

**ROADWAY TRAFFIC NOISE
FEASIBILITY ASSESSMENT**

Kanata North Community Design Plan
Ottawa, Ontario

REPORT: 18-069-Traffic Noise Feasibility



May 29, 2020

DRAFT

PREPARED FOR

Jean-Luc Rivard

Director of Land Development & Infrastructure

Brigil

98 Lois Street

Gatineau, QC

J8Y 3R7

PREPARED BY

Michael Lafortune, C.E.T., Environmental Scientist

Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes a roadway traffic noise feasibility assessment undertaken in support of a rezoning and draft plan of subdivision application for a proposed residential subdivision, referred to as Kanata North Community Design Plan (Kanata North CDP), located east of Marchbrook Circle, west of March Road, and north of Old Carp Road at 927 March Road in Ottawa, Ontario. The proposed Kanata North CDP subdivision comprises approximately 11 condominium blocks, 33 townhome units and 28 single-family units. As this is for a plan of subdivision, unit and blocks counts are subject to change. The study site is an irregular parcel of land with internal roadways connecting to the surrounding neighborhoods, considered as local streets. Major sources of noise impacting the site include roadway traffic along March Road to the east, several proposed collector roadways internal of the site, and minor influence from Old Carp Road to the south. The site is surrounded by existing low-rise residential properties to the east, south and west, with future residential land to the north. Figure 1 illustrates the site plan with surrounding context.

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) draft site plan drawings provided by Brigil.

Results of the roadway traffic noise calculations indicated that the 9-storey blocks adjacent to March Road (dark red area in contours) will require upgraded building components and air conditioning to allow windows to remain closed while maintaining a comfortable indoor environment. All other blocks (red and orange areas in contours) will require forced air heating with provision for air conditioning (see Figure 3). Results of the roadway traffic noise calculations also indicate that outdoor living areas on blocks adjacent to and having direct exposure to March Road will likely require noise control measures. These measures are briefly described in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically, and administratively feasible. A detailed roadway traffic noise study will be required at the time of subdivision registration to determine specific noise control measures for the development. Warning Clauses will also be required on purchase, sale, and lease agreements. Specific mitigation will be determined during the detailed design assessment.



TABLE OF CONTENTS

1. INTRODUCTION 1

2. TERMS OF REFERENCE 1

3. OBJECTIVES 2

4. METHODOLOGY..... 2

4.1 Background..... 2

4.2 Roadway Traffic Noise 2

4.2.1 Criteria for Roadway Traffic Noise 2

4.2.2 Theoretical Roadway Noise Predictions 3

4.2.3 Roadway Traffic Volumes 4

5. RESULTS AND DISCUSSION 4

5.1 Roadway Traffic Noise Levels 4

5.2 Noise Control Measures 5

6. CONCLUSIONS AND RECOMMENDATIONS..... 6

FIGURES

APPENDICES

Appendix A – STAMSON 5.04 Input and Output Data and Supporting Information



1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Brigil to undertake a roadway traffic noise feasibility assessment in support of a rezoning and draft plan of subdivision application for a proposed residential subdivision, referred to as Kanata North Community Design Plan (Kanata North CDP), located east of Marchbrook Circle, west of March Road, and north of Old Carp Road at 927 March Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to a roadway traffic noise feasibility assessment and was prepared in consideration of the client's draft plan of subdivision application. Gradient Wind's scope of work involved assessing exterior noise levels throughout the site, generated by local roadway traffic.

The assessment was performed on the basis of theoretical noise calculation methods conforming to the City of Ottawa¹ and Ministry of the Environment, Conservation and Parks (MECP)² guidelines. Noise calculations were based on draft site plan drawings provided by Brigil, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed Kanata North CDP subdivision comprises approximately 11 condominium blocks, 33 townhome units and 28 single-family units. As this is for a plan of subdivision, unit and blocks counts are subject to change. The study site is an irregular parcel of land with internal roadways connecting to the surrounding neighborhoods, considered as local streets. Major sources of noise impacting the site include roadway traffic along March Road to the east, several proposed collector roadways internal of the site, and minor influence from Old Carp Road to the south. The site is surrounded by existing low-rise residential properties to the east, south and west, with future residential land to the north. Figure 1 illustrates the site plan with surrounding context.

¹ City of Ottawa Environmental Noise Control Guidelines, January 2016

² Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

3. OBJECTIVES

The principal objective of this work is to calculate the future noise levels on the study site produced by local roadway traffic and explore potential for noise mitigation where required, noise calculations are based on initial concept plan provided by Brigil, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

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 surface roadway traffic noise, 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 Outdoor Living Area (OLA) noise limit is 55 dBA during the daytime period. OLA do not need to be considered during the nighttime period.



Predicted noise levels at the OLA dictate the action required to achieve the recommended sound levels. According to the ENCG, if an area is to be used as an OLA, noise control measures are required to reduce the L_{eq} to 55 dBA. This is typically done with noise control measures outlined in Section 5.2. When noise levels at these areas exceed the criteria, specific Warning Clause requirements may apply. As this is a preliminary assessment, noise control recommendations are of a general nature. Specific mitigation requirements would be the work of a future study.

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were determined by computer modelling using two programs. To provide a general sense of noise across the site, the employed software program was Predictor-Lima (TNM calculation), which incorporates the United States Federal Highway Administration's (FHWA) Transportation Noise Model (TNM) 2.5. This computer program is capable of representing three-dimensional surface and first reflections of sound waves over a suitable spectrum for human hearing. A receptor grid with 5 × 5 m spacing was placed across the study site, along with a number of discrete receptors at key sensitive areas.

Although this program outputs noise contours, it is not the approved model for roadway predictions by the City of Ottawa. Therefore, the results were confirmed by performing discrete noise calculations with the Ministry of the Environment, Conservations and Parks (MECP) computerized noise assessment program, STAMSON 5.04, at key receptor locations coinciding with receptor locations in Predictor as shown in Figure 2, as well as receptor distances. 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. In addition to the traffic volumes summarized in Table 1 below, 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.
- Receptor heights taken to be 7.5 m above grade, representative of a third-floor window.
- Absorptive and reflective intermediate ground surfaces based on specific source-receiver path ground characteristics.

- The study site was treated as having flat or gently sloping topography.
- Three receptors were strategically placed throughout the study area.
- Receptor distances and exposure angles are illustrated in Figure 2.

4.2.3 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 provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 1 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Roadway	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
March Road	4-UAD	80	35,000
Old Carp Road	2-UCU	40	8,000
Proposed Internal Collectors	2-UCU	40	8,000

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations for the daytime period, covering the entire study site, are shown in Figure 4-7 at ground level and 7.5 m above grade. Discrete receptors were also placed at key locations throughout the site. The noise contours were generated using TNM and verified with discrete receptors using STAMSON 5.04, as shown in Figure 2, and summarized in Table 2 below. Appendix A contains the complete set of input and output data from all STAMSON 5.04 calculations.

³ City of Ottawa Transportation Master Plan, November 2013



TABLE 2: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)		Predictor-Lima Noise Level (dBA)	
			Day	Night	Day	Night
1	7.5	POW – 9-Storey Block	71	63	71	64
2	7.5	POW – 6-Storey Block	64	56	65	58
3	7.5	POW – 4-Storey Block	64	56	62	55

As shown above, the results calculated from TNM have good correlation with calculations performed in STAMSON 5.04. A tolerance of 3 dBA between models is generally considered acceptable given human hearing cannot detect a change in sound level of less than 3 dBA. Results of the roadway traffic noise calculations indicated that the 9-storey blocks adjacent to March Road (dark red area in contours) will require upgraded building components and air conditioning to allow windows to remain closed while maintaining a comfortable indoor environment. All other blocks (red and orange areas in contours) will require forced air heating with provision for air conditioning (see Figure 3). Results of the roadway traffic noise calculations also indicate that outdoor living areas on blocks adjacent to and having direct exposure to March Road will likely require noise control measures. These measures are briefly described in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically and administratively feasible. A detailed roadway traffic noise study will be required at the time of subdivision registration to determine specific noise control measures for the development. Warning Clauses will also be required on purchase, sale, and lease agreements. Specific mitigation will be determined during the detailed design assessment.

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic, at a number of receptors, exceed the criteria listed in the ENCG for outdoor living areas, as discussed in Section 4.2. Therefore, noise control measures as described below, subscribing to Table 2.3a in the ENCG and listed in order of preference, will be required to reduce the L_{eq} to 55 dBA:



- Distance setback with soft ground
- Insertion of noise insensitive land uses between the source and sensitive points of reception
- Orientation of buildings to provide sheltered zones in rear yards
- Shared outdoor amenity areas
- Earth berms (sound barriers)
- Acoustic barriers

6. CONCLUSIONS AND RECOMMENDATIONS

Results of the roadway traffic noise calculations indicated that the 9-storey blocks adjacent to March Road (dark red area in contours) will require upgraded building components and air conditioning to allow windows to remain closed while maintaining a comfortable indoor environment. All other blocks (red and orange areas in contours) will require forced air heating with provision for air conditioning (see Figure 3). Results of the roadway traffic noise calculations also indicate that outdoor living areas on blocks adjacent to and having direct exposure to March Road will likely require noise control measures. These measures are briefly described in Section 5.2, with the aim to reduce the L_{eq} to as close to 55 dBA as technically, economically, and administratively feasible. A detailed roadway traffic noise study will be required at the time of subdivision registration to determine specific noise control measures for the development. Warning Clauses will also be required on purchase, sale, and lease agreements. Specific mitigation will be determined during the detailed design assessment.

This concludes our traffic noise 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.

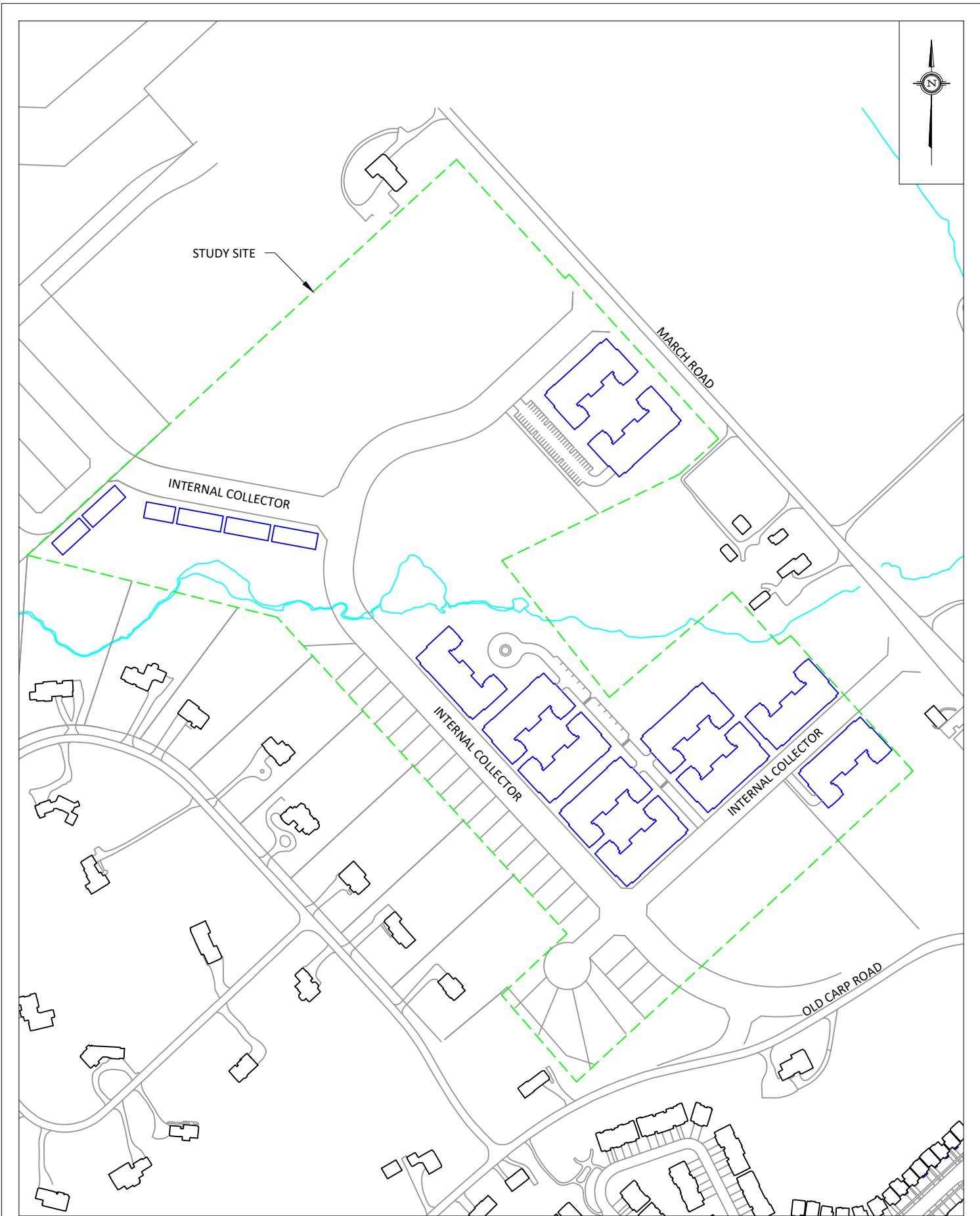
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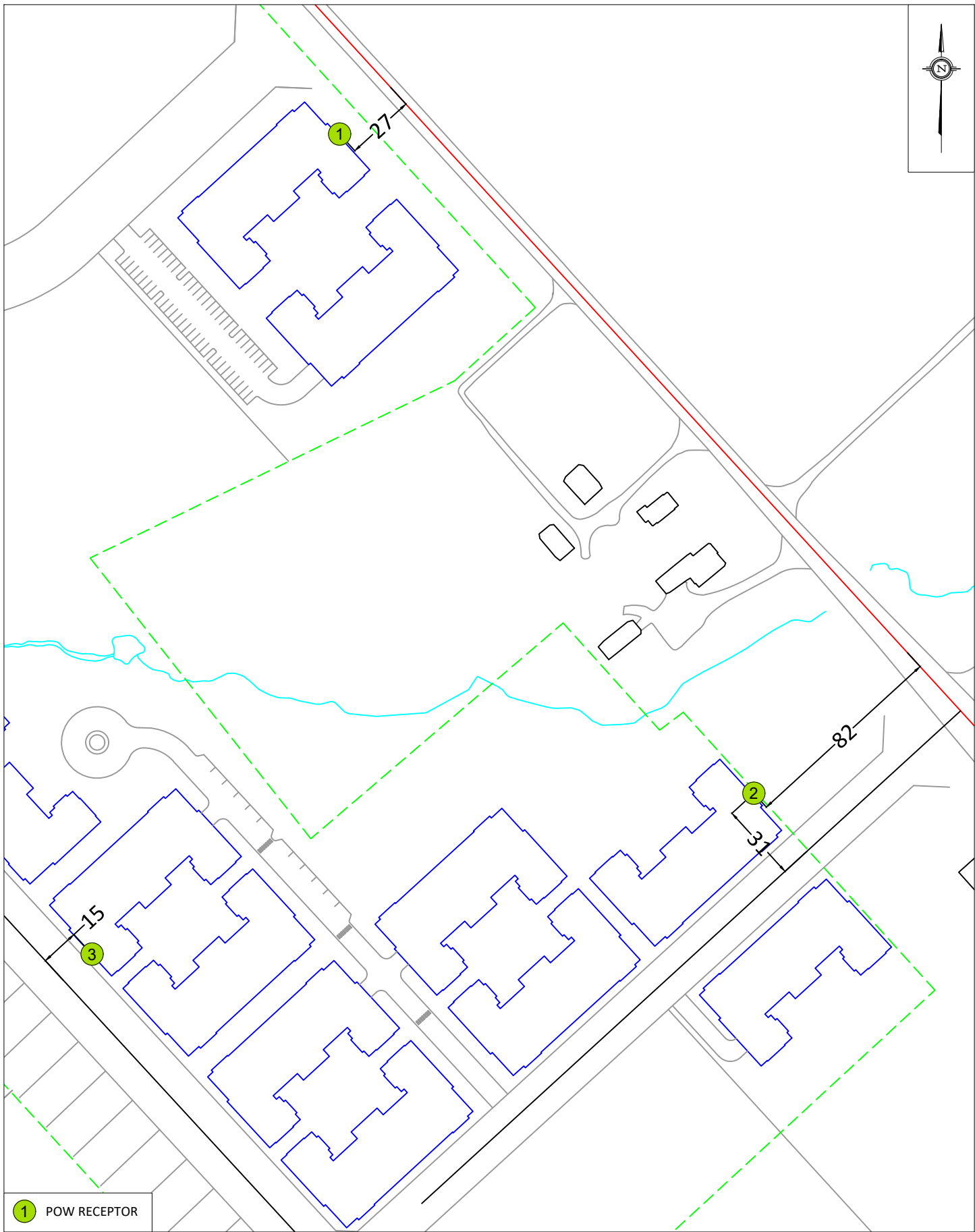
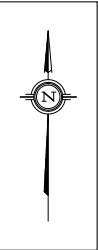
Michael Lafortune, C.E.T.
Environmental Scientist

Joshua Foster, P.Eng.
Principal

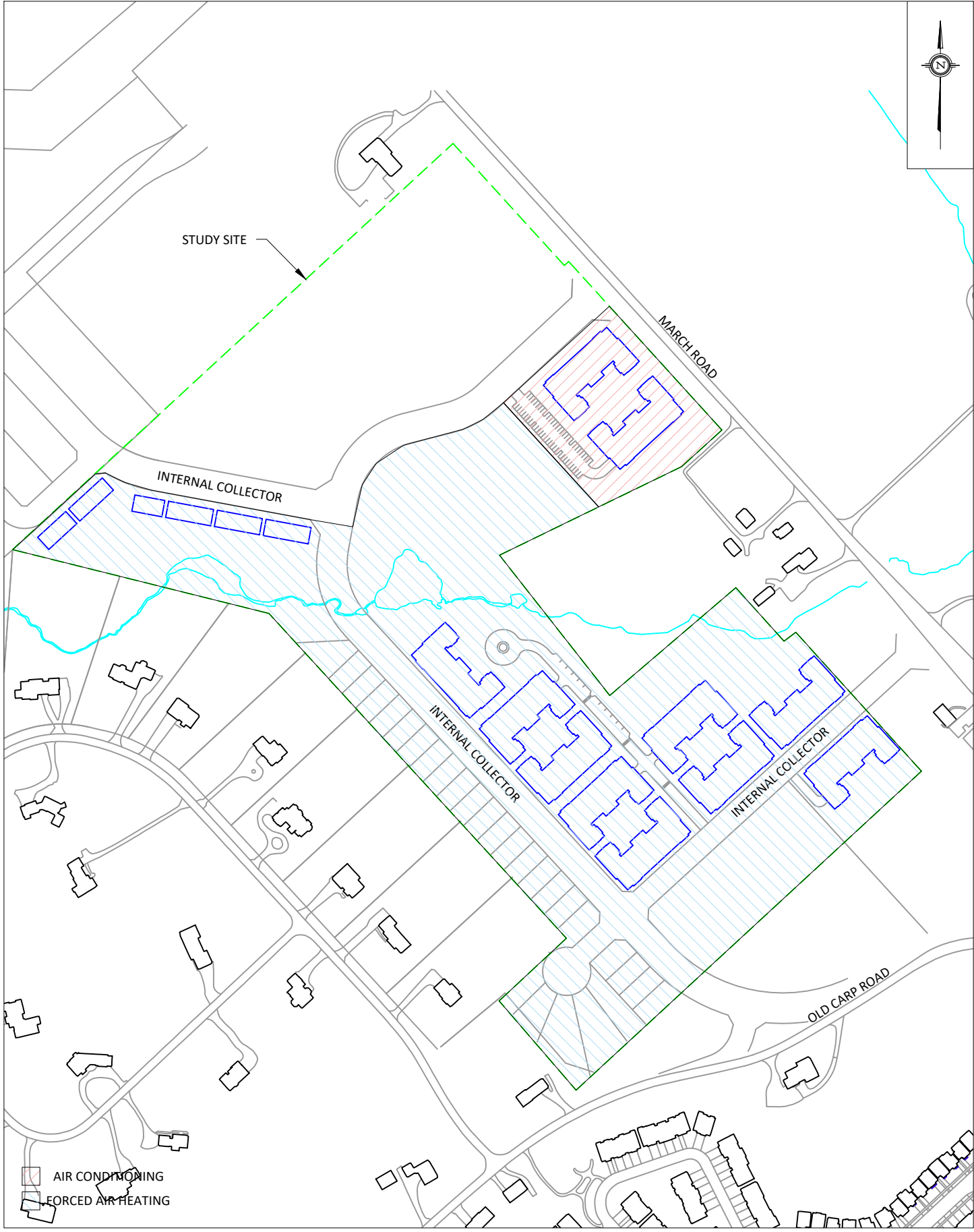
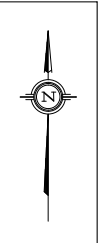
Gradient Wind File #18-069-Traffic Noise Feasibility







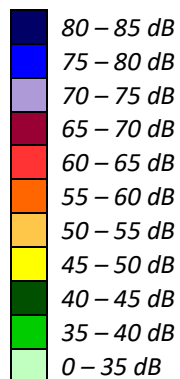
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SCALE	1:2000 (APPROX.)	DRAWING NO. GW18-069-2
DATE	APRIL 28, 2020	DRAWN BY M.L.



PROJECT	KANATA NORTH COMMUNITY DESIGN PLAN, KANATA ROADWAY TRAFFIC NOISE FEASIBILITY ASSESSMENT	
SCALE	1:4000 (APPROX.)	DRAWING NO. GW18-069-3
DATE	MAY 29, 2020	DRAWN BY M.L.



FIGURE 4: GROUND LEVEL NOISE CONTOURS FOR THE SITE (DAYTIME PERIOD)



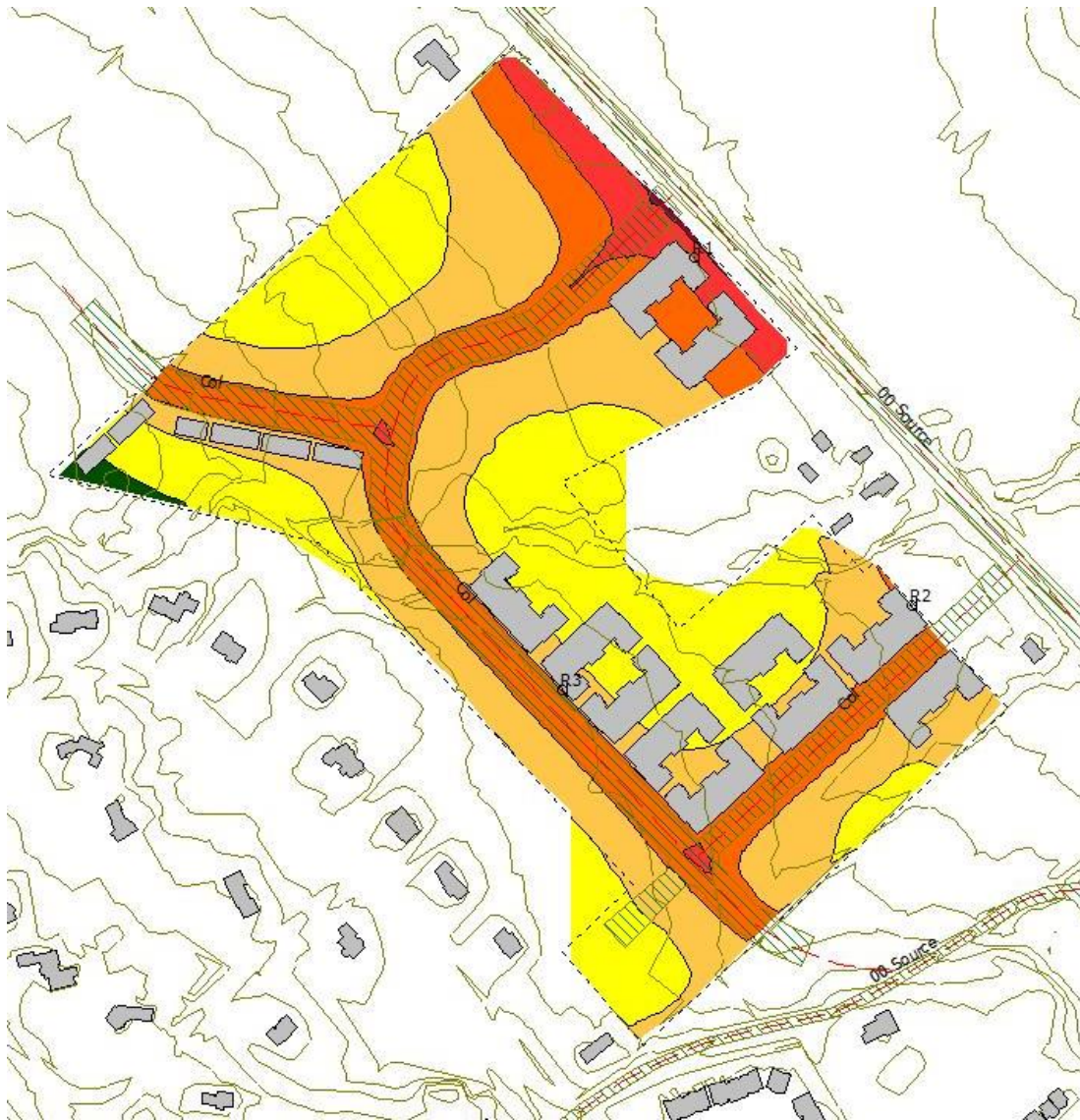
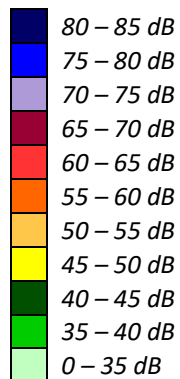


FIGURE 5: GROUND LEVEL NOISE CONTOURS FOR THE SITE (NIGHTTIME PERIOD)



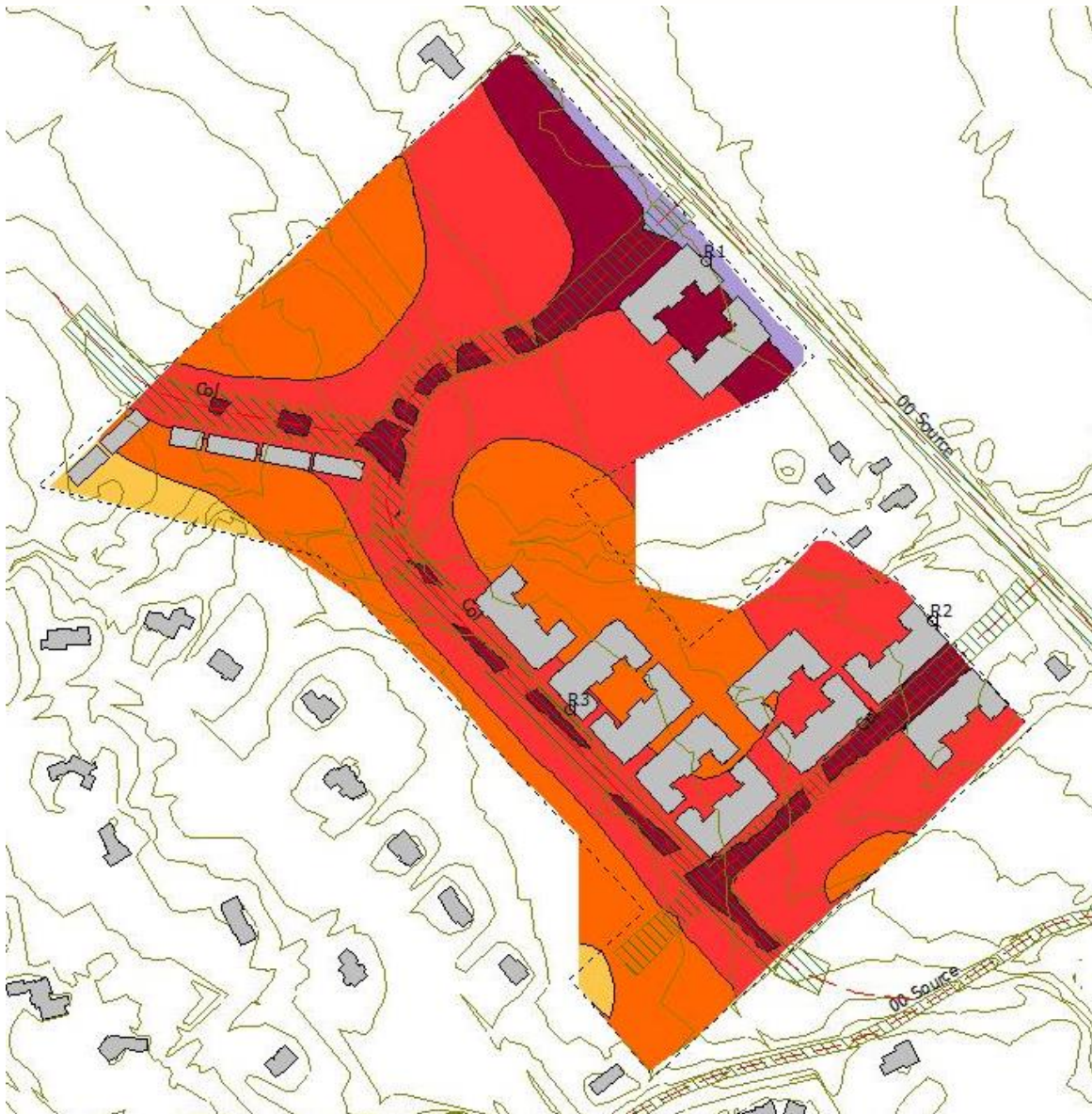


FIGURE 6: 7.5 M NOISE CONTOURS FOR THE SITE (DAYTIME PERIOD)

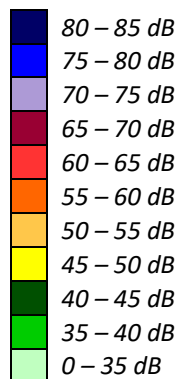
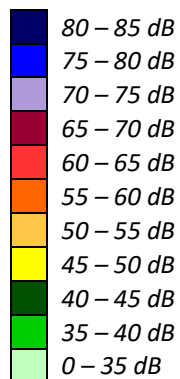


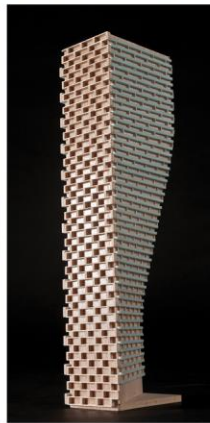


FIGURE 7: 7.5 M NOISE CONTOURS FOR THE SITE (NIGHTTIME PERIOD)



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APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 28-04-2020 13:20:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 80 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): 35000
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: March (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 : 27.00 / 27.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: March (day)

Source height = 1.50 m

ROAD (0.00 + 71.25 + 0.00) = 71.25 dBA

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

--									
-90	90	0.48	76.17	0.00	-3.78	-1.14	0.00	0.00	0.00
71.25									

Segment Leq : 71.25 dBA

Total Leq All Segments: 71.25 dBA

Results segment # 1: March (night)

Source height = 1.50 m

ROAD (0.00 + 63.65 + 0.00) = 63.65 dBA

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

--									
-90	90	0.48	68.57	0.00	-3.78	-1.14	0.00	0.00	0.00
63.65									

Segment Leq : 63.65 dBA

Total Leq All Segments: 63.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 71.25
(NIGHT): 63.65

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STAMSON 5.0 NORMAL REPORT Date: 20-05-2020 11:31:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 80 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): 35000
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: March (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 : 82.00 / 82.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 8000
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: Col (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 : 31.00 / 31.00 m
Receiver height : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: March (day)

Source height = 1.50 m

ROAD (0.00 + 64.11 + 0.00) = 64.11 dBA

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

--									
-90	90	0.48	76.17	0.00	-10.92	-1.14	0.00	0.00	0.00
64.11									

Segment Leq : 64.11 dBA

Results segment # 2: Col (day)

Source height = 1.50 m

ROAD (0.00 + 58.15 + 0.00) = 58.15 dBA

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

--									
-90	90	0.48	63.96	0.00	-4.67	-1.14	0.00	0.00	0.00
58.15									

Segment Leq : 58.15 dBA

Total Leq All Segments: 65.09 dBA



Results segment # 1: March (night)

Source height = 1.50 m

ROAD (0.00 + 56.51 + 0.00) = 56.51 dBA

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

--									
-90	90	0.48	68.57	0.00	-10.92	-1.14	0.00	0.00	0.00
56.51									

Segment Leq : 56.51 dBA

Results segment # 2: Col (night)

Source height = 1.50 m

ROAD (0.00 + 50.56 + 0.00) = 50.56 dBA

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

--									
-90	90	0.48	56.36	0.00	-4.67	-1.14	0.00	0.00	0.00
50.56									

Segment Leq : 50.56 dBA

Total Leq All Segments: 57.49 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 65.09
(NIGHT) : 57.49

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STAMSON 5.0 NORMAL REPORT Date: 20-05-2020 11:38:24
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 6477/563 veh/TimePeriod *
Medium truck volume : 515/45 veh/TimePeriod *
Heavy truck volume : 368/32 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 8000
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: Col (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 : 7.50 / 7.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00



Results segment # 1: Col (day)

Source height = 1.50 m

ROAD (0.00 + 63.96 + 0.00) = 63.96 dBA

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

--									
-90	90	0.00	63.96	0.00	0.00	0.00	0.00	0.00	0.00
63.96									

Segment Leq : 63.96 dBA

Total Leq All Segments: 63.96 dBA

Results segment # 1: Col (night)

Source height = 1.50 m

ROAD (0.00 + 56.36 + 0.00) = 56.36 dBA

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

--									
-90	90	0.00	56.36	0.00	0.00	0.00	0.00	0.00	0.00
56.36									

Segment Leq : 56.36 dBA

Total Leq All Segments: 56.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY) : 63.96
(NIGHT) : 56.36

