



Environmental Noise Assessment

Zibi Development Phase 1

Ottawa, Ontario

REPORT: GWE14-017 - Environmental Noise

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EXECUTIVE SUMMARY

This document describes an environmental noise feasibility assessment performed for Phase 1 of a proposed mixed-use redevelopment of the former Domtar Lands in Ottawa, Ontario. The proposed concept plan for development, Phase 1, shows four low to mid-rise buildings west of Booth Street on Chaudière Island. Figure 1 illustrates a site plan with surrounding context. The major source of roadway noise is Booth Street to the east of the development. Other sources of noise influencing the site are four exhaust fans located at the Chaudière Hydro Limited Partnership (CHLP) generating station. Furthermore, as CHLP is expanding their operation at the site, impacts from the new generating station have also been considered as part of this assessment.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment (MOE) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings received from Barry J. Hobin & Associates Architects Incorporated.

The results of the current analysis indicate that noise levels from roadway traffic will range between 46 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the east façade of Block 207 (Receptor 8), which is nearest and most exposed to Booth Street. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figures 5 and 6).

In addition to upgraded windows, the installation of central air conditioning (or similar mechanical system) will be required for all office space facing north, east or south in Blocks 207 and 208.

The installation of forced air heating with provisions for central air conditioning (or similar mechanical systems) will be required for all residential units facing east or south in Block 205 and units facing north, east or south in Block 206. Warning Clause (Type C¹) in all Agreements of Lease, Purchase and Sale will be required for these residential units.

¹ City of Ottawa Environmental Noise Control Guidelines, SS Wilson Associates, May 10, 2006
Windmill Development Group

Results of the previous master plan environmental noise assessment show that within the study area of development Phase 1, ambient noise from Chaudière Falls will not be of a concern.

Noise levels as a result of the existing Powerhouse No. 2 exhaust fans exceed the stationary noise criteria along the north façades of Blocks 206 and 207. If these fans are to remain operational after the construction of the Phase 1 Zibi development, noise control measures will need to be provided for these sources. The most effective and efficient way to deal with noise is at the source. Therefore, cooperation of the source owner is desirable. Noise control for the existing Powerhouse No. 2 exhaust fans (EF-1 to 4) may include the use of silencers, acoustic louvers or an acoustically lined exhaust hood that would break the line of sight between the source and receiver. The inside of the hood should be lined with 50 mm of mould resistant mineral fiber insulation. These measures should provide an insertion loss upwards of 20 dBA, thus bringing the fans into compliance with the City of Ottawa ENCG noise criteria.

Noise levels as a result of the proposed new powerhouse fall below the stationary noise criteria along the west façade of Block 206, where background noise from Chaudière Falls and roadway traffic is dominant.

The functions of the rooftop restaurant patio on Block 208 and the programmable Head Street Square in the centre of the development are exempt from the ENCG; however, special care should be taken for these spaces to not adversely impact surrounding noise sensitive spaces. The Head Street Square will be used for functions such as markets and festivals. Directional loud speakers should be used and orientated away from noise sensitive spaces. The rooftop patio on Block 208 should be placed as far as possible away from the east façade of Block 205. A solid screen could be used to block the line of sight from the windows on Block 205 and the patio. For bedroom and living room windows facing into the Head Street Square and the rooftop patio, we would recommend they have a minimum STC rating of 35 and units be provided with central air conditioning, which would allow residents to keep doors and windows closed.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Windmill Development Group (Windmill) to undertake an environmental noise study for Phase 1 of their proposed mixed-use redevelopment of the former Domtar Lands in Ottawa, Ontario. GWE previously completed a preliminary noise study for the Master Plan. The focus of this study is more detailed for the Phase 1 development. This report summarizes the methodology, results and recommendations related to an environmental noise assessment. GWE's scope of work involved assessing exterior noise levels generated by local roadway traffic, existing and new stationary noise sources surrounding the site. The assessment was performed on the basis of both theoretical noise calculations and on previous site measurements conforming to the City of Ottawa² and Ministry of the Environment³ guidelines. Noise calculations were based on architectural drawings received from Barry J. Hobin & Associates Architects Incorporated, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications. Information regarding the new generating station on the Chaudière Hydro Limited Partnership (CHLP) lands were provided by their consultant HATCH.

2. TERMS OF REFERENCE

The focus of this environmental noise assessment is the first phase of a proposed multi-phased mixed-use redevelopment of the former Domtar lands in Ottawa, Ontario, and Gatineau, Quebec. The scope of this noise study relates to Phase 1 of the Ottawa side of the Zibi development, occupying the west side of Chaudière Island. The proposed concept plan for Phase 1 shows four low to mid-rise buildings to the west of Booth Street on Chaudière Island. Two of the buildings will be new construction, while the other buildings will be renovations of existing Domtar buildings. Residential terraces are proposed for Block 206. A commercial terrace / restaurant patio is proposed for the roof of Block 208. The central courtyard, Head Street Square, will be programmable to allow functions such as markets and festivals throughout the year.

The major source of roadway noise influencing the site is Booth Street to the east of the development. The Prince of Wales rail bridge is more than 700 metres (m) from the site and would not impact the site, even if rail operations on the bridge were to resume. Other sources noise influencing the development are stationary sources, which include four existing exhaust fans located at the CHLP generating station.

² City of Ottawa Environmental Noise Control Guidelines, SS Wilson Associates, May 10, 2006

³ Ministry of the Environment – Publication NPC-300

CHLP is planning to expand their facility and construct a new powerhouse and sluice way. Figure 1 illustrates a complete site plan with surrounding context. From GWE's previous study, noise from the Chaudière Falls would not have a significant impact on the Phase 1 development.

3. OBJECTIVES

The main goals of this work are to: (i) calculate the future noise levels on the study building produced by local roadway traffic, (ii) ensure that interior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 and 4.4 of this report, (iii) identify significant ambient noise sources and determine preliminary impacts, and (iv) identify recommendations for future detailed studies where noise levels exceed City of Ottawa and MOE objective noise levels.

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 limits (that are relevant to this study) are 45 and 40 dBA for private offices/residence living rooms and residence sleeping quarters respectively, as listed in Table 1. Based on GWE's experience, more comfortable indoor noise levels should be targeted toward 42 and 37 dBA to control peak noise, and deficiencies in building envelope construction.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD & RAIL)⁴

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

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

⁴ Adapted from ENCG – Table 1.6

TABLE 2: ROAD & RAIL NOISE COMBINED – OUTDOOR NOISE, VENTILATION AND WARNING CLAUSE REQUIREMENTS⁵

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

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

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

TABLE 3: ROAD & RAIL NOISE BUILDING COMPONENT REQUIREMENTS⁶

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

⁵ Adapted from ENCG – Table 1.10

⁶ Adapted from ENCG – Table 1.8

4.2.2 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan⁷. Average Annual Daily Traffic (AADT) volumes are then based on data in Table 1.7 of the ENCG for each roadway classification. Information about possible future roadway expansions were obtained from The Transportation Master Plan – Affordable 2013 Roadway Network. Table 4 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 4: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Booth Street	4-UAU	60	30,000

4.2.3 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the Ministry of the Environment (MOE) computerized noise assessment program, STAMSON 5.04, for road and rail analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway noise calculations were performed by treating each road segment as separate line sources of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 4, theoretical noise predictions were based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions
- The day/night split was taken to be 92% / 8% respectively for all streets
- Absorptive and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics
- The study site was treated as having flat topography

Noise receptors were strategically placed at 20 locations around the study area (see Figures 2 and 3).

⁷ City of Ottawa Transportation Master Plan, November 2013

4.3 Indoor Noise Calculations

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

According to the ENCG, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure⁸ considers:

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

Based on published research⁹, exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

⁸ Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

⁹ CMHC, Road & Rail Noise: Effects on Housing

4.4 Stationary Noise

Apart from transportation sources, stationary noise sources can also have an impact on sensitive developments. A stationary source of noise is defined under ENCG as *“a source of sound or combination of sources of sound that are included and normally operated within the property lines of a facility, and includes the premises of a person as one stationary source, unless the dominant source of sound on those premises is construction”*¹⁰. Stationary noise impacts are based on a one-hour equivalent sound pressure level (L_{EQ}). The MOE and ENCG have set stationary source noise level limits in urban areas (Class 1) to be 50 decibels (dBA) or background noise levels due to traffic, whichever is higher for the daytime period (07:00 to 19:00). Similarly, the evening (19:00 to 23:00) and nighttime criteria (23:00 to 07:00) are 50 and 45 dBA respectively or the background noise levels, whichever is higher.

Background noise levels for roadway traffic were predicted using STAMSON following a similar methodology as described in Section 4.2, however using the minimum hourly traffic volumes based on traffic counts for the Booth Street & Ottawa River Parkway intersection. The lowest hourly traffic volume during the daytime period (07:00 to 19:00) is 1166 vehicles per hour. No traffic counts were available for the evening (19:00 to 23:00) and overnight (23:00 to 07:00) periods.

Background noise levels away from Booth Street are dominated by the sound of falling water over the Chaudière falls as was documented in the noise report prepared by GWE for the Master Plan.

Based on the previous master plan environmental noise assessment, prepared by GWE dated July 22, 2014, existing sources of stationary noise impacting the Phase 1 development are the CHLP generating station Powerhouse No. 2 exhaust fans on the building's south façade. The CHLP is currently expanding their facility to increase power generation. The expansion proposes a new sluice way and powerhouse west of the existing Powerhouse No. 2. Information on the proposed powerhouse and noise sources was provided to GWE through CHLP's noise consultant HATCH without prejudice. The new equipment will consist of transformers and exhaust fans. For maintenance purposes a trash rake is infrequently used and was considered to be an insignificant source of noise.

¹⁰ ENCG, Appendix B, Page B-7

4.4.1 Predictor Lima Noise Predictions

The impact of the external stationary noise sources from the existing and proposed powerhouses on the study site areas was determined by computer modelling. Stationary noise source modelling is based on the software program *Predictor-Lima* developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments, and has been accepted by the MOE as part of Environmental Compliance Approvals, formally Certificate of Approval (C of A) applications.

Eight individual noise sensor locations were selected in the *Predictor-Lima* model to measure the noise impact at plane of windows (POW) points of reception during the daytime/evening (07:00 – 23:00) and nighttime (23:00 – 07:00) periods. Sensor locations are on the western façades of Block 206 where traffic noise levels are low, as described in Table 5 and illustrated in Figure 4. The mechanical equipment at the proposed powerhouse was represented as point sources in the *Predictor* model, while the outfall to the north of the site was represented as an area source. Air temperature, pressure and humidity were assumed 10°C, 101.3 kPa and 70%, respectively. Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground while a value of 1 represents grass, and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades.

TABLE 5: RECEPTOR LOCATIONS

Receptor Number	Location	Absolute Height (m)
R1	POW – Block 206 – Level 2	5
R2	POW – Block 206 – Level 5	16
R3	POW – Block 206 – Level 8	25
R4	POW – Block 206 – Level 12	37
R5	POW – Block 206 – Level 16	48
R6	POW – Block 206 – Level 18	55
R7	POW – Block 206 – Level 6	17.5
R8	POW – Block 207 – Level 2	5

4.4.2 Determination of Noise Source Power Levels

Determination of sound power levels from the existing Powerhouse No. 2 exhaust fans (EF-1 to 4) was done through previously completed noise measurements. The previous on-site measurements were conducted using a Brüel & Kjær integrating sound level meter, Type 2250, equipped with a Type 4189 microphone. The meter was calibrated using a Brüel & Kjær Type 4231 sound level calibrator. During the measurement period, on May 21, 2014, the skies were clear, temperature was +22°C, winds south-southwest at 10 km/h, and the relative humidity was less than 50%.

The following equation was then used to derive sound power levels to be used in the Predictor-Lima model based on the measured sound pressure levels from Powerhouse No. 2 exhaust fans.

$$L_w = L_p + 20 \log (R) + 11 - D_i$$

Where:

L_w is the sound power level referenced to a picowatt

L_p is the measured sound pressure level

R is the distance from source to measurement location

For the new powerhouse, the sound data and operating frequency for each unit are based on information provided by HATCH and summarized in Table 6 below, and includes equipment such as transformers and ventilation fans. All transformers and ventilation fans were assumed to operate continuously and concurrently during the daytime/evening and nighttime periods. Figure 4 illustrates the location of the mechanical equipment located at the proposed powerhouse.

TABLE 6: PROPOSED POWERHOUSE STATIONARY SOURCE SOUND POWER DATA

Source	Tag	Frequency Band (Hz)								Total (dBA)
		63	125	250	500	1000	2000	4000	8000	
S1	T1	92	95	93	93	87	82	77	69	93.2
S2	T2									
S3	T3									
S4	T4									
S5	FAN SF-A1	76	74	76	77	71	66	63	58	77.1
S6	FAN EF-A	83	83	77	71	68	65	61	55	74.9
S7	FAN SF-G1	81	81	78	70	70	70	68	66	77.1
S8	FAN SF-01	79	81	81	76	68	68	63	58	77.6
S9	FAN EF-01									
S10	Outfall	52	54	52	54	55	52	47	40	59
S11	EF-1	N/A	N/A	N/A	N/A	94.5	N/A	N/A	N/A	94.5
S12	EF-2									
S13	EF-3									
S14	EF-4									

5. RESULTS AND DISCUSSION

5.1 Roadway Noise Levels

Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations. The results of the roadway noise calculations are summarized in Table 7 below.

TABLE 7: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	
		Day	Night
1	POW – Block 205 – 3 rd Floor – North Façade	45	37
2	POW – Block 205 – 3 rd Floor – East Façade	60	52
3	POW – Block 205 – 3 rd Floor – South Façade	60	52
4	POW – Block 206 – 3 rd Floor – North Façade	63	55
5	POW – Block 206 – 3 rd Floor – East Façade	63	55
6	POW – Block 206 – 3 rd Floor – South Façade	53	45
7	POW – Block 207 – 3 rd Floor – North Façade	70	62
8	POW – Block 207 – 3 rd Floor – East Façade	73	65
9	POW – Block 207 – 7 th Floor – West Façade	51	43
10	POW – Block 208 – 3 rd Floor – South Façade	69	62
11	POW – Block 205 – 6 th Floor – North Façade	50	43
12	POW – Block 205 – 6 th Floor – East Façade	60	53
13	POW – Block 205 – 6 th Floor – South Façade	60	52
14	POW – Block 206 – 17 th Floor – North Façade	64	57
15	POW – Block 206 – 17 th Floor – East Façade	65	57
16	POW – Block 206 – 17 th Floor – South Façade	64	57
17	OLA – Block 206 – 18 th Floor – West Terrace	44	37
18	OLA – Block 206 – 4 th Floor – South Courtyard	50	43
19	OLA – Head Street Square	58	51
20	OLA – Block 208 – Rooftop Terrace	52	44

The results of the current analysis indicate that noise levels from roadway traffic will range between 46 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the east façade of Block 207 (Receptor 8), which is nearest and most exposed to Booth Street.

5.2 Noise Control Measures

The noise levels predicted due to road traffic exceed the criteria listed in the ENCG for building components. As discussed in Section 4.3 the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per city of Ottawa requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figures 5 and 6):

- **General and Private Office Space Windows**
 - (i) General and private office space windows facing east on Blocks 207 and 208 will require a minimum STC of 26 and 31 respectively
 - (ii) General and private office space windows facing north and south on Blocks 207 and 208 will require a minimum STC of 23 and 28 respectively
 - (iii) All other general and private office space windows are to satisfy Ontario Building Code (OBC 2012) requirements
- **Exterior Walls**
 - (i) Exterior wall components on the north, east and south façades of Blocks 207 and 208 require a minimum STC of 45 which will be achieved with brick cladding or an acoustical equivalent according to NRC test data¹¹

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

¹¹ J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

require review by a qualified acoustical engineer for conformance to the recommendations of this report prior to building permit application.

Results of the calculations also indicate that all office space facing north, east or south in Block 207 and 208 will require central air conditioning (or similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. Residential units facing east or south in Block 205 and units facing north, east or south in Block 206 will require forced air heating with provisions for central air conditioning (or similar mechanical systems). In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements for residential units, as summarized in Table 8 below (see Figure 7).

TABLE 8: SITE VENTILATION AND WARNING CLAUSE REQUIREMENTS

Location	Ventilation Requirements	Warning Clause
Block 205 – East and South facing units	Forced Air Heating with Provisions for Central Air Conditioning	Type C
Block 206 – North, East and South facing units	Forced Air Heating with Provisions for Central Air Conditioning	Type C
Block 207 – North, East and South facing space	Central Air Conditioning	N/A
Block 208 – North, East and South facing space	Central Air Conditioning	N/A

5.3 Stationary Noise Results

Results of the previous master plan environmental noise assessment show that within the study area of development Phase 1, ambient noise from Chaudière Falls will not be of a significant concern.

According to the ENCG, noise levels from stationary sources in a Class 1 area are not to be greater than 50 dBA or the background noise level (whichever is higher) at the plane of window during the daytime period (07:00 – 19:00). The lowest 1-hour L_{EQ} produced by roadway traffic noise at Receptor 4 was calculated to be 61 dBA. Noise criteria for evening (19:00 to 23:00) and nighttime (23:00 to 07:00) periods are based on background ambient noise measurements of 58 dB taken at equal distance from the falls as the western façade of Block 206, as documented in the noise report prepared by GWE for the Master Plan.

Noise levels as a result of the existing Powerhouse No. 2 exhaust fans exceeds the stationary noise criteria along the north façades of Block 206 and 207 where background noise due to roadway traffic is dominant. If the fans remain in operation after the construction of Phase 1, noise control measures will need to be provided for these sources. The most effective and efficient way to deal with noise is at the source. Therefore, cooperation of the source owner is desirable. Noise control for the existing Powerhouse No. 2 exhaust fans (EF-1 to 4) may include the use of silencers, acoustic louvers or an acoustically lined exhaust hood that would break the line of sight between the source and receiver. The inside of the hood should be lined with 50 mm of mould resistant mineral fiber insulation. These measures should provide an insertion loss upwards of 20 dBA, thus bringing the fans into compliance with the City of Ottawa ENCG noise criteria.

Noise levels produced by the proposed powerhouse are expected to fall below the stationary noise criteria along the west façade of Block 206 where background noise is dominated by water flowing over the Chaudière Falls. Impact results of the proposed powerhouse are summarized in Table 9 below.

The functions of the rooftop restaurant patio on Block 208 and the programmable Head Street Square in the centre of the development are exempt from the ENCG; however, special care should be taken for these spaces to not adversely impact surrounding noise sensitive spaces. The Head Street Square will be used for functions such as markets and festivals. Directional loud speakers should be used and orientated away from noise sensitive spaces. The rooftop patio on Block 208 should be placed as far as possible away

from the east façade of Block 205. A solid screen could be used to block the line of sight from the windows on Block 205 and the patio. For bedroom and living room windows facing into the Head Street Square and the rooftop patio, we would recommend they have a minimum STC rating of 35 and units be provided with central air conditioning which would allow residences to keep doors and windows closed.

TABLE 9: PREDICTED DAYTIME & NIGHTTIME NOISE LEVELS

RECEPTOR	LOCATION	L _{EQ} SOUND LEVEL (dBA)		STATIONARY NOISE CRITERIA (dBA)		MITIGATION REQUIRED TO MEET MOE CRITERIA	
		DAY	NIGHT	DAY	NIGHT	DAY	NIGHT
R1	POW – Block 206 – Level 2	45	45	58	58	NO	NO
R2	POW – Block 206 – Level 5	50	50	58	58	NO	NO
R3	POW – Block 206 – Level 8	49	49	58	58	NO	NO
R4	POW – Block 206 – Level 12	51	51	58	58	NO	NO
R5	POW – Block 206 – Level 16	43	43	58	58	NO	NO
R6	POW – Block 206 – Level 18	52	52	58	58	NO	NO
R7	POW – Block 206 – Level 6	64	64	61	45	YES	YES
R8	POW – Block 207 – Level 2	65	65	61	45	YES	YES

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels from roadway traffic will range between 46 and 73 dBA during the daytime period (07:00-23:00) and between 38 and 66 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 73 dBA) occurs on the east façade of Block 207 (Receptor 8), which is nearest and most exposed to Booth Street. Minimum building construction in all areas is required to satisfy the Ontario Building Code (2012). In addition, Sound Transmission Class (STC) ratings are required for building components where noise levels exceed 65 dBA (see Figures 5 and 6).

In addition to upgraded windows, the installation of central air conditioning (or similar mechanical system) will be required for all office space facing north, east or south in Blocks 207 and 208.

The installation of forced air heating with provisions for central air conditioning (or similar mechanical systems) will be required for all residential units facing east or south in Block 205 and units facing north, east or south in Block 206. The following Warning Clause (Type C¹²) in all Agreements of Lease, Purchase and Sale will be required for residential units in these Blocks:

“This dwelling unit has been fitted with a forced air heating system and the ducting etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City of Ottawa’s and the Ministry of the Environment’s noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and off the immediate vicinity of the subject property).”

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

“The Transferee covenants with the Transferor that the above clause, verbatim, shall be included in all subsequent Agreements of Purchase and Sale and deeds conveying the

¹² *ibid*

lands described herein, which shall run with the said lands and is for the benefit of the subsequent owners of the said lands and the owner of the adjacent road.”

Results of the previous master plan environmental noise assessment show that within the study area of development Phase 1, ambient noise from Chaudière Falls will not be of a concern.

Noise levels as a result of the existing Powerhouse No. 2 exhaust fans exceed the stationary noise criteria along the north façades of Block 206 and 207. If the fans are to remain in operation after the construction of Phase 1, noise control measures will need to be provided for these sources. The most effective and efficient way to deal with noise is at the source. Therefore, cooperation of the source owner is desirable. Noise control for the existing Powerhouse No. 2 exhaust fans (EF-1 to 4) may include the use of silencers, acoustic louvers or an acoustically lined exhaust hood that would break the line of sight between the source and receiver. The inside of the hood should be lined with 50 mm of mould resistant mineral fiber insulation. These measures should provide an insertion loss upwards of 20 dBA, thus bringing the fans into compliance with the City of Ottawa ENCG noise criteria.

Noise levels as a result of the proposed powerhouse fall below the stationary noise criteria along the west façade of Block 206 where background noise levels are dominated from water falling over the Chaudière Falls.

The functions of the rooftop restaurant patio on Block 208 and the programmable Head Street Square in the centre of the development are exempt from the ENCG; however, special care should be taken for these spaces to not adversely impact surrounding noise sensitive spaces. The Head Street Square will be used for functions such as markets and festivals. Directional loud speakers should be used and orientated away from noise sensitive spaces. The rooftop patio on Block 208 should be placed as far as possible away from the east façade of Block 205. A solid screen could be used to block the line of sight from the windows on Block 205 and the patio. For bedroom and living room windows facing into the Head Street Square and the rooftop patio, we would recommend they have a minimum STC rating of 35 and units be provided with central air conditioning, which would allow residents to keep doors and windows closed.

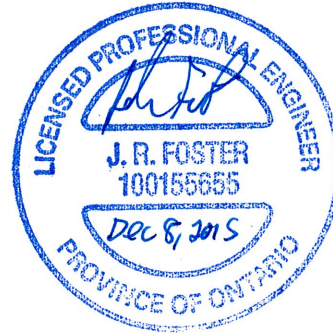
This concludes our assessment and report. If you have any questions or wish to discuss our findings please advise us. In the interim, we thank you for the opportunity to be of service.

Yours truly,

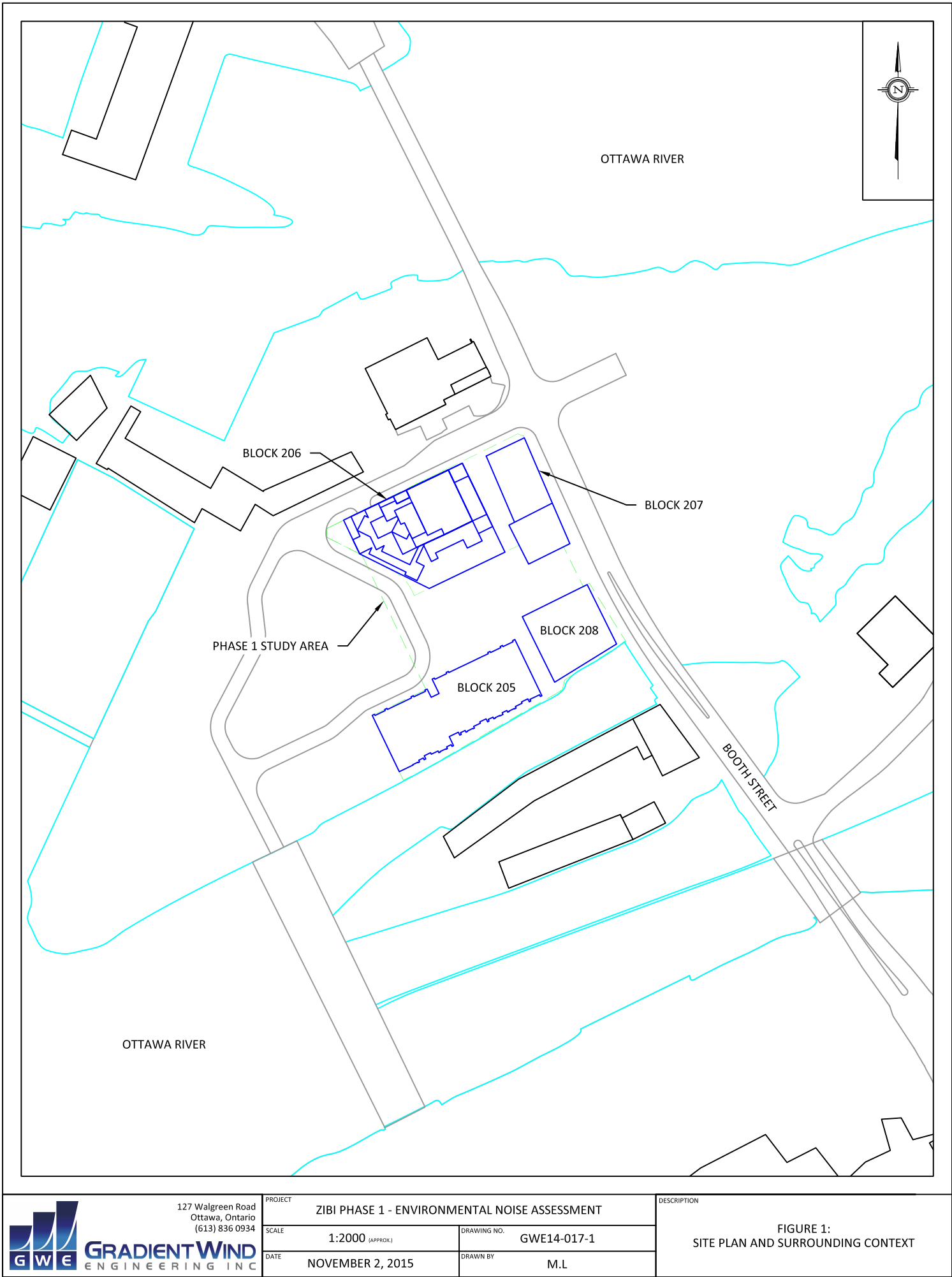
Gradient Wind Engineering Inc.


A blue ink signature of Michael Lafortune.

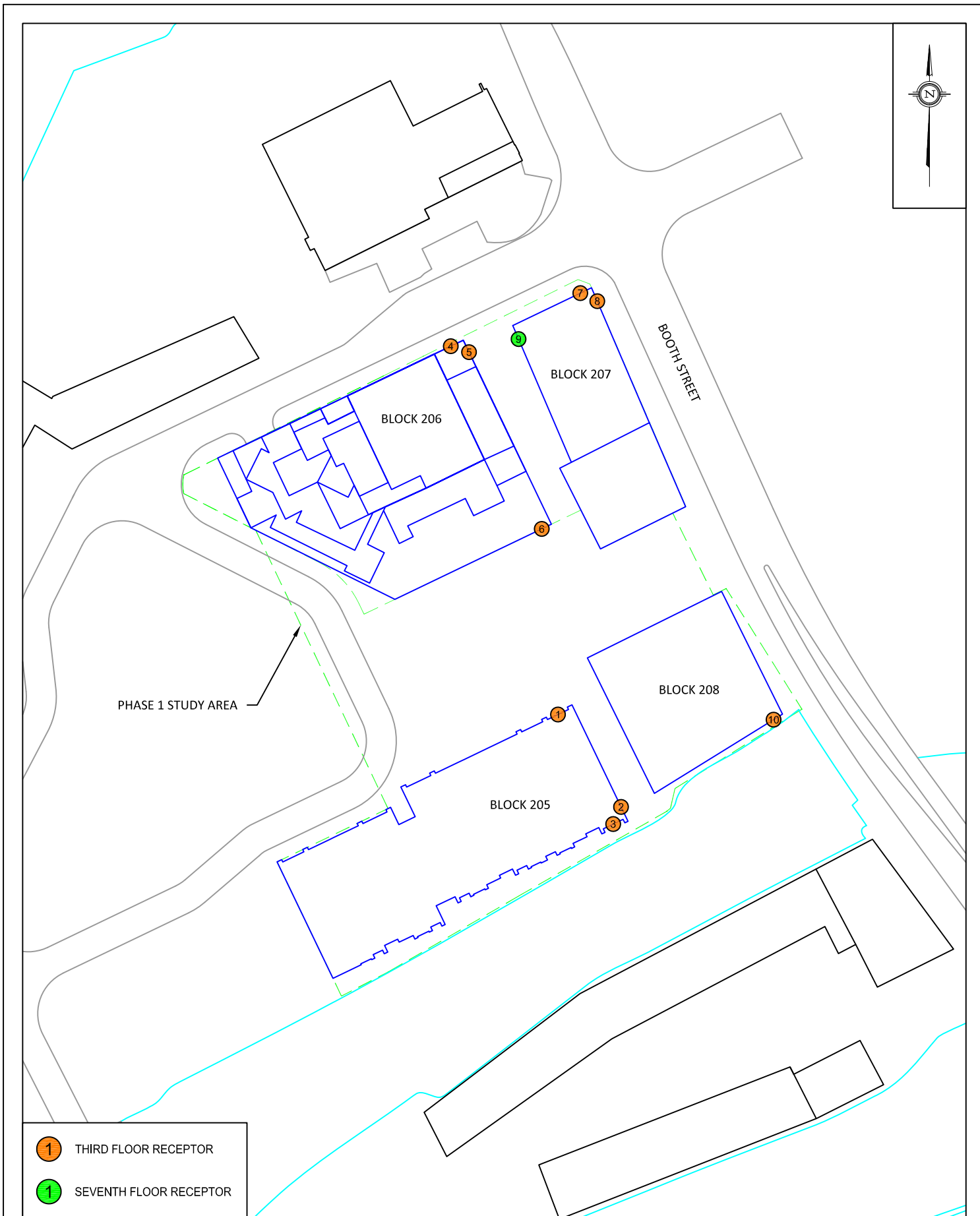
Michael Lafortune
Environmental Technologist
GWE14-017 – Environmental Noise



Joshua Foster, P.Eng.
Partner



 <div>127 Walgreen Road Ottawa, Ontario (613) 836 0934</div>	PROJECT			DESCRIPTION	
	ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT				
	SCALE	1:2000 (APPROX.)	DRAWING NO.		GWE14-017-1
	DATE	NOVEMBER 2, 2015	DRAWN BY		M.L
FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT					




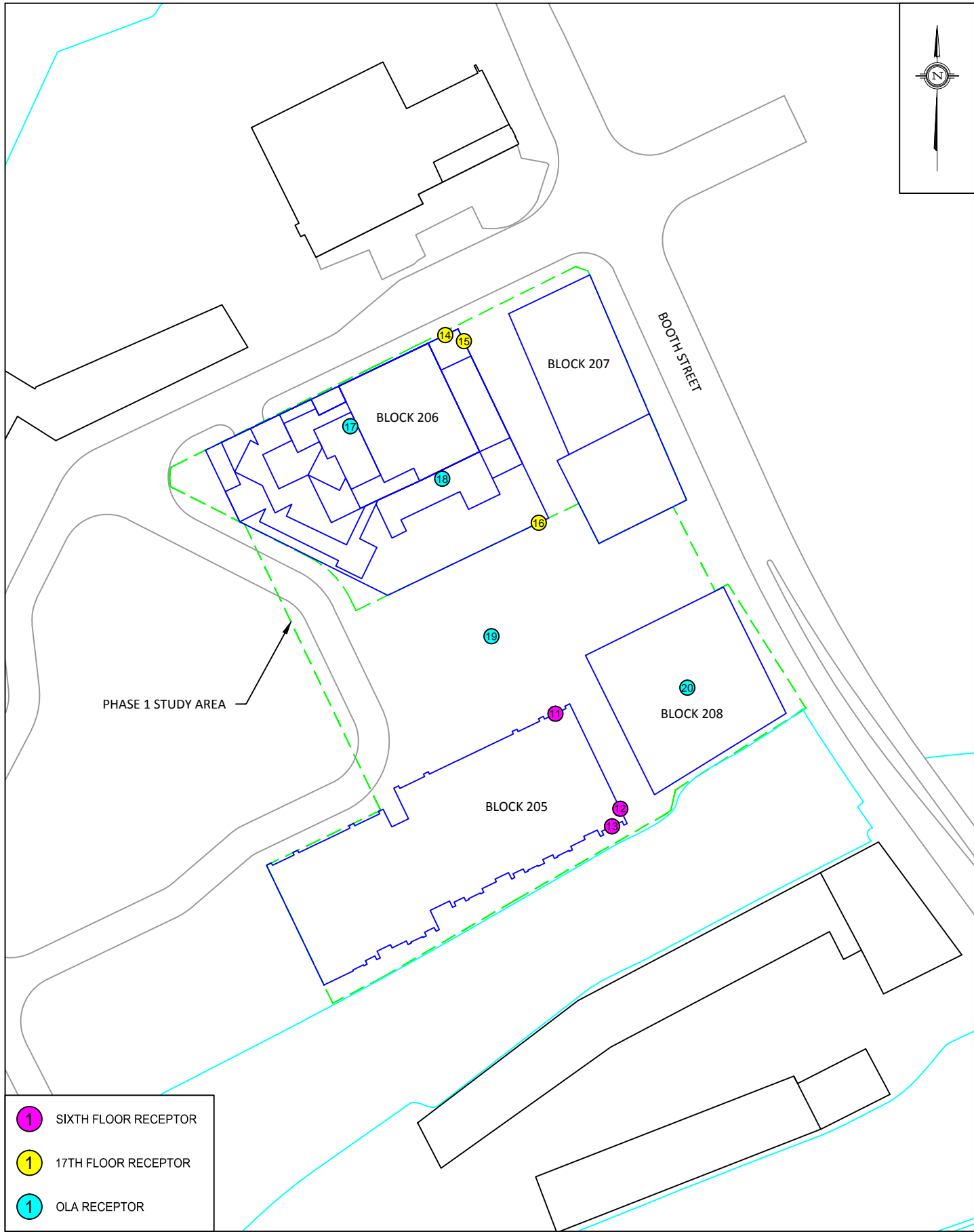
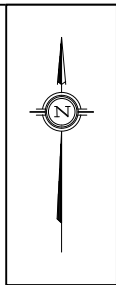
 <p>127 Walgreen Road Ottawa, Ontario (613) 836 0934</p>	PROJECT		ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
	SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE14-017-2	
	DATE	NOVEMBER 2, 2015	DRAWN BY	M.L.	

FIGURE 2:
THIRD AND SEVENTH FLOOR RECEPTOR LOCATIONS



- SIXTH FLOOR RECEPTOR
- 17TH FLOOR RECEPTOR
- OLA RECEPTOR



127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND
ENGINEERING INC

PROJECT	ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT	
SCALE	1:1000 (APPROX.)	DRAWING NO. GWE14-017-3
DATE	NOVEMBER 2, 2015	DRAWN BY M.L

DESCRIPTION	FIGURE 3: SIXTH FLOOR, 17TH FLOOR AND OLA RECEPTOR LOCATIONS
-------------	--

OTTAWA RIVER

OUTFALL

POWERHOUSE NO. 2

BOOTH STREET

PROPOSED POWERHOUSE

PHASE 1 STUDY AREA

BLOCK 205

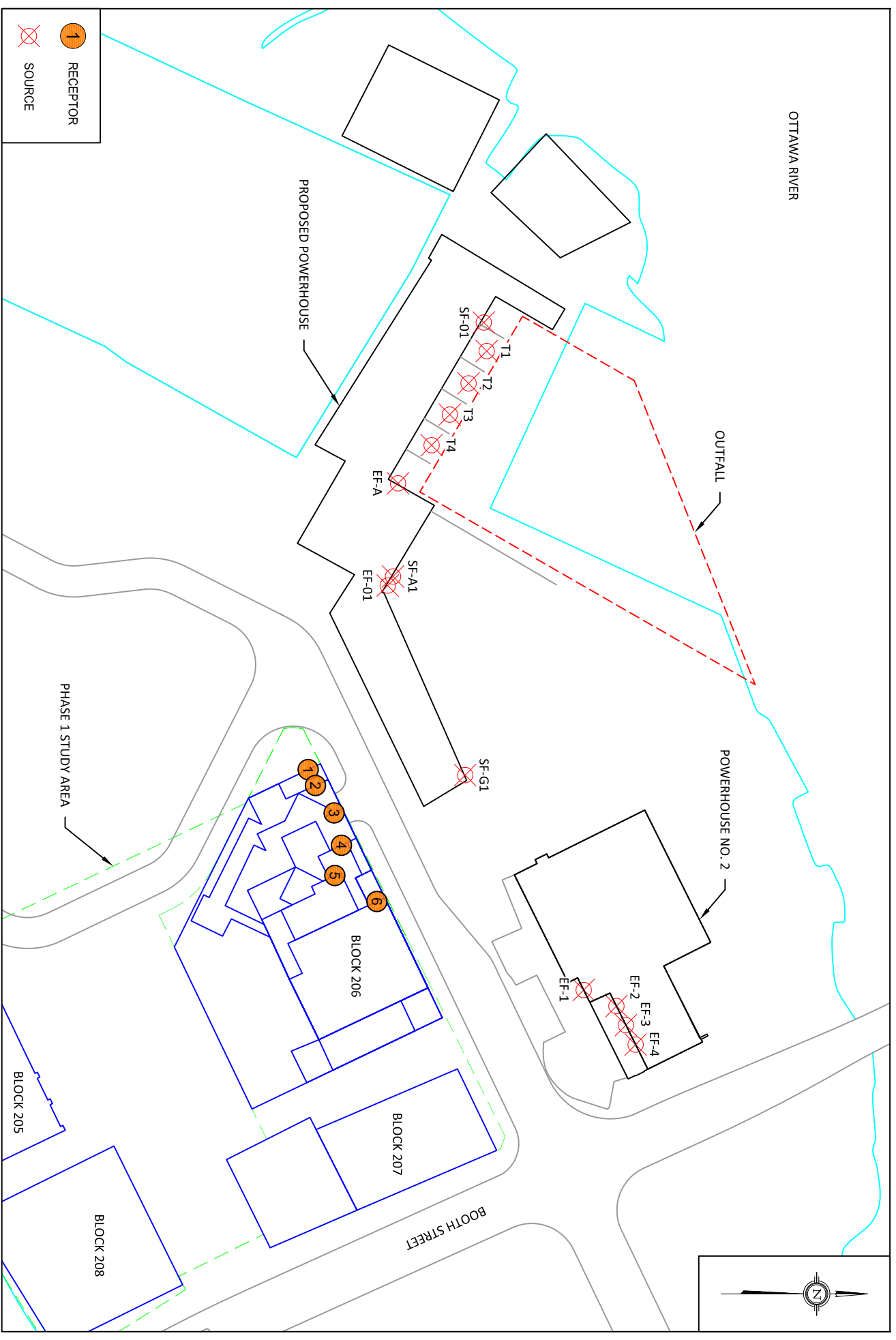
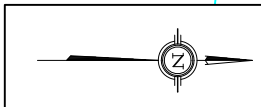
BLOCK 208


BLOCK 206

BLOCK 207

1 RECEPTOR

SOURCE





GRADIENT WIND

ENGINEERING INC

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

PROJECT
ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT

SCALE
1:1000 (approx)

DATE
NOVEMBER 2, 2015

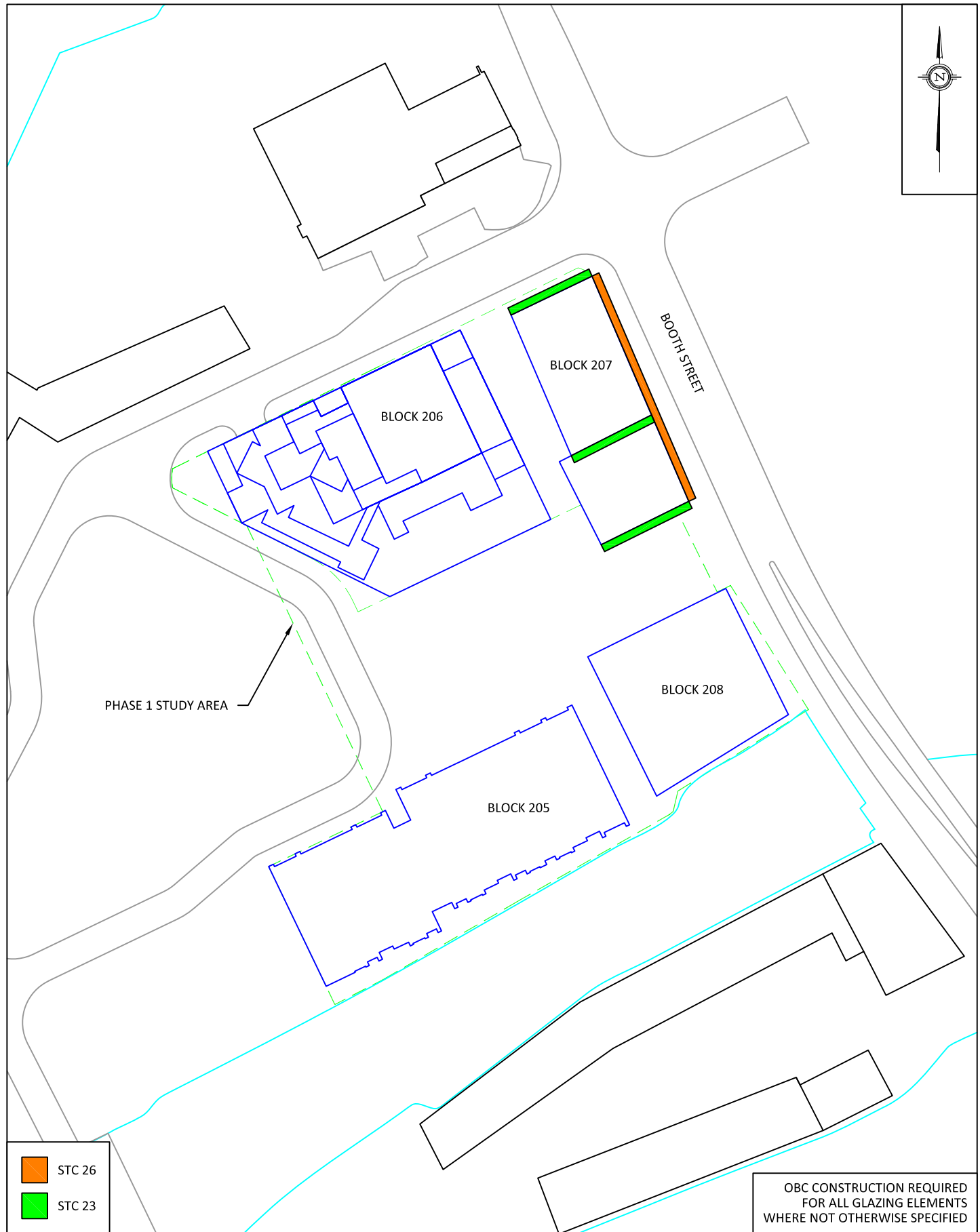
DRAWING NO.
GWE14-017-4

DRAWN BY
M.L.

DESCRIPTION
STATIONARY RECEPTOR AND SOURCE LOCATIONS

FIGURE 4:

STATIONARY RECEPTOR AND SOURCE LOCATIONS



127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND
ENGINEERING INC.

PROJECT

ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT

SCALE

1:1000 (APPROX.)

DATE

NOVEMBER 2, 2015

DRAWING NO.

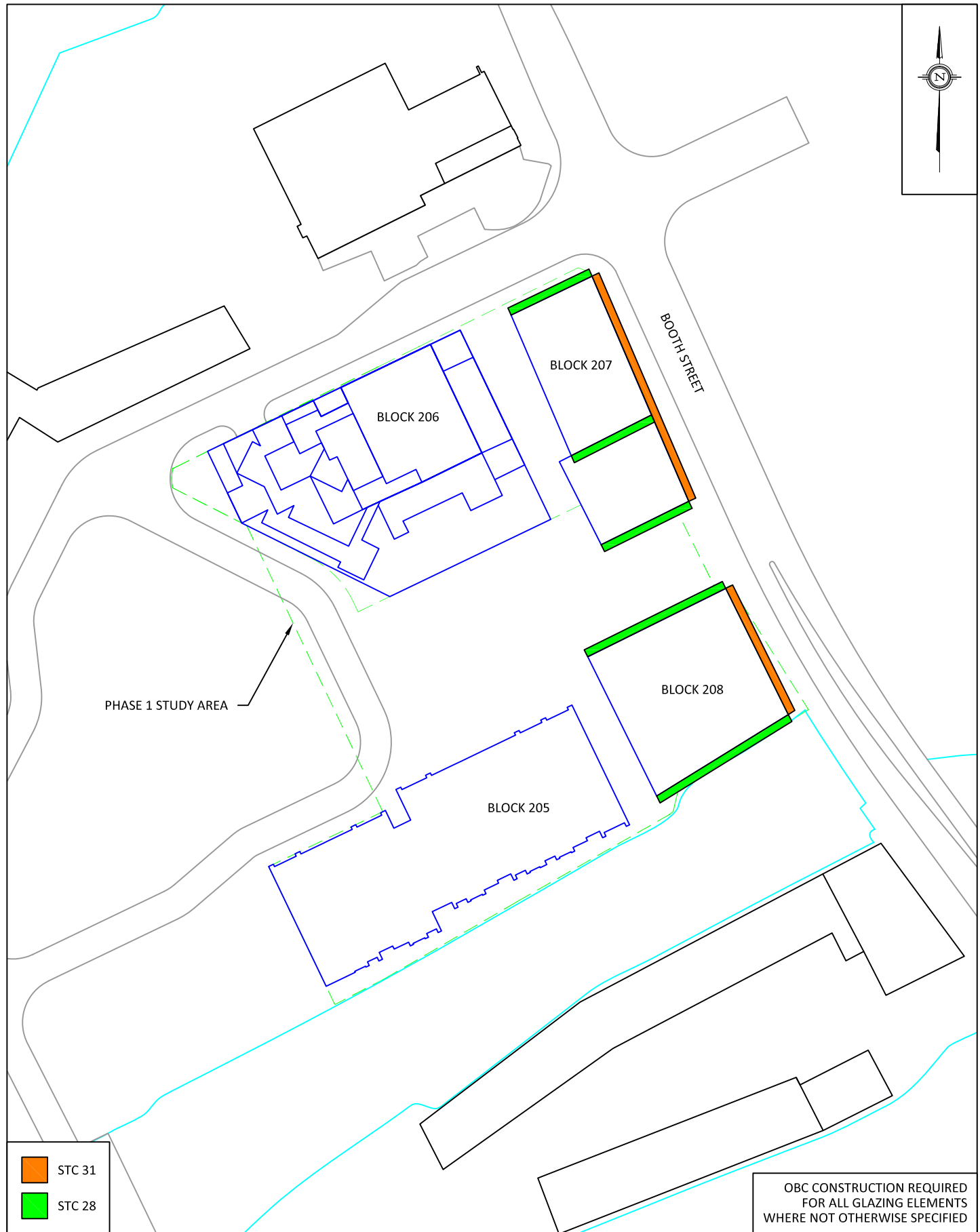
GWE14-017-5

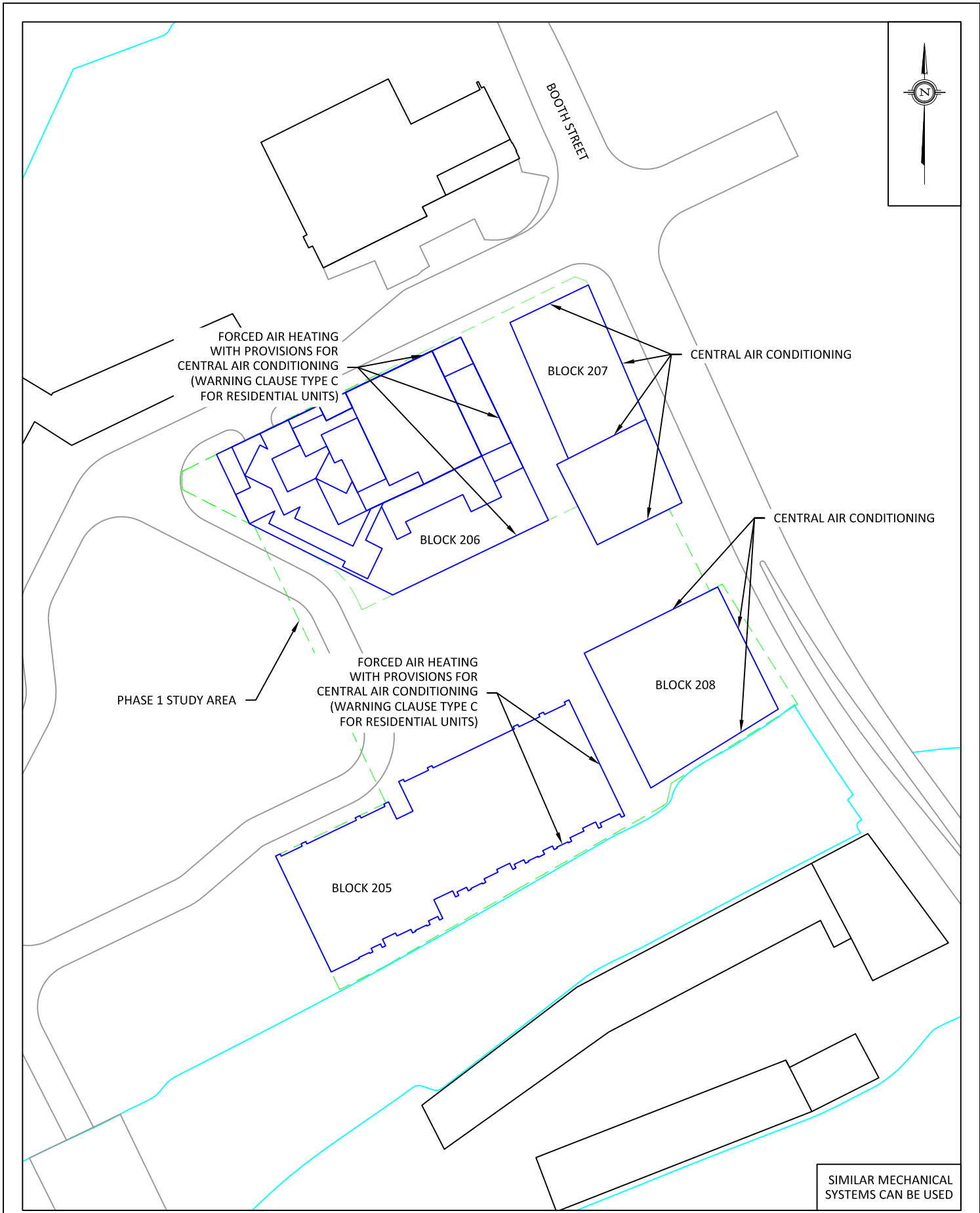
DRAWN BY

M.L.


DESCRIPTION

FIGURE 5:
GENERAL OFFICE WINDOW STC REQUIREMENTS





SIMILAR MECHANICAL
SYSTEMS CAN BE USED

 <p>127 Walgreen Road Ottawa, Ontario (613) 836 0934</p> <p>GRADIENT WIND ENGINEERING INC.</p>	PROJECT		ZIBI PHASE 1 - ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
	SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE14-017-7	
	DATE	NOVEMBER 2, 2015	DRAWN BY	M.L	
FIGURE 7: VENTILATION REQUIREMENTS					

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA (ROADWAY TRAFFIC NOISE)

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:20:48
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -59.00 deg -37.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 52.00 / 52.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -59.00 deg Angle2 : -37.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 40.00 / 40.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

 Angle1 Angle2 : -37.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 52.00 / 52.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -37.00 deg Angle2 : 0.00 deg
 Barrier height : 9.00 m
 Barrier receiver distance : 40.00 / 40.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: BoothL (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	7.50	2.88	2.88

ROAD (0.00 + 43.32 + 0.00) = 43.32 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	-37	0.00	73.01	0.00	-5.40	-9.13	0.00	0.00	-15.16	43.32

Segment Leq : 43.32 dBA

Results segment # 2: BoothR (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	7.50	2.88	2.88

ROAD (0.00 + 40.89 + 0.00) = 40.89 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-37	0	0.00	73.01	0.00	-5.40	-6.87	0.00	0.00	-19.85	40.89

Segment Leq : 40.89 dBA

Total Leq All Segments: 45.28 dBA

Results segment # 1: BoothL (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	7.50	2.88	2.88

ROAD (0.00 + 35.72 + 0.00) = 35.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	-37	0.00	65.41	0.00	-5.40	-9.13	0.00	0.00	-15.16	35.72

Segment Leq : 35.72 dBA

Results segment # 2: BoothR (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	7.50	2.88	2.88

ROAD (0.00 + 33.29 + 0.00) = 33.29 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-37	0	0.00	65.41	0.00	-5.40	-6.87	0.00	0.00	-19.85	33.29

Segment Leq : 33.29 dBA

Total Leq All Segments: 37.68 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 45.28
(NIGHT): 37.68

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:20:57
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -61.00 deg -21.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 49.00 / 49.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -61.00 deg Angle2 : -21.00 deg
 Barrier height : 9.00 m
 Barrier receiver distance : 37.00 / 37.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothC (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothC (day/night)

Angle1 Angle2 : -12.00 deg 13.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 51.00 / 51.00 m

Receiver height : 7.50 / 7.50 m

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

Barrier angle1 : -12.00 deg Angle2 : 13.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 38.00 / 38.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 3: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: BoothR (day/night)

Angle1 Angle2 : 13.00 deg 59.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 51.00 / 51.00 m

Receiver height : 7.50 / 7.50 m

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

Barrier angle1 : 42.00 deg Angle2 : 59.00 deg

Barrier height : 7.00 m

Barrier receiver distance : 38.00 / 38.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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	7.50	2.97	2.97

ROAD (0.00 + 42.57 + 0.00) = 42.57 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-61	-21	0.00	73.01	0.00	-5.14	-6.53	0.00	0.00	-18.76	42.57

Segment Leq : 42.57 dBA

Results segment # 2: BoothC (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	7.50	3.03	3.03

ROAD (0.00 + 39.25 + 0.00) = 39.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	13	0.00	73.01	0.00	-5.31	-8.57	0.00	0.00	-19.87	39.25

Segment Leq : 39.25 dBA

Results segment # 3: BoothR (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 ! 7.50 ! 3.03 ! 3.03

ROAD (59.76 + 42.94 + 0.00) = 59.85 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

13 42 0.00 73.01 0.00 -5.31 -7.93 0.00 0.00 0.00 59.76

42 59 0.00 73.01 0.00 -5.31 -10.25 0.00 0.00 -14.50 42.94

Segment Leq : 59.85 dBA

Total Leq All Segments: 59.97 dBA

Results segment # 1: BoothL (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	7.50	2.97	2.97

ROAD (0.00 + 34.97 + 0.00) = 34.97 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-61	-21	0.00	65.41	0.00	-5.14	-6.53	0.00	0.00	-18.76	34.97

Segment Leq : 34.97 dBA

Results segment # 2: BoothC (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	7.50	3.03	3.03

ROAD (0.00 + 31.65 + 0.00) = 31.65 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	13	0.00	65.41	0.00	-5.31	-8.57	0.00	0.00	-19.87	31.65

Segment Leq : 31.65 dBA

Results segment # 3: BoothR (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 7.50 ! 3.03 ! 3.03

ROAD (52.17 + 35.34 + 0.00) = 52.26 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

13 42 0.00 65.41 0.00 -5.31 -7.93 0.00 0.00 0.00 52.17

42 59 0.00 65.41 0.00 -5.31 -10.25 0.00 0.00 -14.50 35.34

Segment Leq : 52.26 dBA

Total Leq All Segments: 52.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.97
(NIGHT): 52.38

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:21:05
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : 9.00 deg 57.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 54.00 / 54.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 38.00 deg Angle2 : 57.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 41.00 / 41.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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 ! 7.50 ! 2.94 ! 2.94

ROAD (59.51 + 42.82 + 0.00) = 59.61 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

9 38 0.00 73.01 0.00 -5.56 -7.93 0.00 0.00 0.00 59.51

38 57 0.00 73.01 0.00 -5.56 -9.77 0.00 0.00 -14.86 42.82

Segment Leq : 59.61 dBA

Total Leq All Segments: 59.61 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 7.50 ! 2.94 ! 2.94

ROAD (51.92 + 35.22 + 0.00) = 52.01 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

9 38 0.00 65.41 0.00 -5.56 -7.93 0.00 0.00 0.00 51.92

38 57 0.00 65.41 0.00 -5.56 -9.77 0.00 0.00 -14.86 35.22

Segment Leq : 52.01 dBA

Total Leq All Segments: 52.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.61
(NIGHT): 52.01

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:21:13
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -67.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 40.00 / 40.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -67.00 deg Angle2 : -44.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 29.00 / 29.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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 ! 7.50 ! 3.15 ! 3.15

ROAD (0.00 + 45.43 + 62.63) = 62.71 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-67 -44 0.00 73.01 0.00 -4.26 -8.94 0.00 0.00 -14.38 45.43

-44 0 0.00 73.01 0.00 -4.26 -6.12 0.00 0.00 0.00 62.63

Segment Leq : 62.71 dBA

Total Leq All Segments: 62.71 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 7.50 ! 3.15 ! 3.15

ROAD (0.00 + 37.83 + 55.03) = 55.11 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-67 -44 0.00 65.41 0.00 -4.26 -8.94 0.00 0.00 -14.38 37.83

-44 0 0.00 65.41 0.00 -4.26 -6.12 0.00 0.00 0.00 55.03

Segment Leq : 55.11 dBA

Total Leq All Segments: 55.11 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.71
(NIGHT): 55.11

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:21:23
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -68.00 deg -6.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 37.00 / 37.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -68.00 deg Angle2 : -49.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 26.00 / 26.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

Angle1 Angle2 : -6.00 deg 68.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 37.00 / 37.00 m

Receiver height : 7.50 / 7.50 m

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

Barrier angle1 : -6.00 deg Angle2 : 68.00 deg

Barrier height : 23.00 m

Barrier receiver distance : 28.00 / 28.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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	7.50	3.28	3.28

ROAD (0.00 + 45.42 + 62.87) = 62.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	-49	0.00	73.01	0.00	-3.92	-9.77	0.00	0.00	-13.90	45.42
-49	-6	0.00	73.01	0.00	-3.92	-6.22	0.00	0.00	0.00	62.87

Segment Leq : 62.94 dBA

Results segment # 2: BoothR (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	7.50	2.96	2.96

ROAD (0.00 + 45.22 + 0.00) = 45.22 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-6	68	0.00	73.01	0.00	-3.92	-3.86	0.00	0.00	-20.00	45.22

Segment Leq : 45.22 dBA

Total Leq All Segments: 63.01 dBA

Results segment # 1: BoothL (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	7.50	3.28	3.28

ROAD (0.00 + 37.82 + 55.27) = 55.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-68	-49	0.00	65.41	0.00	-3.92	-9.77	0.00	0.00	-13.90	37.82
-49	-6	0.00	65.41	0.00	-3.92	-6.22	0.00	0.00	0.00	55.27

Segment Leq : 55.35 dBA

Results segment # 2: BoothR (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	7.50	2.96	2.96

ROAD (0.00 + 37.63 + 0.00) = 37.63 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-6	68	0.00	65.41	0.00	-3.92	-3.86	0.00	0.00	-20.00	37.63

Segment Leq : 37.63 dBA

Total Leq All Segments: 55.42 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.01
(NIGHT): 55.42

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:23:58
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : 0.00 deg 45.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 39.00 / 39.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 42.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 28.00 / 28.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

Angle1 Angle2 : 54.00 deg 71.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 32.00 / 32.00 m

Receiver height : 7.50 / 7.50 m

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

Barrier angle1 : 54.00 deg Angle2 : 71.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 22.00 / 22.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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 ! 7.50 ! 3.19 ! 3.19

ROAD (0.00 + 46.06 + 51.08) = 52.26 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

0 42 0.00 73.01 0.00 -4.15 -6.32 0.00 0.00 -16.48 46.06

42 45 0.00 73.01 0.00 -4.15 -17.78 0.00 0.00 0.00 51.08

Segment Leq : 52.26 dBA

Results segment # 2: BoothR (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 ! 7.50 ! 3.37 ! 3.37

ROAD (0.00 + 42.33 + 0.00) = 42.33 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

54 71 0.00 73.01 0.00 -3.29 -10.25 0.00 0.00 -17.14 42.33

Segment Leq : 42.33 dBA

Total Leq All Segments: 52.68 dBA

Results segment # 1: BoothL (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 7.50 ! 3.19 ! 3.19

ROAD (0.00 + 38.46 + 43.48) = 44.67 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

0 42 0.00 65.41 0.00 -4.15 -6.32 0.00 0.00 -16.48 38.46

42 45 0.00 65.41 0.00 -4.15 -17.78 0.00 0.00 0.00 43.48

Segment Leq : 44.67 dBA

Results segment # 2: BoothR (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 7.50 ! 3.37 ! 3.37

ROAD (0.00 + 34.73 + 0.00) = 34.73 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

54 71 0.00 65.41 0.00 -3.29 -10.25 0.00 0.00 -17.14 34.73

Segment Leq : 34.73 dBA

Total Leq All Segments: 45.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 52.68
(NIGHT): 45.09

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:24:35
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -83.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 15.00 / 15.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Results segment # 1: Booth (day)

Source height = 1.50 m

ROAD (0.00 + 69.64 + 0.00) = 69.64 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-83	0	0.00	73.01	0.00	0.00	-3.36	0.00	0.00	0.00	69.64

-83 0 0.00 73.01 0.00 0.00 -3.36 0.00 0.00 0.00 69.64

Segment Leq : 69.64 dBA

Total Leq All Segments: 69.64 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

ROAD (0.00 + 62.05 + 0.00) = 62.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-83	0	0.00	65.41	0.00	0.00	-3.36	0.00	0.00	0.00	62.05

-83 0 0.00 65.41 0.00 0.00 -3.36 0.00 0.00 0.00 62.05

Segment Leq : 62.05 dBA

Total Leq All Segments: 62.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.64

(NIGHT): 62.05

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:24:57
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -85.00 deg 85.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 15.00 / 15.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Results segment # 1: Booth (day)

Source height = 1.50 m

ROAD (0.00 + 72.76 + 0.00) = 72.76 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-85	85	0.00	73.01	0.00	0.00	-0.25	0.00	0.00	0.00	72.76

Segment Leq : 72.76 dBA

Total Leq All Segments: 72.76 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

ROAD (0.00 + 65.16 + 0.00) = 65.16 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-85	85	0.00	65.41	0.00	0.00	-0.25	0.00	0.00	0.00	65.16

Segment Leq : 65.16 dBA

Total Leq All Segments: 65.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 72.76

(NIGHT): 65.16

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:09
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -74.00 deg 74.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 27.00 / 27.00 m
 Receiver height : 21.50 / 21.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -74.00 deg Angle2 : 74.00 deg
 Barrier height : 23.00 m
 Barrier receiver distance : 1.00 / 1.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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	21.50	20.76	20.76

ROAD (0.00 + 51.00 + 0.00) = 51.00 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-74	74	0.00	73.01	0.00	-2.55	-0.85	0.00	0.00	-18.61	51.00

Segment Leq : 51.00 dBA

Total Leq All Segments: 51.00 dBA

Results segment # 1: Booth (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	21.50	20.76	20.76

ROAD (0.00 + 43.40 + 0.00) = 43.40 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-74	74	0.00	65.41	0.00	-2.55	-0.85	0.00	0.00	-18.61	43.40

Segment Leq : 43.40 dBA

Total Leq All Segments: 43.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.00
(NIGHT): 43.40

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:22
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : 3.00 deg 81.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 16.00 / 16.00 m
 Receiver height : 7.50 / 7.50 m
 Topography : 1 (Flat/gentle slope; no barrier)
 Reference angle : 0.00

Results segment # 1: Booth (day)

Source height = 1.50 m

ROAD (0.00 + 69.09 + 0.00) = 69.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
3	81	0.00	73.01	0.00	-0.28	-3.63	0.00	0.00	0.00	69.09

Segment Leq : 69.09 dBA

Total Leq All Segments: 69.09 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

ROAD (0.00 + 61.50 + 0.00) = 61.50 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
3	81	0.00	65.41	0.00	-0.28	-3.63	0.00	0.00	0.00	61.50

Segment Leq : 61.50 dBA

Total Leq All Segments: 61.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.09
(NIGHT): 61.50

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:30
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -59.00 deg -37.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 52.00 / 52.00 m
 Receiver height : 16.50 / 16.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -59.00 deg Angle2 : -37.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 40.00 / 40.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

 Angle1 Angle2 : -37.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 52.00 / 52.00 m
 Receiver height : 16.50 / 16.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -37.00 deg Angle2 : 0.00 deg
 Barrier height : 9.00 m
 Barrier receiver distance : 40.00 / 40.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: BoothL (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	16.50	4.96	4.96

ROAD (0.00 + 48.98 + 0.00) = 48.98 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	-37	0.00	73.01	0.00	-5.40	-9.13	0.00	0.00	-9.50	48.98

Segment Leq : 48.98 dBA

Results segment # 2: BoothR (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	16.50	4.96	4.96

ROAD (0.00 + 44.79 + 0.00) = 44.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-37	0	0.00	73.01	0.00	-5.40	-6.87	0.00	0.00	-15.95	44.79

Segment Leq : 44.79 dBA

Total Leq All Segments: 50.38 dBA

Results segment # 1: BoothL (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	16.50	4.96	4.96

ROAD (0.00 + 41.38 + 0.00) = 41.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-59	-37	0.00	65.41	0.00	-5.40	-9.13	0.00	0.00	-9.50	41.38

Segment Leq : 41.38 dBA

Results segment # 2: BoothR (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	16.50	4.96	4.96

ROAD (0.00 + 37.19 + 0.00) = 37.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-37	0	0.00	65.41	0.00	-5.40	-6.87	0.00	0.00	-15.95	37.19

Segment Leq : 37.19 dBA

Total Leq All Segments: 42.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.38
(NIGHT): 42.78

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:37
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -61.00 deg -21.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 49.00 / 49.00 m
 Receiver height : 16.50 / 16.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -61.00 deg Angle2 : -21.00 deg
 Barrier height : 9.00 m
 Barrier receiver distance : 37.00 / 37.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothC (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothC (day/night)

Angle1 Angle2 : -12.00 deg 13.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 51.00 / 51.00 m

Receiver height : 16.50 / 16.50 m

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

Barrier angle1 : -12.00 deg Angle2 : 13.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 38.00 / 38.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 3: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: BoothR (day/night)

Angle1 Angle2 : 13.00 deg 59.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 51.00 / 51.00 m

Receiver height : 16.50 / 16.50 m

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

Barrier angle1 : 42.00 deg Angle2 : 59.00 deg

Barrier height : 7.00 m

Barrier receiver distance : 38.00 / 38.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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	16.50	5.17	5.17

ROAD (0.00 + 46.91 + 0.00) = 46.91 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-61	-21	0.00	73.01	0.00	-5.14	-6.53	0.00	0.00	-14.42	46.91

Segment Leq : 46.91 dBA

Results segment # 2: BoothC (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	16.50	5.32	5.32

ROAD (0.00 + 43.85 + 0.00) = 43.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-12	13	0.00	73.01	0.00	-5.31	-8.57	0.00	0.00	-15.27	43.85

Segment Leq : 43.85 dBA

Results segment # 3: BoothR (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 ! 16.50 ! 5.32 ! 5.32

ROAD (59.76 + 49.27 + 0.00) = 60.13 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

13 42 0.00 73.01 0.00 -5.31 -7.93 0.00 0.00 0.00 59.76

42 59 0.00 73.01 0.00 -5.31 -10.25 0.00 0.00 -8.18 49.27

Segment Leq : 60.13 dBA

Total Leq All Segments: 60.43 dBA

Results segment # 1: BoothL (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 16.50 ! 5.17 ! 5.17

ROAD (0.00 + 39.32 + 0.00) = 39.32 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-61 -21 0.00 65.41 0.00 -5.14 -6.53 0.00 0.00 -14.42 39.32

Segment Leq : 39.32 dBA

Results segment # 2: BoothC (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 16.50 ! 5.32 ! 5.32

ROAD (0.00 + 36.25 + 0.00) = 36.25 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-12 13 0.00 65.41 0.00 -5.31 -8.57 0.00 0.00 -15.27 36.25

Segment Leq : 36.25 dBA

Results segment # 3: BoothR (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 16.50 ! 5.32 ! 5.32

ROAD (52.17 + 41.67 + 0.00) = 52.54 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

13 42 0.00 65.41 0.00 -5.31 -7.93 0.00 0.00 0.00 52.17

42 59 0.00 65.41 0.00 -5.31 -10.25 0.00 0.00 -8.18 41.67

Segment Leq : 52.54 dBA

Total Leq All Segments: 52.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.43
(NIGHT): 52.84

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

Angle1 Angle2 : 9.00 deg 57.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 54.00 / 54.00 m
Receiver height : 16.50 / 16.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 38.00 deg Angle2 : 57.00 deg
Barrier height : 7.00 m
Barrier receiver distance : 41.00 / 41.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Booth (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 ! 16.50 ! 5.11 ! 5.11

ROAD (59.51 + 48.74 + 0.00) = 59.86 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

9 38 0.00 73.01 0.00 -5.56 -7.93 0.00 0.00 0.00 59.51

38 57 0.00 73.01 0.00 -5.56 -9.77 0.00 0.00 -8.94 48.74

Segment Leq : 59.86 dBA

Total Leq All Segments: 59.86 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 16.50 ! 5.11 ! 5.11

ROAD (51.92 + 41.14 + 0.00) = 52.27 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

9 38 0.00 65.41 0.00 -5.56 -7.93 0.00 0.00 0.00 51.92

38 57 0.00 65.41 0.00 -5.56 -9.77 0.00 0.00 -8.94 41.14

Segment Leq : 52.27 dBA

Total Leq All Segments: 52.27 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.86
(NIGHT): 52.27

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:25:54
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r14.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -67.00 deg 0.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 40.00 / 40.00 m
 Receiver height : 50.80 / 50.80 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -67.00 deg Angle2 : -44.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 29.00 / 29.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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 ! 50.80 ! 15.05 ! 15.05

ROAD (0.00 + 59.81 + 62.63) = 64.45 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-67 -44 0.00 73.01 0.00 -4.26 -8.94 0.00 0.00 0.00 59.81*
-67 -44 0.00 73.01 0.00 -4.26 -8.94 0.00 0.00 0.00 59.81

-44 0 0.00 73.01 0.00 -4.26 -6.12 0.00 0.00 0.00 62.63

* Bright Zone !

Segment Leq : 64.45 dBA

Total Leq All Segments: 64.45 dBA

Results segment # 1: Booth (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 50.80 ! 15.05 ! 15.05

ROAD (0.00 + 52.21 + 55.03) = 56.86 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-67 -44 0.00 65.41 0.00 -4.26 -8.94 0.00 0.00 0.00 52.21*
-67 -44 0.00 65.41 0.00 -4.26 -8.94 0.00 0.00 0.00 52.21

-44 0 0.00 65.41 0.00 -4.26 -6.12 0.00 0.00 0.00 55.03

* Bright Zone !

Segment Leq : 56.86 dBA

Total Leq All Segments: 56.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.45
(NIGHT): 56.86

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:26:02
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r15.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -68.00 deg -6.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 37.00 / 37.00 m
 Receiver height : 50.80 / 50.80 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -68.00 deg Angle2 : -49.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 26.00 / 26.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

Angle1 Angle2 : -6.00 deg 68.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 37.00 / 37.00 m

Receiver height : 50.80 / 50.80 m

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

Barrier angle1 : -6.00 deg Angle2 : 68.00 deg

Barrier height : 23.00 m

Barrier receiver distance : 28.00 / 28.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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 ! 50.80 ! 16.15 ! 16.15

ROAD (0.00 + 59.32 + 62.87) = 64.46 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-68 -49 0.00 73.01 0.00 -3.92 -9.77 0.00 0.00 0.00 59.32*
-68 -49 0.00 73.01 0.00 -3.92 -9.77 0.00 0.00 0.00 59.32

-49 -6 0.00 73.01 0.00 -3.92 -6.22 0.00 0.00 0.00 62.87

* Bright Zone !

Segment Leq : 64.46 dBA

Results segment # 2: BoothR (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 ! 50.80 ! 13.49 ! 13.49

ROAD (0.00 + 48.37 + 0.00) = 48.37 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-6 68 0.00 73.01 0.00 -3.92 -3.86 0.00 0.00 -16.85 48.37

Segment Leq : 48.37 dBA

Total Leq All Segments: 64.57 dBA

Results segment # 1: BoothL (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)
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1.50	50.80	16.15	16.15
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ROAD (0.00 + 51.72 + 55.27) = 56.86 dBA

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

-68	-49	0.00	65.41	0.00	-3.92	-9.77	0.00	0.00	0.00	51.72*
-----	-----	------	-------	------	-------	-------	------	------	------	--------

-68	-49	0.00	65.41	0.00	-3.92	-9.77	0.00	0.00	0.00	51.72
-----	-----	------	-------	------	-------	-------	------	------	------	-------

-49	-6	0.00	65.41	0.00	-3.92	-6.22	0.00	0.00	0.00	55.27
-----	----	------	-------	------	-------	-------	------	------	------	-------

* Bright Zone !

Segment Leq : 56.86 dBA

Results segment # 2: BoothR (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 50.80 ! 13.49 ! 13.49

ROAD (0.00 + 40.78 + 0.00) = 40.78 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-6 68 0.00 65.41 0.00 -3.92 -3.86 0.00 0.00 -16.85 40.78

Segment Leq : 40.78 dBA

Total Leq All Segments: 56.97 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.57
(NIGHT): 56.97

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:26:10
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r16.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : 0.00 deg 45.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 39.00 / 39.00 m
 Receiver height : 50.80 / 50.80 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : 0.00 deg Angle2 : 42.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 28.00 / 28.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

Angle1 Angle2 : 54.00 deg 71.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 32.00 / 32.00 m

Receiver height : 50.80 / 50.80 m

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

Barrier angle1 : 54.00 deg Angle2 : 71.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 22.00 / 22.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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 ! 50.80 ! 15.40 ! 15.40

ROAD (0.00 + 62.54 + 51.08) = 62.84 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

0 42 0.00 73.01 0.00 -4.15 -6.32 0.00 0.00 0.00 62.54*
0 42 0.00 73.01 0.00 -4.15 -6.32 0.00 0.00 0.00 62.54

42 45 0.00 73.01 0.00 -4.15 -17.78 0.00 0.00 0.00 51.08

* Bright Zone !

Segment Leq : 62.84 dBA

Results segment # 2: BoothR (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 ! 50.80 ! 16.90 ! 16.90

ROAD (0.00 + 59.47 + 0.00) = 59.47 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

54 71 0.00 73.01 0.00 -3.29 -10.25 0.00 0.00 0.00 59.47*
54 71 0.00 73.01 0.00 -3.29 -10.25 0.00 0.00 0.00 59.47

* Bright Zone !

Segment Leq : 59.47 dBA

Total Leq All Segments: 64.48 dBA

Results segment # 1: BoothL (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 50.80 ! 15.40 ! 15.40

ROAD (0.00 + 54.94 + 43.48) = 55.24 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

0 42 0.00 65.41 0.00 -4.15 -6.32 0.00 0.00 0.00 54.94*
0 42 0.00 65.41 0.00 -4.15 -6.32 0.00 0.00 0.00 54.94

42 45 0.00 65.41 0.00 -4.15 -17.78 0.00 0.00 0.00 43.48

* Bright Zone !

Segment Leq : 55.24 dBA

Results segment # 2: BoothR (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 50.80 ! 16.90 ! 16.90

ROAD (0.00 + 51.87 + 0.00) = 51.87 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

54 71 0.00 65.41 0.00 -3.29 -10.25 0.00 0.00 0.00 51.87*
54 71 0.00 65.41 0.00 -3.29 -10.25 0.00 0.00 0.00 51.87

* Bright Zone !

Segment Leq : 51.87 dBA

Total Leq All Segments: 56.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.48
(NIGHT): 56.88

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:26:18
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r17.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -50.00 deg 50.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 64.00 / 64.00 m
 Receiver height : 53.50 / 53.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -50.00 deg Angle2 : 50.00 deg
 Barrier height : 55.00 m
 Barrier receiver distance : 4.00 / 4.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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	53.50	50.25	50.25

ROAD (0.00 + 44.25 + 0.00) = 44.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	50	0.00	73.01	0.00	-6.30	-2.55	0.00	0.00	-19.90	44.25

Segment Leq : 44.25 dBA

Total Leq All Segments: 44.25 dBA

Results segment # 1: Booth (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	53.50	50.25	50.25

ROAD (0.00 + 36.66 + 0.00) = 36.66 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-50	50	0.00	65.41	0.00	-6.30	-2.55	0.00	0.00	-19.90	36.66

Segment Leq : 36.66 dBA

Total Leq All Segments: 36.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 44.25
(NIGHT): 36.66

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:26:25
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r18.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Booth (day/night)

 Angle1 Angle2 : -58.00 deg 58.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 52.00 / 52.00 m
 Receiver height : 12.50 / 12.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -58.00 deg Angle2 : 58.00 deg
 Barrier height : 14.00 m
 Barrier receiver distance : 9.00 / 9.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Results segment # 1: Booth (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	12.50	10.60	10.60

ROAD (0.00 + 50.18 + 0.00) = 50.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	58	0.00	73.01	0.00	-5.40	-1.91	0.00	0.00	-15.51	50.18

Segment Leq : 50.18 dBA

Total Leq All Segments: 50.18 dBA

Results segment # 1: Booth (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	12.50	10.60	10.60

ROAD (0.00 + 42.59 + 0.00) = 42.59 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-58	58	0.00	65.41	0.00	-5.40	-1.91	0.00	0.00	-15.51	42.59

Segment Leq : 42.59 dBA

Total Leq All Segments: 42.59 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.18
(NIGHT): 42.59

STAMSON 5.0 NORMAL REPORT Date: 04-09-2015 14:26:38
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r19.te Time Period: Day/Night 16/8 hours
 Description:

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

 Car traffic volume : 24288/2112 veh/TimePeriod *
 Medium truck volume : 1932/168 veh/TimePeriod *
 Heavy truck volume : 1380/120 veh/TimePeriod *
 Posted speed limit : 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): 30000
 Percentage of Annual Growth : 0.00
 Number of Years of Growth : 0.00
 Medium Truck % of Total Volume : 7.00
 Heavy Truck % of Total Volume : 5.00
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

 Angle1 Angle2 : -55.00 deg 13.00 deg
 Wood depth : 0 (No woods.)
 No of house rows : 0 / 0
 Surface : 2 (Reflective ground surface)
 Receiver source distance : 57.00 / 57.00 m
 Receiver height : 1.50 / 1.50 m
 Topography : 2 (Flat/gentle slope; with barrier)
 Barrier angle1 : -55.00 deg Angle2 : -10.00 deg
 Barrier height : 7.00 m
 Barrier receiver distance : 46.00 / 46.00 m
 Source elevation : 0.00 m
 Receiver elevation : 0.00 m
 Barrier elevation : 0.00 m
 Reference angle : 0.00

Road data, segment # 2: BoothC (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothC (day/night)

Angle1 Angle2 : 13.00 deg 21.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 57.00 / 57.00 m

Receiver height : 1.50 / 1.50 m

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

Barrier angle1 : 13.00 deg Angle2 : 21.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 45.00 / 45.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Road data, segment # 3: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: BoothR (day/night)

Angle1 Angle2 : 31.00 deg 58.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 52.00 / 52.00 m

Receiver height : 1.50 / 1.50 m

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

Barrier angle1 : 31.00 deg Angle2 : 58.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 43.00 / 43.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (day)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 1.50 ! 1.50 ! 1.50

ROAD (0.00 + 42.40 + 58.27) = 58.38 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-55 -10 0.00 73.01 0.00 -5.80 -6.02 0.00 0.00 -18.79 42.40

-10 13 0.00 73.01 0.00 -5.80 -8.94 0.00 0.00 0.00 58.27

Segment Leq : 58.38 dBA

Results segment # 2: BoothC (day)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 1.50 ! 1.50 ! 1.50

ROAD (0.00 + 33.69 + 0.00) = 33.69 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

13 21 0.00 73.01 0.00 -5.80 -13.52 0.00 0.00 -20.00 33.69

Segment Leq : 33.69 dBA

Results segment # 3: BoothR (day)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 1.50 ! 1.50 ! 1.50

ROAD (0.00 + 39.37 + 0.00) = 39.37 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

31 58 0.00 73.01 0.00 -5.40 -8.24 0.00 0.00 -20.00 39.37

Segment Leq : 39.37 dBA

Total Leq All Segments: 58.45 dBA

Results segment # 1: BoothL (night)

Source height = 1.50 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.50 ! 1.50 ! 1.50 ! 1.50

ROAD (0.00 + 34.80 + 50.68) = 50.79 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-55 -10 0.00 65.41 0.00 -5.80 -6.02 0.00 0.00 -18.79 34.80

-10 13 0.00 65.41 0.00 -5.80 -8.94 0.00 0.00 0.00 50.68

Segment Leq : 50.79 dBA

Results segment # 2: BoothC (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	1.50	1.50

ROAD (0.00 + 26.09 + 0.00) = 26.09 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
13	21	0.00	65.41	0.00	-5.80	-13.52	0.00	0.00	-20.00	26.09

Segment Leq : 26.09 dBA

Results segment # 3: BoothR (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	1.50	1.50

ROAD (0.00 + 31.77 + 0.00) = 31.77 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
31	58	0.00	65.41	0.00	-5.40	-8.24	0.00	0.00	-20.00	31.77

Segment Leq : 31.77 dBA

Total Leq All Segments: 50.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.45
(NIGHT): 50.86

STAMSON 5.0 NORMAL REPORT Date: 08-09-2015 12:54:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r20.te Time Period: Day/Night 16/8 hours
Description:

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 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): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: BoothL (day/night)

Angle1 Angle2 : -75.00 deg -7.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 17.00 / 17.00 m
Receiver height : 10.50 / 10.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -75.00 deg Angle2 : -7.00 deg
Barrier height : 9.00 m
Barrier receiver distance : 15.00 / 15.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: BoothR (day/night)

Car traffic volume : 24288/2112 veh/TimePeriod *

Medium truck volume : 1932/168 veh/TimePeriod *

Heavy truck volume : 1380/120 veh/TimePeriod *

Posted speed limit : 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): 30000

Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 7.00

Heavy Truck % of Total Volume : 5.00

Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: BoothR (day/night)

Angle1 Angle2 : 3.00 deg 75.00 deg

Wood depth : 0 (No woods.)

No of house rows : 0 / 0

Surface : 2 (Reflective ground surface)

Receiver source distance : 19.00 / 19.00 m

Receiver height : 10.50 / 10.50 m

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

Barrier angle1 : 3.00 deg Angle2 : 75.00 deg

Barrier height : 9.00 m

Barrier receiver distance : 15.00 / 15.00 m

Source elevation : 0.00 m

Receiver elevation : 0.00 m

Barrier elevation : 0.00 m

Reference angle : 0.00

Results segment # 1: BoothL (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	2.55	2.55

ROAD (0.00 + 48.52 + 0.00) = 48.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-75	-7	0.00	73.01	0.00	-0.54	-4.23	0.00	0.00	-19.72	48.52

Segment Leq : 48.52 dBA

Results segment # 2: BoothR (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	3.39	3.39

ROAD (0.00 + 48.79 + 0.00) = 48.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
3	75	0.00	73.01	0.00	-1.03	-3.98	0.00	0.00	-19.21	48.79

Segment Leq : 48.79 dBA

Total Leq All Segments: 51.67 dBA

Results segment # 1: BoothL (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	2.55	2.55

ROAD (0.00 + 40.92 + 0.00) = 40.92 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-75	-7	0.00	65.41	0.00	-0.54	-4.23	0.00	0.00	-19.72	40.92

Segment Leq : 40.92 dBA

Results segment # 2: BoothR (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	3.39	3.39

ROAD (0.00 + 41.20 + 0.00) = 41.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
3	75	0.00	65.41	0.00	-1.03	-3.98	0.00	0.00	-19.21	41.20

Segment Leq : 41.20 dBA

Total Leq All Segments: 44.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 51.67
(NIGHT): 44.07

APPENDIX B

STAMSON 5.04 - INPUT AND OUTPUT DATA (BACKGROUND NOISE CALCULATION)

STAMSON 5.0 NORMAL REPORT Date: 27-07-2015 15:03:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4-1H.te Time Period: 1 hours
Description:

Road data, segment # 1: Booth

Car traffic volume : 1026 veh/TimePeriod
Medium truck volume : 82 veh/TimePeriod
Heavy truck volume : 58 veh/TimePeriod
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Booth

Angle1 Angle2 : -67.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 40.00 m
Receiver height : 7.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -67.00 deg Angle2 : -44.00 deg
Barrier height : 7.00 m
Barrier receiver distance : 29.00 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Booth

Source height = 1.49 m

Barrier height for grazing incidence

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

-----+-----+-----+-----
1.49 ! 7.50 ! 3.15 ! 3.15

ROAD (0.00 + 43.71 + 60.92) = 61.00 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

-67 -44 0.00 71.30 0.00 -4.26 -8.94 0.00 0.00 -14.39 43.71

-44 0 0.00 71.30 0.00 -4.26 -6.12 0.00 0.00 0.00 60.92

Segment Leq : 61.00 dBA

Total Leq All Segments: 61.00 dBA

TOTAL Leq FROM ALL SOURCES: 61.00