



October 2, 2018

Thanh Do
Susan D. Smith Architect
941 Merivale Road
Ottawa, ON, K1Z 6A1

Dear Mr. Do

Re: Roadway Traffic Noise Brief
3310 Leitrim Road, Ottawa
GWE File No.: 18-152 – Noise Brief

1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Susan D. Smith Architect (SDS) to undertake a roadway traffic noise brief for the proposed renovation and addition of the Hieu Giang Vietnamese Buddhist temple at 3310 Leitrim Road in Ottawa, Ontario. The project evolves converting an existing residential house into a place of worship with an addition to accommodate a congregational area. The existing house would continue to be used as a residence. The study was requested by the City of Ottawa, as the subject property is considered noise sensitive and is within 100 meters (m) of an arterial roadway, namely Leitrim Road. This roadway traffic noise brief summarizes the methodology, results and recommendations related to roadway traffic noise. GWE's scope of work involved assessing exterior noise levels generated by local roadway traffic to ensure that the development is designed with appropriate noise control measures to allow future occupants a comfortable indoor environment. The roadway traffic noise brief was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa¹ and Ministry of the Environment and Climate Change (MOECC)² guidelines. Our study was based

¹ City of Ottawa – Environmental Noise Control Guidelines, January 2016

² Ministry of the Environment and Climate Change (MOECC) – Environmental Noise Guideline, Publication NPC-300, August 2013

on architectural drawings provided by SDS and future traffic volumes corresponding to the City of Ottawa's Official Plan (OP). For this report, Project North is in the general direction as true north.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise brief is a proposed renovation and addition of the Hieu Giang Vietnamese Buddhist temple. The site is located south of Leitrim Road which is the only source of roadway traffic noise. The study site is surrounded by a recreational sports field to the East, baseball fields to the South, a recreational sports arena to the West and Leitrim Road to the North. North of Leitrim road lies agricultural lands. There are no plans of future expansion of this roadway under the City of Ottawa's Master Transportation Plan. The development is set back approximately 26 m from the center of Leitrim Road. Figure 1 illustrates a complete site plan with surrounding context.

3. OBJECTIVES

The main goals of this work are to: (i) calculate the future noise levels on the study building produced by local roadway traffic and (ii) ensure that exterior noise levels do not exceed the ENCG objective limit, as specified in Section 4.2.1 of this report.

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{eq} , provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings.

Predicted noise levels at the plane of window (POW) and outdoor living area (OLA) dictate the action required to achieve the recommended indoor and OLA sound levels, as specified in the ENCG. When noise levels at these areas exceed the ENCG objective limit of 55 dBA, specific outdoor, ventilation and Warning Clause requirements may apply. In addition, where noise levels exceed 65 dBA, upgraded building components must be designed to ensure indoor sound level limits can be met.

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 Plan³ 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 1 (below) summarizes the AADT values used for the roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Class	Speed Limit (km/h)	Official Plan AADT
Leitrim Road	2-RAU	60	10,000

³ City of Ottawa Transportation Master Plan, November 2013
 SDS Architects – 3310 Leitrim Road

4.2.3 Theoretical Roadway Traffic Noise Predictions

Noise predictions were performed with the aid of the MOECC computerized noise assessment program, STAMSON 5.04, for road analysis. Appendix A includes the STAMSON 5.04 input and output data and Figure 2 illustrates STAMSON 5.04 input data.

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise, and by using existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 1, theoretical noise predictions were based on the following parameters:

- Practitioners attend assembly held every Sunday from 9am to 1pm at the study building
- 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 intermediate ground surfaces based on the vegetated rural surroundings
- The study site was treated as having flat or gently sloping topography
- Blockage from the study building considered as a barrier
- Two noise receptors were strategically placed at the plane of window (POW) at the north and east façade, and one outdoor living area (OLA) receptor at the rear of the building to represent the rear yard /shrine area (Figure 1)
- Leitrim Road extends far beyond the 100m radius of each receiver before it intersects with another roadway or changes direction. Therefore, an exposure angle of -90 degrees and 90 degrees was used for receptor 1 and 3. An exposure angle of 0 degrees and 90 degrees was used for receptor 2

5. RESULTS AND CONCLUSIONS

The results of the roadway traffic noise calculations are summarized in Table 2 below. Appendix A includes a complete set of STAMSON 5.04 input and output data and Figure 2 illustrates STAMSON 5.04 input data.

TABLE 2: 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	1.5	Ground Level – Rear yard (OLA)	54	48
2	1.5	Ground Level – East Façade (POW)	57	50
3	1.5	Ground Level – North Façade (POW)	63	59

The results of the current study indicate that noise levels will range between 54 and 63 dBA during the daytime period (07:00-23:00) and between 48 and 59 dBA during the nighttime period (23:00-07:00). The highest noise levels occur along the building's north façade, which is nearest and most exposed to Leirtrim Road. Since noise exceed the ENCG objective limit of 55 dBA, the development will require forced air heating with provision for air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment. The following Warning Clause⁴ will also be placed on all Lease, Purchase and Sale Agreements, as summarized below:

"Purchasers/tenants are advised that sound levels due to increasing road traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the City of Ottawa and the Ministry of Environment

To help address the need for sound attenuation this development has been designed so as to provide an outdoor area and indoor environment that is within provincial guidelines.

Measures for sound attenuation include:

- *The outdoor amenity area has been orientated to the rear of the building to limit exposure to roadway noise*

To ensure that provincial sound level limits are not exceeded, it is important to maintain these sound attenuation features."

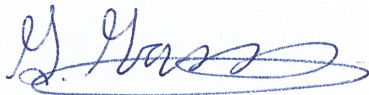
⁴ City of Ottawa Environmental Noise Control Guidelines, January 2016
SDS Architects – 3310 Leirtrim Road

This dwelling unit and place of worship has also been designed with the provisions for adding central air conditioning at the occupants' discretion. Installation of central air condition will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment.

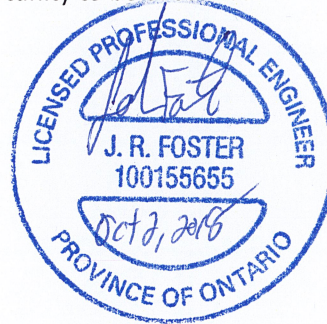
This concludes our assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

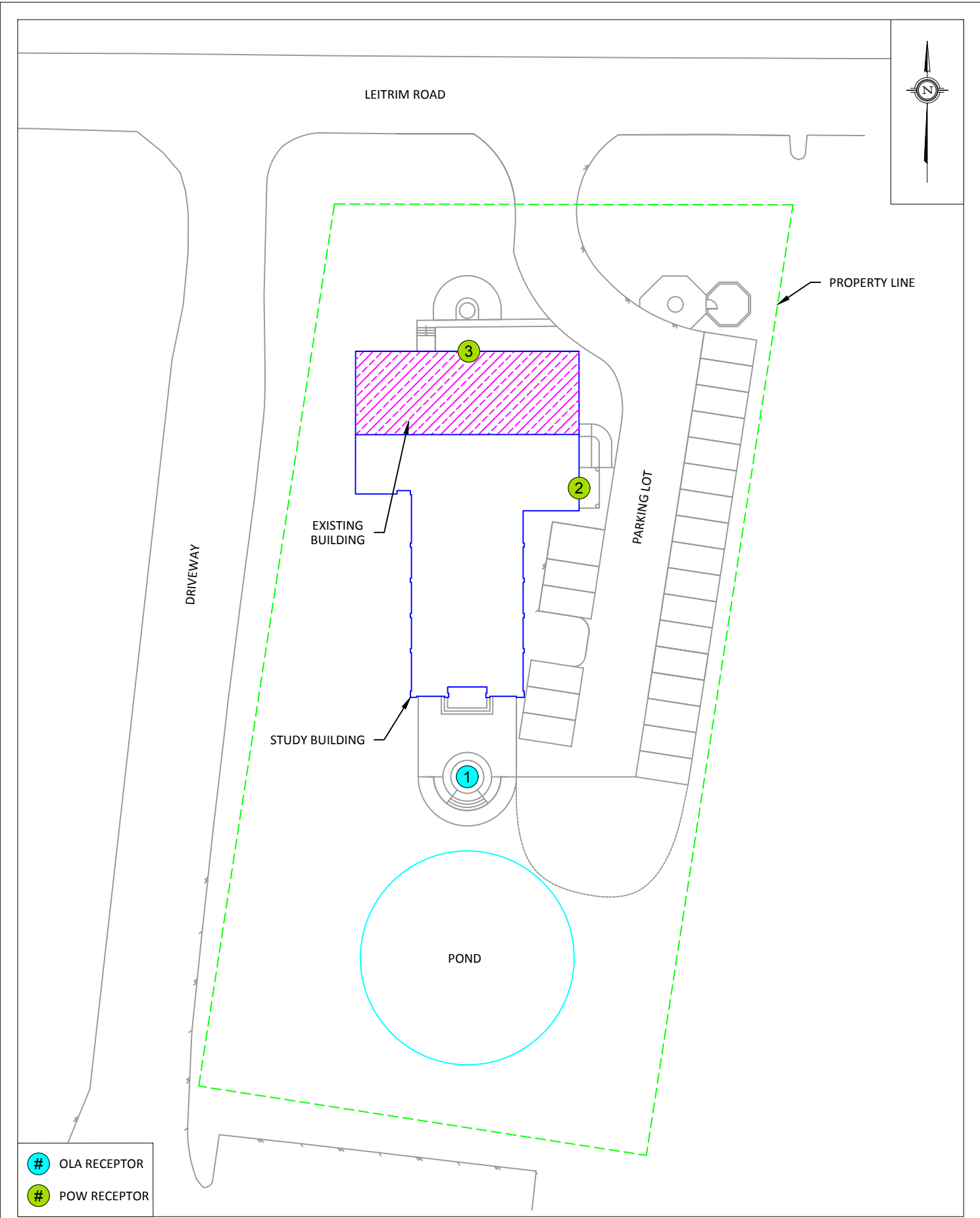
Gradient Wind Engineering Inc.

A handwritten signature in blue ink, appearing to read 'G. Garro', with a horizontal line underneath.

Giuseppe Garro, B.A.Sc.
Junior Environmental Scientist
GWE18-152 – Traffic Noise Brief



Joshua Foster, P.Eng.
Principal

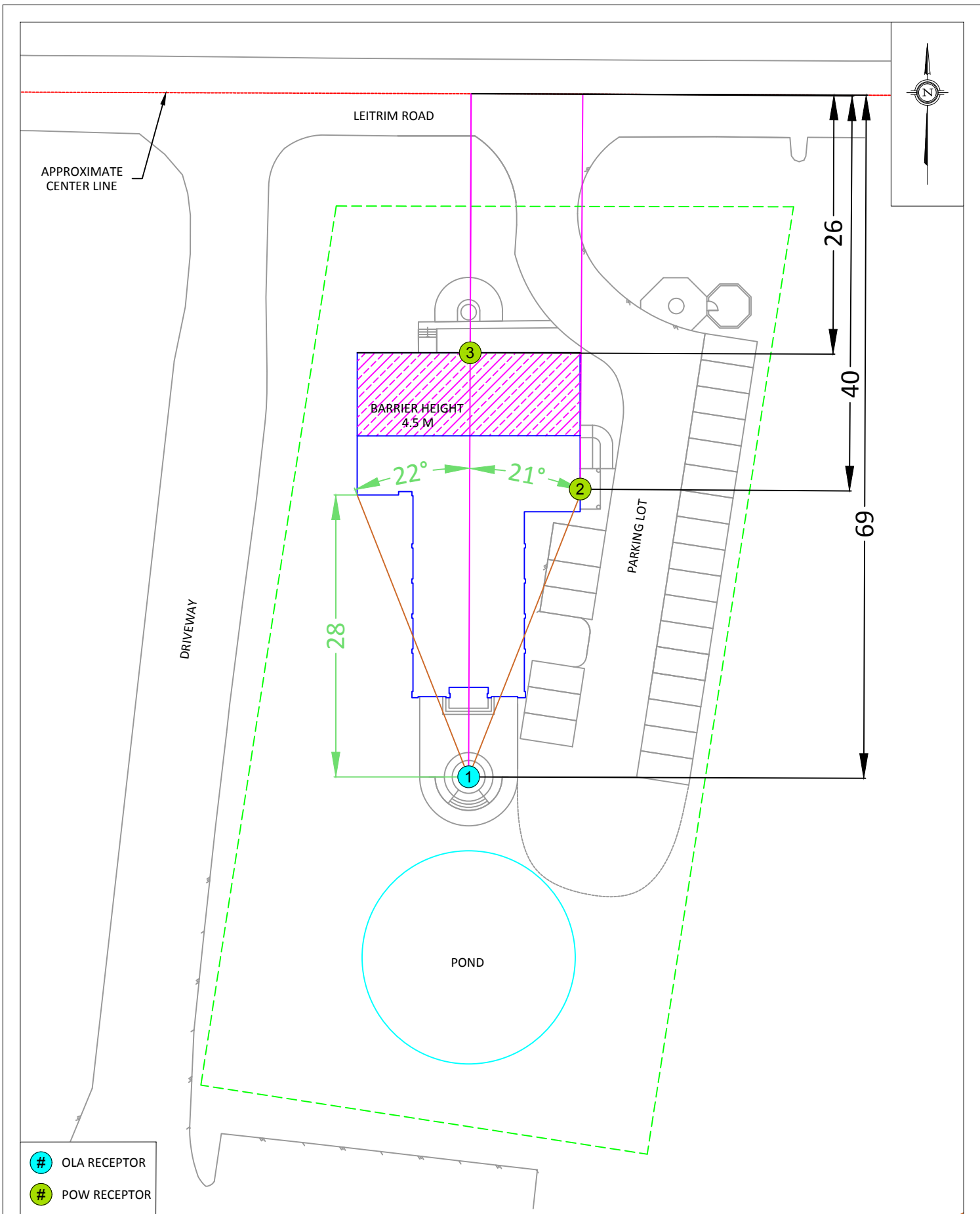


GRADIENTWIND
ENGINEERING INC

127 Walgreen Road
Ottawa, Ontario
(613) 836 0934

PROJECT	3310 LEITRIM ROAD- TRAFFIC NOISE BRIEF	
SCALE	1:500 (APPROX.)	DRAWING NO. GWE18-152
DATE	OCTOBER 1, 2018	DRAWN BY G.G.

DESCRIPTION	FIGURE 1: SITE PLAN, SURROUNDING CONTEXT, AND RECEPTOR LOCATIONS
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APPENDIX A

STAMSON 5.04 - INPUT AND OUTPUT DATA

STAMSON 5.0 NORMAL REPORT Date: 01-10-2018 12:34:34
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

```
-----
Car traffic volume   : 8096/704   veh/TimePeriod  *
Medium truck volume : 644/56    veh/TimePeriod  *
Heavy truck volume  : 460/40    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): 10000
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: Leitrim Rd (day/night)

```
-----
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth           : 0           (No woods.)
No of house rows     : 0 / 0
Surface              : 1           (Absorptive ground surface)
Receiver source distance : 68.90 / 68.90 m
Receiver height      : 1.50 / 4.50 m
Topography           : 2           (Flat/gentle slope; with barrier)
Barrier angle1       : -22.00 deg   Angle2 : 21.00 deg
Barrier height       : 4.50 m
Barrier receiver distance : 28.45 / 28.45 m
Source elevation     : 0.00 m
Receiver elevation   : 0.00 m
Barrier elevation    : 0.00 m
Reference angle      : 0.00
```

Results segment # 1: Leitrim Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

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

ROAD (51.00 + 40.73 + 51.09) = 54.25 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	-22	0.66	68.24	0.00	-10.99	-6.25	0.00	0.00	0.00
-22	21	0.39	68.24	0.00	-9.20	-6.26	0.00	0.00	-12.04
21	90	0.66	68.24	0.00	-10.99	-6.15	0.00	0.00	0.00

SubLeq

51.00

40.73

51.09

Segment Leq : 54.25 dBA

Total Leq All Segments: 54.25 dBA

Results segment # 1: Leitrim Rd (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	4.50	3.26	3.26

ROAD (44.22 + 38.77 + 44.31) = 47.85 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj
-90	-22	0.57	60.64	0.00	-10.40	-6.02	0.00	0.00	0.00
-22	21	0.30	60.64	0.00	-8.61	-6.25	0.00	0.00	-7.01
21	90	0.57	60.64	0.00	-10.40	-5.93	0.00	0.00	0.00

SubLeq

44.22

38.77

44.31

Segment Leq : 47.85 dBA

Total Leq All Segments: 47.85 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 54.25
(NIGHT): 47.85

STAMSON 5.0 NORMAL REPORT Date: 01-10-2018 12:36:45
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

```
-----
Car traffic volume   : 8096/704   veh/TimePeriod  *
Medium truck volume : 644/56    veh/TimePeriod  *
Heavy truck volume  : 460/40    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): 10000
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: Leitrim Rd (day/night)

```
-----
Angle1   Angle2      : 0.00 deg   90.00 deg
Wood depth : 0        (No woods.)
No of house rows : 0 / 0
Surface     : 1        (Absorptive ground surface)
Receiver source distance : 40.00 / 40.00 m
Receiver height : 1.50 / 4.50 m
Topography    : 1        (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Results segment # 1: Leitrim Rd (day)

Source height = 1.50 m

ROAD (0.00 + 56.73 + 0.00) = 56.73 dBA

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

--									
0	90	0.66	68.24	0.00	-7.04	-4.47	0.00	0.00	0.00
56.73									

--									

Segment Leq : 56.73 dBA

Total Leq All Segments: 56.73 dBA

Results segment # 1: Leitrim Rd (night)

Source height = 1.50 m

ROAD (0.00 + 49.66 + 0.00) = 49.66 dBA

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

--									
0	90	0.57	60.64	0.00	-6.66	-4.31	0.00	0.00	0.00
49.66									

--									

Segment Leq : 49.66 dBA

Total Leq All Segments: 49.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.73
(NIGHT): 49.66

STAMSON 5.0 NORMAL REPORT Date: 01-10-2018 12:37:37
 MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

```
-----
Car traffic volume   : 8096/704   veh/TimePeriod  *
Medium truck volume : 644/56    veh/TimePeriod  *
Heavy truck volume  : 460/40    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): 10000
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: Leitrim Rd (day/night)

```
-----
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth           : 0           (No woods.)
No of house rows     : 0 / 0
Surface              : 1           (Absorptive ground surface)
Receiver source distance : 26.13 / 15.00 m
Receiver height      : 1.50 / 4.50 m
Topography           : 1           (Flat/gentle slope; no barrier)
Reference angle      : 0.00
```

Results segment # 1: Leitrim Rd (day)

Source height = 1.50 m

ROAD (0.00 + 62.78 + 0.00) = 62.78 dBA

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

--

-90	90	0.66	68.24	0.00	-4.00	-1.46	0.00	0.00	0.00
62.78									

--

Segment Leq : 62.78 dBA

Total Leq All Segments: 62.78 dBA

Results segment # 1: Leitrim Rd (night)

Source height = 1.50 m

ROAD (0.00 + 59.34 + 0.00) = 59.34 dBA

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

--

-90	90	0.57	60.64	0.00	0.00	-1.30	0.00	0.00	0.00
59.34									

--

Segment Leq : 59.34 dBA

Total Leq All Segments: 59.34 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.78

(NIGHT): 59.34