Environmental Noise Assessment

1531, 1539 Stittsville Main Street

Stittsville, Ontario

REPORT: GWE18 –145 -Environmental Noise

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EXECUTIVE SUMMARY

This document describes an environmental noise assessment performed for a proposed development located at 1531, 1539 Stittsville Main Street in Stittsville, Ontario. The site is located Southeast of the Stittsville Main Street and Orville Street intersection. The development site is currently comprised of three existing structures, which would be demolished to make way for the new development. The development comprises two rectangular planform buildings: a 4-storey building featuring two commercial units at grade as well as residential units in remaining spaces, and a proposed townhome. This includes 7 townhomes and 47 stacked rental units, making up a total of approximately 54 residential units. Amenity space is provided in the form of private terraces. Balconies and terraces less than 4 m in depth are not considered as outdoor living areas (OLA), as per ENCG. Therefore, there are no associated OLA for this development. The major sources of transportation noise are Stittsville Main Street and Abbott Street. The major sources of stationary noise are from rooftop mechanical equipment atop the proposed 4-storey building.

The assessment is based on: (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation, and Parks (MECP) and City of Ottawa requirements; (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings received from Project1 Studio.

Based on the assumptions in this report it is expected that stationary noise levels from the 4-storey building's mechanical equipment will fall below ENCG criteria during all hours of the day. Since noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses. It is recommended that mechanical equipment on the roof be placed as far as possible from the surrounding buildings, particularly the existing townhomes Northeast of the site.

The results of the current study indicate that roadway noise levels will range between 49 and 68 dBA during the daytime period (07:00-23:00) and between 38 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (ie. 68 dBA) occurs along the 4-storey building's Southwest façade, which is nearest and most exposed to Stittsville Main Street. Predicted noise levels due to roadway traffic exceed the criteria listed in section 4.3 for building components, therefore, upgraded building components are required where noise levels exceed 65 dBA as shown in Figure 11.

In addition to upgrade building components, ventilation requirements dictate that the development should have central air conditioning. If installed this would allow occupants to keep windows closed to maintain a quiet indoor environment. A Warning Clause[1] in all Agreements of Lease, Purchase, and Sale will be required for these units. Predicted traffic noise levels for the proposed townhome exceed the criteria listed in section 4.3 for ventilation requirements, suggesting the need for forced air heating and provision for central air conditioning at the occupant's discretion. A Warning Clause[2] in all Agreements of Lease, Purchase, and Sale will be required for these units.

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

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Huntington Properties to undertake an environmental noise assessment of a proposed mix-use commercial and residential development located at 1531, 1539 Stittsville Main Street in Stittsville, Ontario. This report summarizes the methodology, results and recommendations related to an environmental noise assessment. GWE's scope of work involved assessing exterior noise levels throughout the site, generated by local transportation sources, as well as consideration of stationary impacts from proposed mechanical equipment. The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa[3] and Ministry of the Environment, Conservation and Parks (MECP)[4] guidelines. Noise calculations were based on site plan and architectural drawings prepared by Project1 Studio, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this environmental noise assessment is a proposed development comprising two rectangular planform buildings: a 4-storey building featuring two commercial units at grade as well as residential units in remaining spaces, and a proposed townhome. The 4-storey and townhome buildings are expected to achieve approximately twelve-metres and eight-meters above grade upon completion, respectively. The site is located Southeast of the Stittsville Main Street and Orville Street intersection. The development site is currently comprised of three existing structures, which would be demolished to make way for the new development. Amenity space is provided in the form of private terraces. Balconies and terraces less than 4 m in depth are not considered as outdoor living areas (OLA), as per ENCG. Therefore, there are no associated OLA for this development. The major sources of transportation noise are Stittsville Main Street and Abbott Street. The major sources of stationary noise are from rooftop mechanical equipment atop the proposed buildings. The site is surrounded by mixed-use residential and commercial land. Figure 1 illustrates the site plan and surrounding context.

[3] City of Ottawa Environmental Noise Control Guidelines, January 2016
[4] Ministry of the Environment, Conservation and Parks (MECP) – Environmental Noise Guideline, Publication NPC-300, August 2013

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) calculate the future noise levels on surrounding noise-sensitive properties, as well as the study building, produced by stationary noise sources associated with the development, and (iii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG) as outlined in Section 4.2 and Section 4.3 of this report.

4. METHODOLOGY

4.1 Background

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

4.2 Stationary Noise

4.2.1 Stationary Noise Source Assessment and Criteria

The equivalent sound energy level, L_{eq}, provides a weighted 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 selected period of time. For stationary sources, the L_{eq} is calculated on an hourly interval, while for roadways, the L_{eq} is calculated based on a 16-hour daytime / 8-hour nighttime split.

Noise criteria taken from the ENCG apply to points of reception (POR). A POR is defined under the ENCG as "any location on a noise sensitive land use where noise from a stationary source is received", this can be an outdoor point of reception or at the plane of window. A POR can be located on an existing or zoned

for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds, and noise sensitive buildings such as schools, places of worship and daycare facilities. According to the ENCG, the recommended maximum noise level for a suburban (Class 2) environment at a POR is either the lowest one-hour background noise level due to other sources, or the exclusionary limits outlined in Table 1, whichever is higher.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 2 AREA

Time of Day	Outdoor Points of Reception	Plane of Window
07:00 – 19:00	50	50
19:00 – 23:00	45	50
23:00 – 07:00	N/A	45

4.2.2 Determination of Noise Source Power Levels

Table 2 summarizes the sound power levels of each source assumed in our analysis. Source locations are illustrated in Figure 3. The proposed equipment is expected to be comprised of:

- Sixty multi-zone ductless heat pumps (HP) – Senville model SENA/18HF/D (S1 x 60). The condensing units are located on the roof of the building with pipe connections to the main unit situated within each dwelling.

At the time of our review, overall sound power data of the equipment was still unknown. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review. With that notion, the sound calculations performed assumed sound power levels based on similar mechanical equipment for this type of application used in Gradient Wind's past experience on similar projects. Figure 3 displays the stationary source locations.

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source ID	Source	Height above roof (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1 x 60	Condenser-Radiated	2.00	43	58	59	68	67	63	55	47	72

4.2.3 Stationary Source Noise Predictions

The impact of the stationary noise sources on the nearby residential 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 Ministry of Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approvals applications.

A total of eight receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime and evening period (07:00 – 23:00), as well as the nighttime period (23:00 – 07:00). POR locations included outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. Sensor locations are described in Table 3. All units were represented as point sources in the Predictor model. Table 4 below contains Predictor-Lima calculation settings. These settings are typical and have been based on ISO 9613 standards and guidance from the MECP.

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. Figure 2 displays the stationary noise receptor locations. Further modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Location	Height Above Grade (m)
R1	OPOR – Park	1.5
R2	POW – Northeast Building Façade	11.5
R3	POW – Northeast Building Façade	4.5
R4	POW – Northeast Building Façade	11.5
R5	POW – Southeast Building Façade	5.0
R6	POW – Southwest Building Façade	4.0
R7	POW – Northwest Building Façade	2.00

R8	POW – West Building Façade	6.00

TABLE 4: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Default ground attenuation factor	1
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

4.3 Roadway Traffic Noise

4.3.1 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 ($L_{eq}16$) daytime (07:00-23:00) / 8-hour ($L_{eq}8$) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters, respectively, for roadway as listed in Table 5.

TABLE 5: INDOOR SOUND LEVEL CRITERIA (ROAD)[5]

Type of Space	Time Period	L_{eq} (dBA)
		Road
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50

[5] Adapted from ENCG 2016 – Tables 2.2b and 2.2c

Living/dining/den areas of **residences**, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

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

4.3.2 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan 3 which provides additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 6 (below) summarizes the AADT values used for the roadway included in this assessment.

TABLE 6: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Stittsville Main Street	2-RAU	50	**15,000**
Abbott Street	2-UMCU	50	**12,000**

4.3.3 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 6, 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.
- Reflective ground surface between source and receiver for Stittsville Main Street, while absorptive ground considered for the surface between source and receiver for Abbott Street.
- Topography assumed to be a flat/gentle slope.
- Receptor height taken to be 10.5 metres at the 4th floor of the of the residential and commercial building and 4.5 meters at the 2nd floor of the townhome building. This coincides with the plane of window (POW) due to the elevation of the site.
- Surrounding buildings used as potential noise barriers. Receptors influenced by these barriers are outlined in Figures 5-8.
- Noise receptors were strategically placed at six locations around the study area as outlined in Figure 4.
- The cluster of buildings Northeast of Stittsville Main street were treated as a row of houses within STAMSON and assumed to have a density of 40% for receptor 5, which contributed to a partial barrier effect.

4.3.4 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, concrete and masonry walls can achieve STC 50 or more. Curtain wall systems typically provide around STC 35, depending on the glazing elements.

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 Section 4.3, when daytime noise levels (from road) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[6] considers:

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

Based on published research[7], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

5. RESULTS AND DISCUSSION

5.1 Stationary Noise Levels

As Table 7 summarizes, stationary noise levels from the 4-storey building's mechanical equipment are expected to fall below ENCG criteria during all hours of the day. Since noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses.

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

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

To reiterate, overall sound power data of the equipment was still unknown at the time of this review, resulting in sound calculations to assume sound power levels based on similar mechanical equipment used in Gradient Wind's past experience. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review.

TABLE 7: NOISE LEVELS FROM STATIONARY SOURCE: MUA

Receiver Number	Location	1-HR L_{eq} (dBA)		ENCG Criteria (dBA)		Meets ENCG	
		Day	Night	Day	Night	Day	Night
R1	OPOR – Park	33	30	50	N/A	YES	YES
R2	POW – Northeast Building Façade	46	43	50	45	YES	YES
R3	POW – Northeast Building Façade	40	37	50	45	YES	YES
R4	POW – Northeast Building Façade	47	44	50	45	YES	YES
R5	POW – Southeast Building Façade	38	35	50	45	YES	YES
R6	POW – Southeast Building Façade (Retail)	48	45	50	45	YES	YES
R7	POW – Northwest Building Façade	40	37	50	45	YES	YES
R8	POW – West Building Façade (Retail)	47	44	50	45	YES	YES

It is recommended that mechanical equipment on the roof be placed as far as possible from the surrounding buildings, particularly the existing townhomes Northeast of the site..

5.2 Transportation Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 8 below. Appendix A includes a complete set of STAMSON 5.04 input and output data and Figure 5-10 illustrates STAMSON 5.04 input data.

TABLE 8: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height (m)	Plane of Window/Outdoor Living Area Receptor Location	Noise Level (dBA)	
			Day	Night
1	10.5	4th Storey – Southeast Façade (POW)	64	56
2	10.5	4th Storey – Southwest Façade (POW)	68	61
3	10.5	4th Storey – Northwest Façade (POW)	64	57
4	10.5	4th Storey – Northeast Façade (POW)	49	38
5	4.5	2nd Storey – Southwest Façade (POW)	59	55
6	4.5	2nd Storey – Northwest Façade (POW)	59	51

The results of the current study indicate that roadway noise levels will range between 49 and 68 dBA during the daytime period (07:00-23:00) and between 38 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (ie. 68 dBA) occurs along the building's Southwest façade, which is nearest and most exposed to Stittsville Main Street. Predicted noise levels due to roadway traffic exceed the criteria listed in section 4.3 for building components, therefore, upgraded building components are required where noise levels exceed 65 dBA as shown in Figure 11.

5.2.1 Noise Control Measures

The noise levels predicted due to the roadway traffic exceed the criteria listed in Section 4.3 for building components. The commercial and residential building façade closest to Stittsville Main Street will require updated building components as described below. As discussed in Section 4. the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). It is recommended detailed STC calculations be performed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 11):

- **Living Room Windows (4-Storey Building)**

(i) Living room windows facing the Southwest will require a minimum STC of 28

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

- **Bedroom Windows (4-Storey Building)**

(i) Bedroom windows facing the Southwest will require a minimum STC of 32

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

- **Exterior Walls (4-Storey Building)**

(i) Exterior wall components on the South façade require a minimum STC of 45. Wall assemblies meeting STC 45 would include steel stud walls a minimum of 92 mm deep filled with batt insulation, exterior dense glass sheathing, and a 16 mm gypsum board on the inside.

The STC requirements would apply to windows, doors, spandrel panels and curtain wall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window / wall system is used. 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 specified an example window configuration, however several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. 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.

Results of the calculations also indicate that both proposed buildings will require central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6 below.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the assumptions in this report it is expected that stationary noise levels from the 4-storey buildings mechanical equipment will fall below ENCG criteria during all hours of the day. Since noise levels fall below ENCG criteria, the proposed development is expected to be compatible with the existing and future noise sensitive land uses.

It is recommended that mechanical equipment on the roof be placed as far as possible from the surrounding buildings, particularly the existing townhomes Northeast of the site, in order to improve sound levels within the noise sensitive space.

To reiterate, overall sound power data of the equipment was still unknown at the time of this review, resulting in sound calculations to assume sound power levels based on similar mechanical equipment used

in Gradient Wind's past experience. As shop drawings and equipment selections become available, these should be forwarded to Gradient Wind for review.

The results of the current study indicate that roadway noise levels will range between 49 and 68 dBA during the daytime period (07:00-23:00) and between 38 and 61 dBA during the nighttime period (23:00-07:00). The highest noise level (ie. 68 dBA) occurs along the 4-storey building's Southwest façade, which is nearest and most exposed to Stittsville Main Street. Predicted noise levels due to roadway traffic exceed the criteria listed in section 4.3 for building components, therefore, upgraded building components are required where noise levels exceed 65 dBA as shown in Figure 11.

In addition to upgrade building components, ventilation requirements dictate that the development should have central air conditioning. If installed this would allow occupants to keep windows closed to maintain a quiet indoor environment. The following Warning Clause[8] in all Agreements of Lease, Purchase, and Sale will be required for these units:

> *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing roadway traffic will interfere with some activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.*
>
> *To help address the need for sound attenuation this development has been designed so as to provide an indoor environment that is within provincial guidelines. Measures for sound attenuation include:*
>
> - *STC multi-pane glass glazing elements*
> - *Upgraded exterior walls achieving STC 45 or greater*
>
> *To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features.*
>
> *To ensure that provincial sound level limits are not exceeded internally, this dwelling unit has been designed with central air conditioning. The installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring*

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

that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment, Conservation and Parks."

The following Warning Clause will be required in all Agreements of Lease, Purchase and Sale for the units in the proposed townhome:

"Purchasers/tenants are advised that, sound levels due to increasing roadway traffic will interfere with some activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment, Conservation and Parks.

To help address the need for sound attenuation this development has been designed with forced air heating and a provision for central air conditioning at the occupant`s discretion. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound levels limits of the city and the Ministry of the Environment, Conservation and Parks.

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,

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GWE18-145 - Environmental Noise

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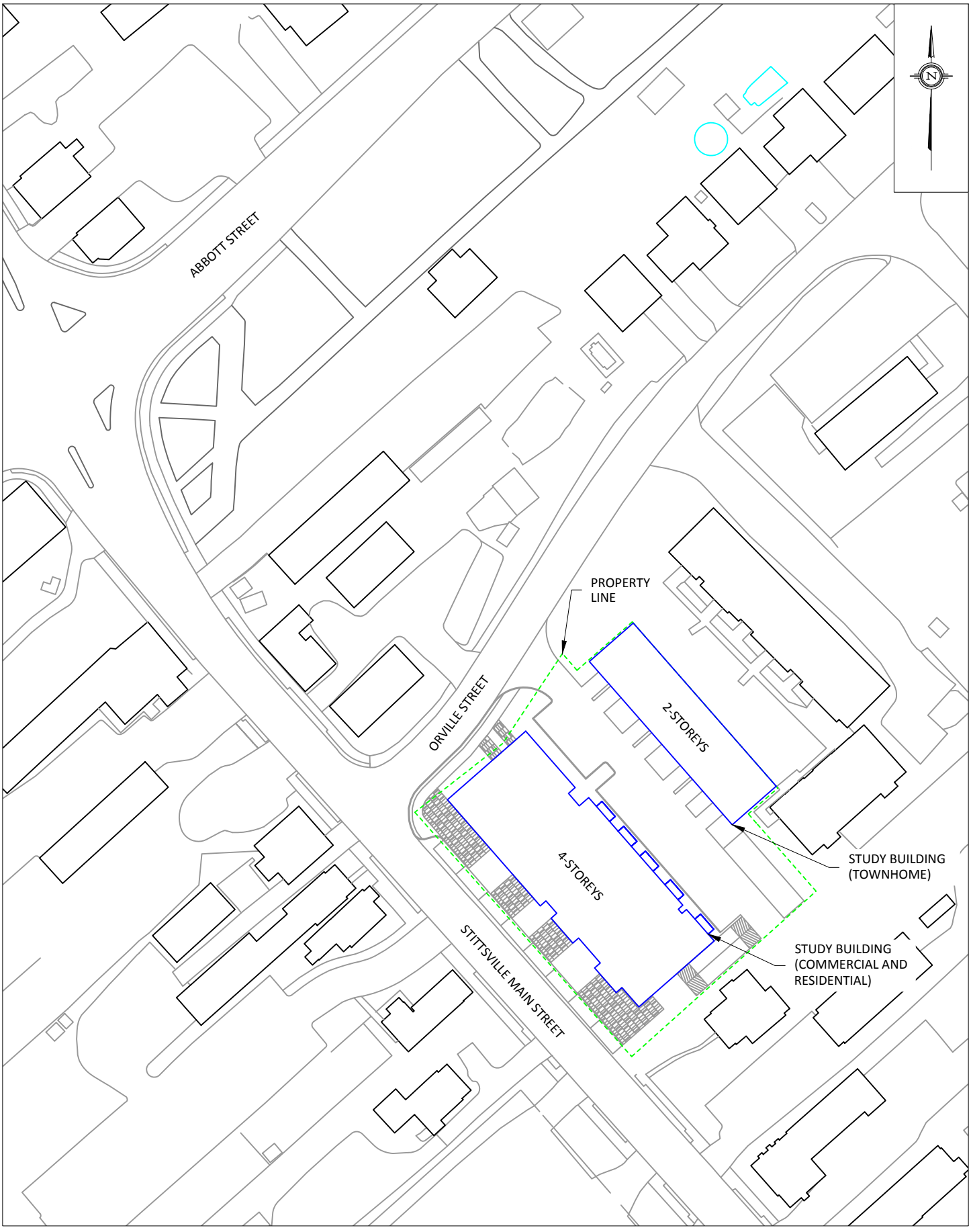

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PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018
DRAWN BY	G.G.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

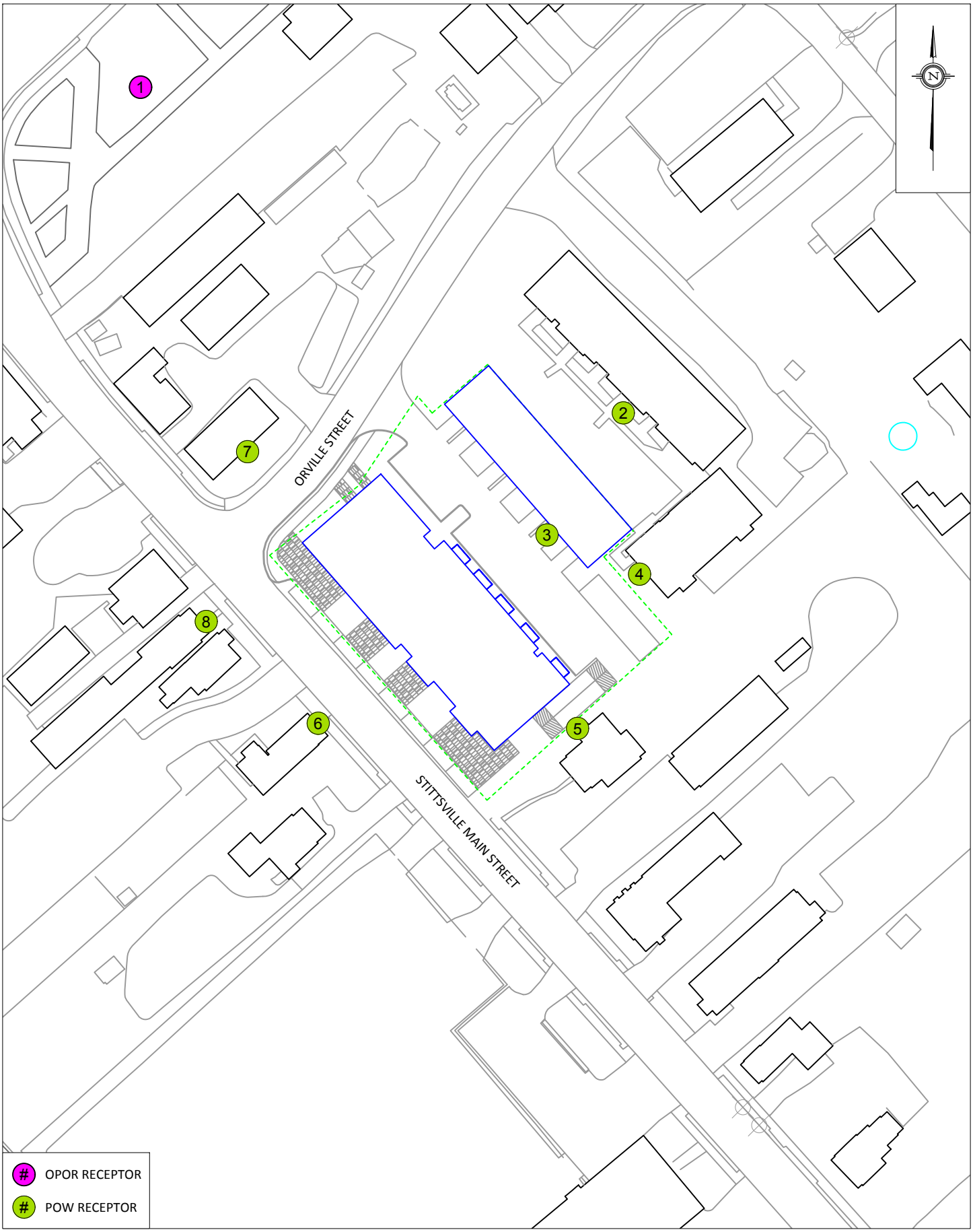

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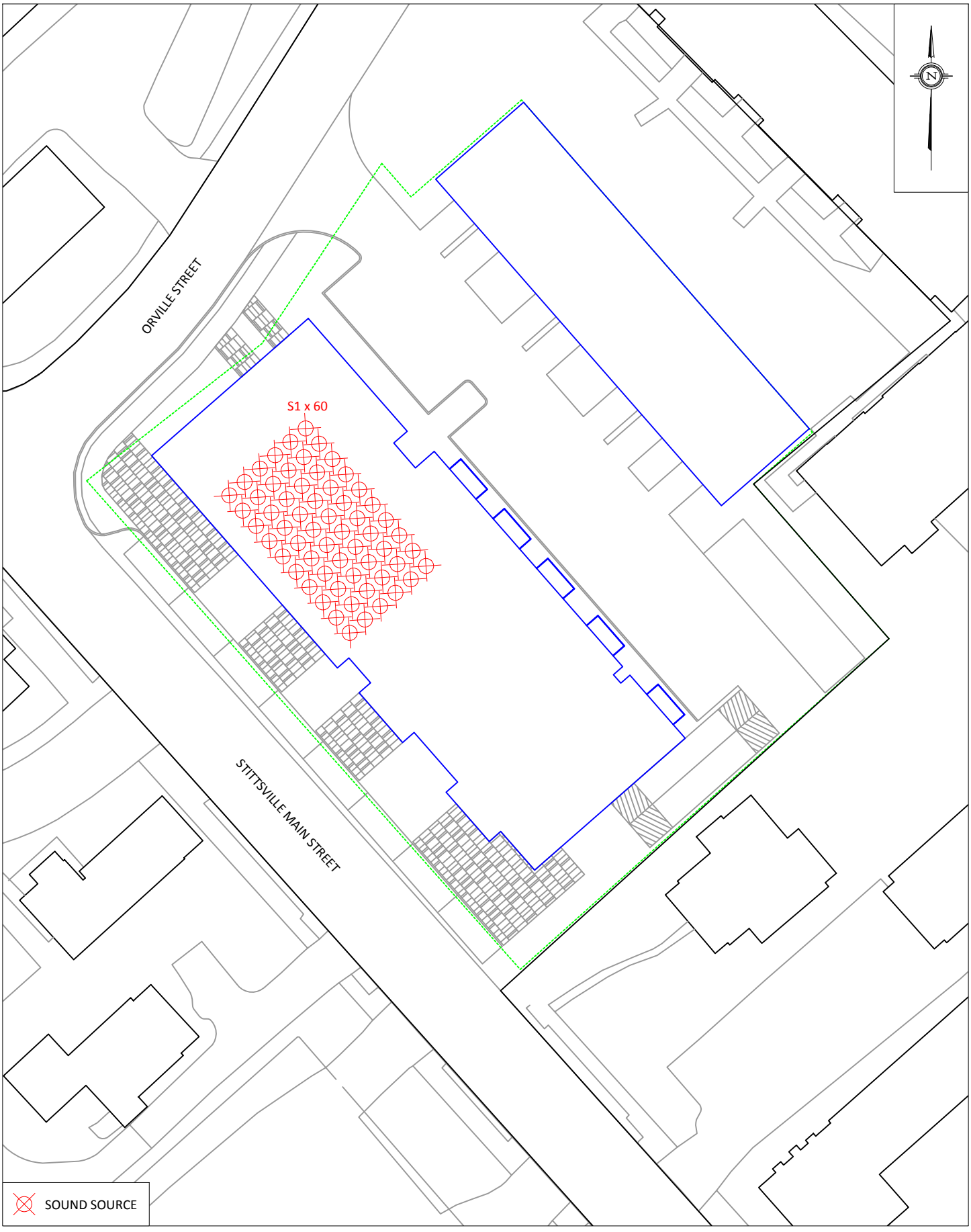
FIGURE 2:
STATIONARY NOISE RECEPTOR LOCATIONS



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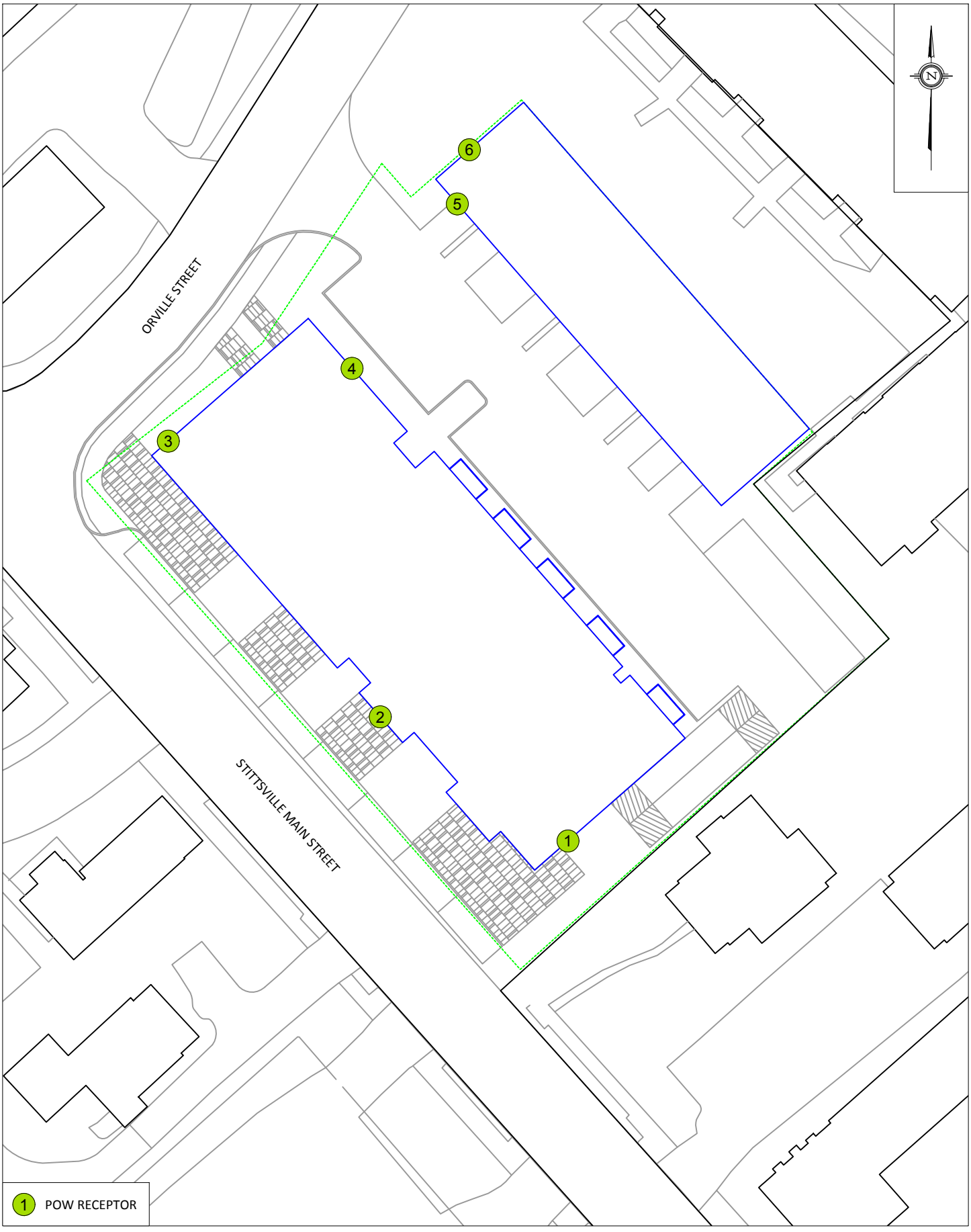
DESCRIPTION

FIGURE 3:
STATIONARY SOUND SOURCE LOCATION



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DESCRIPTION

FIGURE 4:
TRAFFIC NOISE RECEPTOR LOCATIONS

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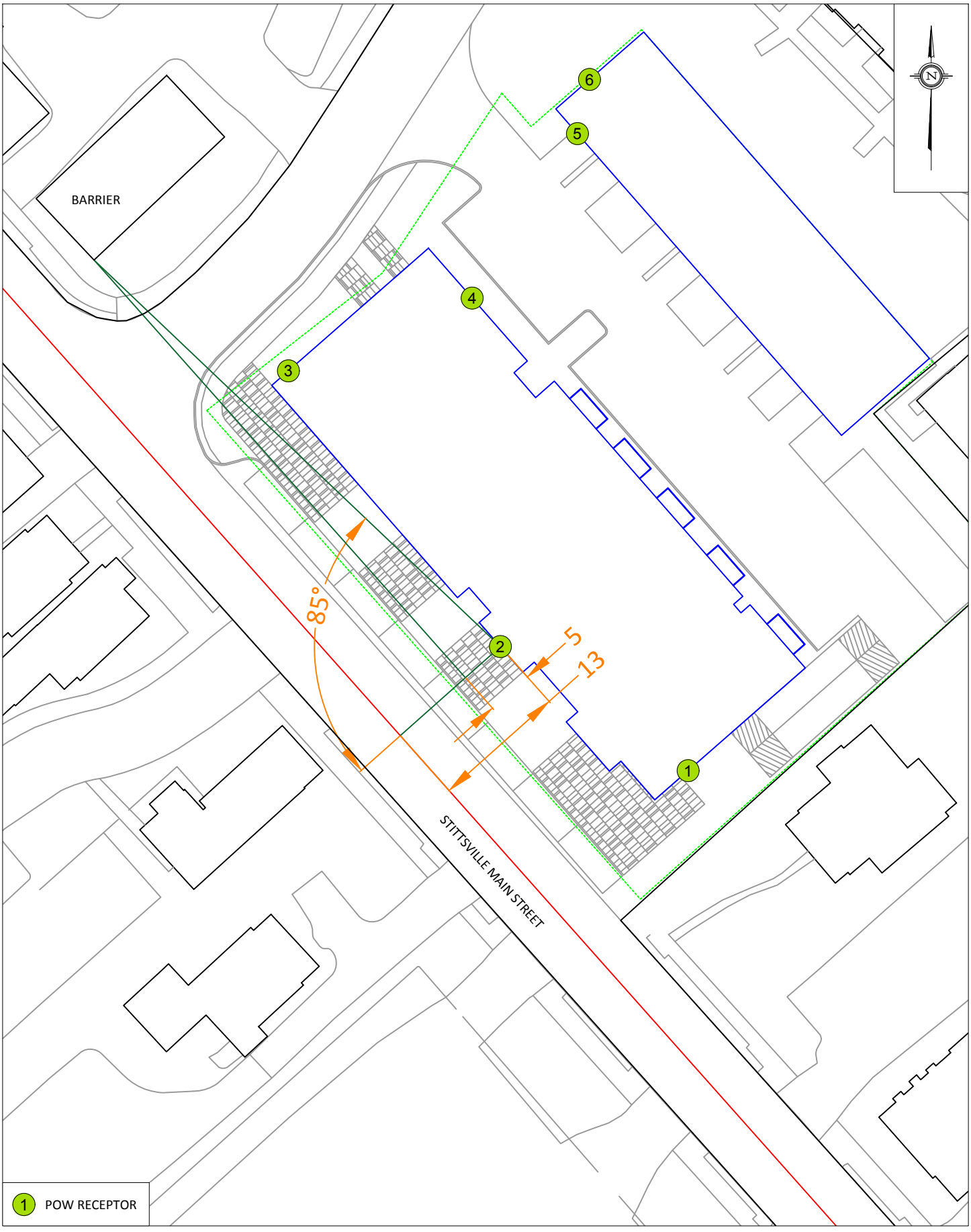
FIGURE 5:
RECEPTOR 1 STAMSON INPUT



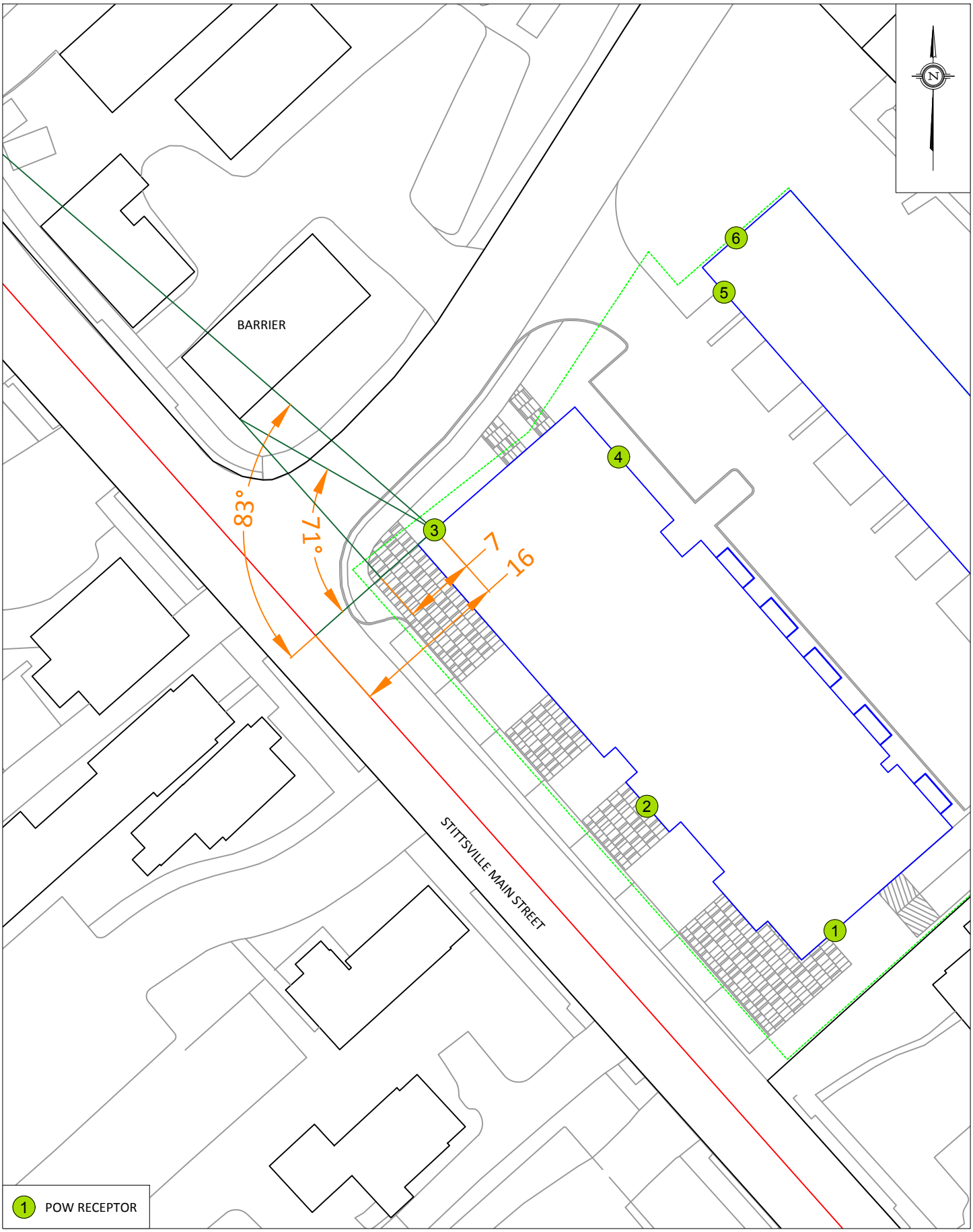
127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY		
SCALE	1:500 (APPROX.)	DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018	DRAWN BY	G.G.

DESCRIPTION

FIGURE 6:
RECEPTOR 2 STAMSON INPUT



GRADIENT WIND ENGINEERING INC
127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018
DRAWN BY	G.G.
DESCRIPTION	FIGURE 7: RECEPTOR 3 STAMSON INPUT

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018	DRAWN BY	G.G.

DESCRIPTION

FIGURE 8:
RECEPTOR 4 STAMSON INPUT

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018	DRAWN BY	G.G.

DESCRIPTION

FIGURE 9:
RECEPTOR 5 STAMSON INPUT

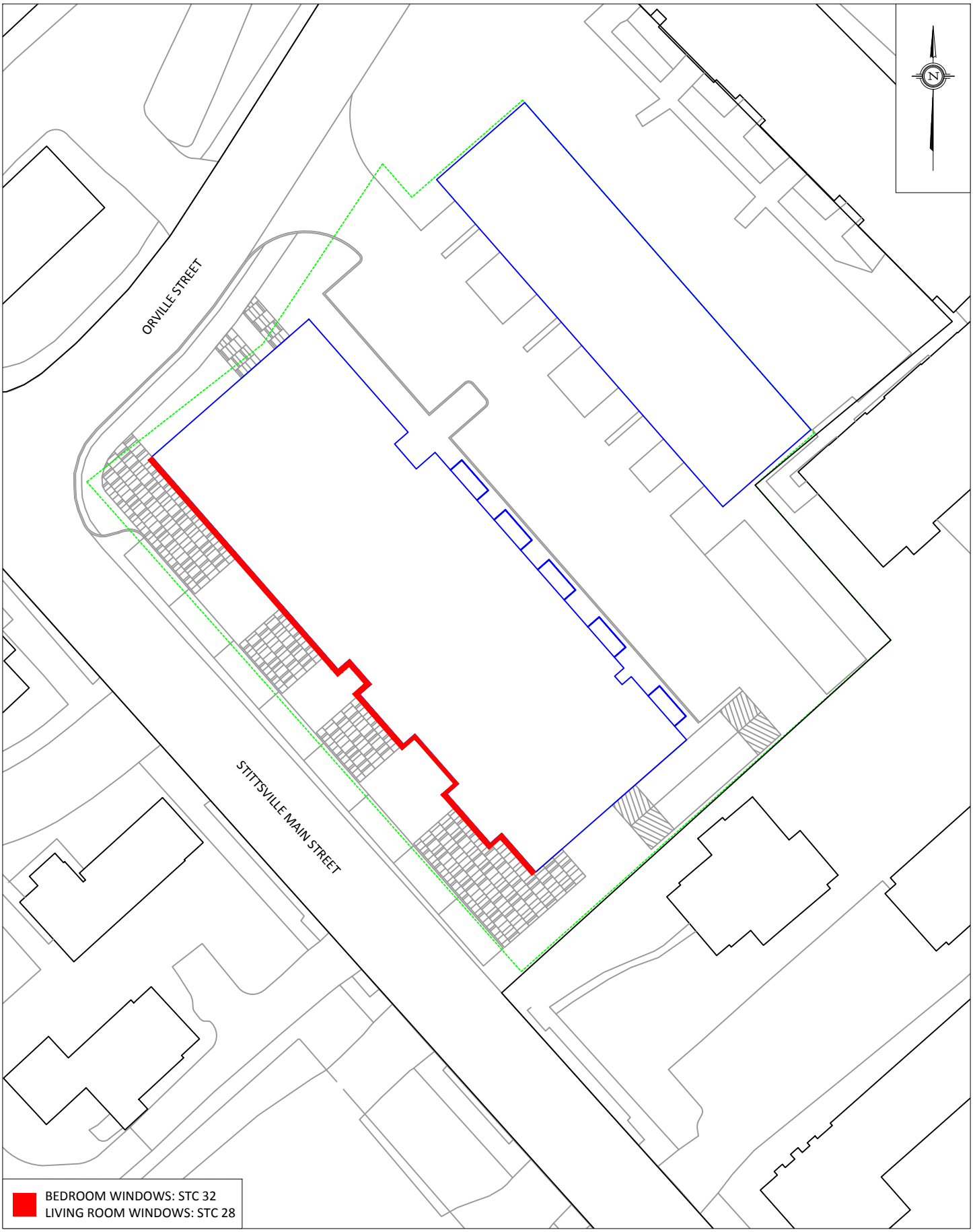
127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018
DRAWN BY	G.G.

DESCRIPTION

FIGURE 10:
RECEPTOR 6 STAMSON INPUT



GRADIENT WIND ENGINEERING INC
127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

PROJECT	1531, 1539 STITTSVILLE MAIN STREET - ENVIRONMENTAL NOISE STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE18-128
DATE	NOVEMBER 1, 2018
DRAWN BY	G.G.

DESCRIPTION

FIGURE 11:
BEDROOM AND LIVING ROOM STC REQUIREMENTS

APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 15:38:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Stitts MS (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   0.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  19.00 / 19.00  m
Receiver height           :  10.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -90.00 deg   Angle2 : -77.00 deg
Barrier height            :   9.00 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: Stitts MS (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 !       10.50 !        6.23 !         6.23

ROAD (0.00 + 48.58 + 63.77) = 63.90 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -77   0.00  68.48   0.00  -1.03 -11.41   0.00   0.00  -7.46
48.58
-------------------------------------------------------------------------------
--
   -77      0   0.00  68.48   0.00  -1.03  -3.69   0.00   0.00   0.00
63.77
-------------------------------------------------------------------------------
--

Segment Leq : 63.90 dBA

Total Leq All Segments: 63.90 dBA
```

```
Results segment # 1: Stitts MS (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 !        4.50 !        3.08 !         3.08

ROAD (0.00 + 36.88 + 56.17) = 56.22 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90    -77   0.00  60.88   0.00  -1.03 -11.41   0.00   0.00 -11.57
36.88
-------------------------------------------------------------------------------
--
   -77      0   0.00  60.88   0.00  -1.03  -3.69   0.00   0.00   0.00
56.17
-------------------------------------------------------------------------------
--

Segment Leq : 56.22 dBA

Total Leq All Segments: 56.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.90
                           (NIGHT): 56.22
#
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 15:43:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Stitts MS (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  15.00 / 15.00  m
Receiver height           :  10.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  85.00 deg   Angle2 : 90.00 deg
Barrier height            :   8.00 m
Barrier receiver distance :   5.00 / 5.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

#
```

```
Results segment # 1: Stitts MS (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 !       10.50 !        7.50 !         7.50

ROAD (68.36 + 47.86 + 0.00) = 68.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     85   0.00  68.48   0.00   0.00  -0.12   0.00   0.00   0.00
68.36
-------------------------------------------------------------------------------
--
    85     90   0.00  68.48   0.00   0.00 -15.56   0.00   0.00  -5.06
47.86
-------------------------------------------------------------------------------
--

Segment Leq : 68.40 dBA

Total Leq All Segments: 68.40 dBA

#
```

```
Results segment # 1: Stitts MS (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 !        4.50 !        3.50 !         3.50

ROAD (60.76 + 36.74 + 0.00) = 60.78 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
   -90     85   0.00  60.88   0.00   0.00  -0.12   0.00   0.00   0.00
60.76
-------------------------------------------------------------------------------
--
    85     90   0.00  60.88   0.00   0.00 -15.56   0.00   0.00  -8.58
36.74
-------------------------------------------------------------------------------
--

Segment Leq : 60.78 dBA

Total Leq All Segments: 60.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.40
                           (NIGHT): 60.78
#
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 15:47:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Stitts MS (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   83.00 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           :  10.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  71.00 deg   Angle2 : 83.00 deg
Barrier height            :   9.00 m
Barrier receiver distance :   7.00 / 7.00   m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

#
```

```
Results segment # 1: Stitts MS (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 !       10.50 !        6.56 !         6.56

ROAD (64.16 + 47.35 + 0.00) = 64.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     71   0.00  68.48   0.00  -0.28  -4.04   0.00   0.00   0.00
64.16
-------------------------------------------------------------------------------
--
    71     83   0.00  68.48   0.00  -0.28 -11.76   0.00   0.00  -9.09
47.35
-------------------------------------------------------------------------------
--

Segment Leq : 64.25 dBA

Total Leq All Segments: 64.25 dBA

#
```

```
Results segment # 1: Stitts MS (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 !        4.50 !        3.19 !         3.19

ROAD (56.56 + 32.26 + 0.00) = 56.58 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     71   0.00  60.88   0.00  -0.28  -4.04   0.00   0.00   0.00
56.56
-------------------------------------------------------------------------------
--
    71     83   0.00  60.88   0.00  -0.28 -11.76   0.00   0.00 -16.58
32.26
-------------------------------------------------------------------------------
--

Segment Leq : 56.58 dBA

Total Leq All Segments: 56.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.25
                           (NIGHT): 56.58
#
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 15:53:22
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Abbott St (day/night)
----------------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  12000
    Percentage of Annual Growth        :   0.00
    Number of Years of Growth          :   0.00
    Medium Truck % of Total Volume     :   7.00
    Heavy Truck  % of Total Volume     :   5.00
    Day (16 hrs) % of Total Volume     :  92.00

Data for Segment # 1: Abbott St (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   46.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 120.00 / 120.00 m
Receiver height           :  10.50 / 4.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :   0.00 deg   Angle2 : 15.00 deg
Barrier height            :   6.00 m
Barrier receiver distance :  58.00 / 58.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

#
```

```
Results segment # 1: Abbott St (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 !       10.50 !        6.15 !         6.15

ROAD (0.00 + 44.15 + 47.04) = 48.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     15   0.03  67.51   0.00  -9.30 -10.79   0.00   0.00  -4.98
42.43*
     0     15   0.39  67.51   0.00 -12.55 -10.81   0.00   0.00   0.00
44.15
-------------------------------------------------------------------------------
--
    15     46   0.39  67.51   0.00 -12.55  -7.92   0.00   0.00   0.00
47.04
-------------------------------------------------------------------------------
--

 * Bright Zone !

Segment Leq : 48.84 dBA

Total Leq All Segments: 48.84 dBA

#
```

```
Results segment # 1: Abbott St (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 !        4.50 !        3.05 !         3.05

ROAD (0.00 + 28.30 + 37.69) = 38.16 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------------
--
     0     15   0.21  59.91   0.00 -10.93 -10.80   0.00   0.00  -9.88
28.30
-------------------------------------------------------------------------------
--
    15     46   0.57  59.91   0.00 -14.18  -8.04   0.00   0.00   0.00
37.69
-------------------------------------------------------------------------------
--

Segment Leq : 38.16 dBA

Total Leq All Segments: 38.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.84
                           (NIGHT): 38.16
#
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 16:10:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Stitts MS (day/night)
--------------------------------------------
Angle1   Angle2           : -90.00 deg   67.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      2 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  52.00 / 52.00  m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#
```

```
Results segment # 1: Stitts MS (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.96 + 0.00) = 58.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     67   0.00  68.48   0.00  -5.40  -0.59   0.00  -3.53   0.00
58.96
-------------------------------------------------------------------------
--

Segment Leq : 58.96 dBA

Total Leq All Segments: 58.96 dBA

Results segment # 1: Stitts MS (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 54.89 + 0.00) = 54.89 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
   -90     67   0.00  60.88   0.00  -5.40  -0.59   0.00   0.00   0.00
54.89
-------------------------------------------------------------------------
--

Segment Leq : 54.89 dBA

Total Leq All Segments: 54.89 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.96
                           (NIGHT): 54.89
#
```

```
STAMSON 5.0        NORMAL REPORT        Date: 25-10-2018 16:15:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: Stitts MS (day/night)
--------------------------------------------
Angle1   Angle2           :   0.00 deg   65.00 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           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

#
```

```
Road data, segment # 2: Abbott St (day/night)
-----------------------------------------
Car traffic volume  :  9715/845   veh/TimePeriod  *
Medium truck volume :   773/67    veh/TimePeriod  *
Heavy truck volume  :   552/48    veh/TimePeriod  *
Posted speed limit  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  12000
    Percentage of Annual Growth         :   0.00
    Number of Years of Growth           :   0.00
    Medium Truck % of Total Volume      :   7.00
    Heavy Truck  % of Total Volume      :   5.00
    Day (16 hrs) % of Total Volume      :  92.00

Data for Segment # 2: Abbott St (day/night)
-------------------------------------------
Angle1   Angle2           :  -7.00 deg   38.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 111.00 / 111.00 m
Receiver height           :   4.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Stitts MS (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 58.26 + 0.00) = 58.26 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     65   0.00  68.48   0.00  -5.80  -4.42   0.00   0.00   0.00
58.26
-------------------------------------------------------------------------
--

Segment Leq : 58.26 dBA

#
```

```
Results segment # 2: Abbott St (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -7     38   0.57  67.51   0.00 -13.65  -6.18   0.00   0.00   0.00
47.68
-------------------------------------------------------------------------
--

Segment Leq : 47.68 dBA

Total Leq All Segments: 58.62 dBA

Results segment # 1: Stitts MS (night)
--------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.66 + 0.00) = 50.66 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
     0     65   0.00  60.88   0.00  -5.80  -4.42   0.00   0.00   0.00
50.66
-------------------------------------------------------------------------
--

Segment Leq : 50.66 dBA

#
```

```
Results segment # 2: Abbott St (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 40.08 + 0.00) = 40.08 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj
SubLeq
-------------------------------------------------------------------------
--
    -7     38   0.57  59.91   0.00 -13.65  -6.18   0.00   0.00   0.00
40.08
-------------------------------------------------------------------------
--

Segment Leq : 40.08 dBA

Total Leq All Segments: 51.02 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.62
                           (NIGHT): 51.02
```