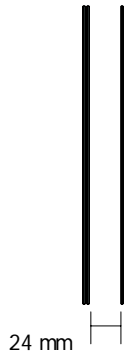
Date: 19 Sep 17

Initials:

Window Specifications as tested by
Intertek for Casa Bella Windows

File Name: Window - Assumed.ixl

STC 38



STC 38

OITC 29

System description

+ 1 x 6.0 mm Laminated Glass (generic PVB-0.045 mm) (ρ :2430 kg/m³,E:46GPa, η :0.03)

+ 1 x 4.0 mm Glass (ρ :2430 kg/m³,E:52GPa, η :0.02)

Mass-air-mass resonant frequency =157 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	19	
63	20	20
80	21	
100	21	
125	21	21
160	20	
200	21	
250	25	24
315	29	
400	33	
500	36	35
630	39	
800	42	
1000	44	43
1250	46	
1600	47	
2000	47	47
2500	48	
3150	50	
4000	52	52
5000	57	

Panel Size 2.7x4 m; Mass 24.6 kg/m²

