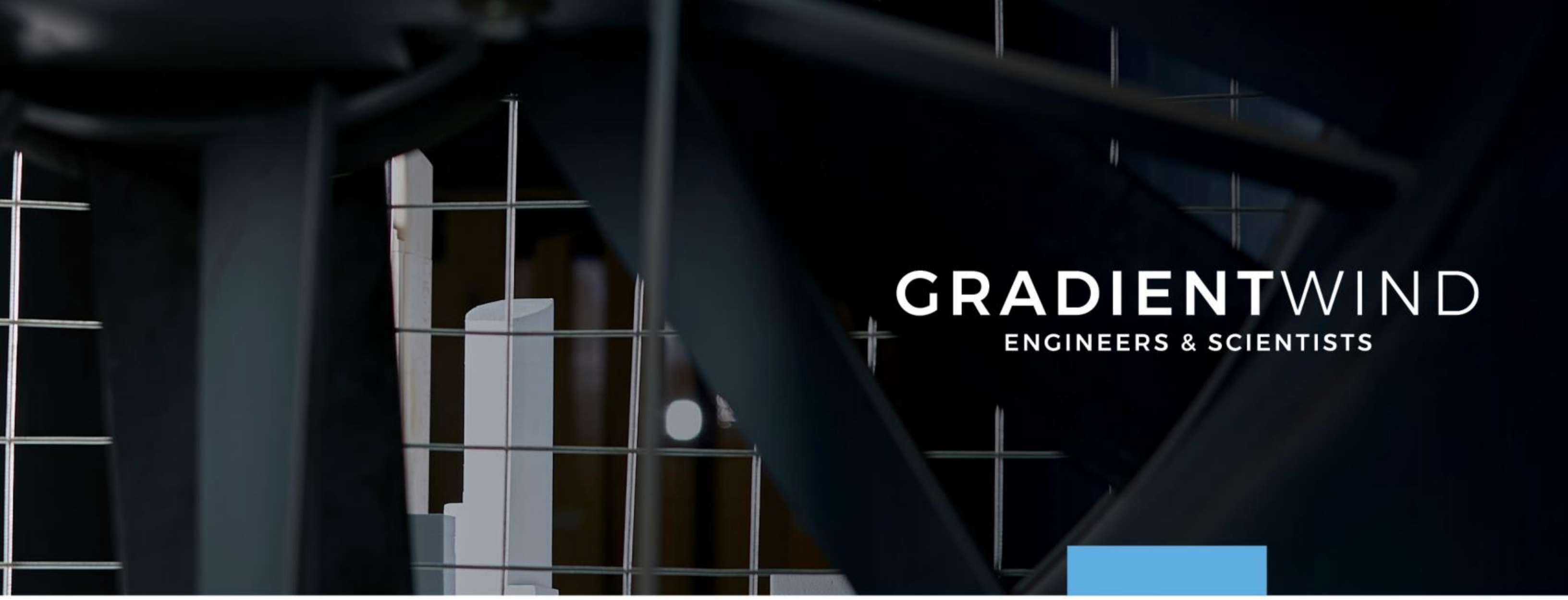
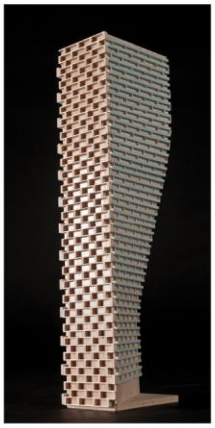
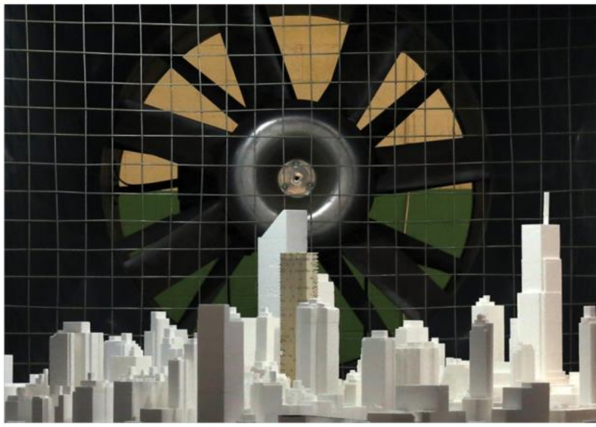


ENVIRONMENTAL NOISE FEASIBILITY ASSESSMENT

Trailsedge North
Ottawa, Ontario

Report: 20-170–Environmental Noise





September 14, 2020

PREPARED FOR
Richcraft Homes Ltd.
2280 St. Laurent Boulevard, Suite 201
Ottawa, ON K1G 4K1

PREPARED BY
Efser Kara, MSc, LEED GA, Acoustic Scientist
Joshua Foster, P.Eng., Principal

EXECUTIVE SUMMARY

This report describes an environmental noise feasibility assessment undertaken for a proposed subdivision development known as Trailsedge North, located within the East Urban Community, in Ottawa, Ontario. The subdivision is located at the southeast corner of a parcel of land bounded by Innes Road to the north, Mer-Bleue Road to the east, future bus rapid transit corridor (Cumberland Transitway) and Brian Coburn Boulevard to the south, and Pagé Road to the west. The proposed subdivision features a mixture of single dwelling lots, detached dwelling and townhome blocks as well as high-density residential developments and parks and situated to the north of the hydro easement.

The major sources of traffic noise impacting the residential subdivision are Brian Coburn Boulevard and the Cumberland Transitway. Also, Fern Casey Boulevard, Van Guard Drive, and Frank Bender Street have been defined as collector and major collector roads within the development and have been considered in our analysis. Mer-Bleue Road is situated more than 400 metres off the development site, therefore, was not considered as a significant source of noise.

The focus of the stationary noise assessment is the existing snow disposal facility located to the east of the development.

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; (iv) the sound power levels of snow disposal facility activities based on the Innes Road Snow Disposal Facility Environmental Study and Design Report[1]; and (v) site plan drawings prepared by Annis, O'Sullivan, Vollebekk Ltd.

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The results of the calculations indicate that the buildings that are directly exposed to major collector roadways will require STC rated building components as well as central air conditioning. For the other blocks, forced air heating with provision for the installation of central air

[1] Stantec, Innes Road Snow Disposal Facility Environmental Study and Design Report, (2020, August 28).

conditioning will be required except for those outside the 55 dBA contour. Additionally, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements.

Results of the roadway traffic noise calculations also indicate that outdoor living areas bordering and having direct exposure to traffic noise may require noise control measures. Mitigation measures are described in Section 5.1.1, 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 to determine specific noise control measures for the development.

A stationary noise assessment was conducted to assess the noise impact from the Innes (Mer Bleue) Snow Disposal Facility on the proposed subdivision. The results indicate that the noise levels produced by activities associated with the SDF are within the noise level limits of the ENCG of the City of Ottawa.

GRADIENTWIND
ENGINEERS & SCIENTISTS

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Richcraft Homes Ltd. to undertake an environmental noise feasibility assessment for a proposed subdivision development known as Trailsedge North located in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local roadway traffic and stationary noise sources.

Our work is based on theoretical noise calculation methods conforming to the City of Ottawa[2] and Ministry of the Environment, Conservation and Parks (MECP)[3] guidelines. Noise calculations were based on site plan drawings prepared by Annis, O'Sullivan, Vollebekk Ltd., 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 feasibility assessment is a proposed subdivision development known as Trailsedge North located in Ottawa, Ontario. The study site is located at the southeast corner of a parcel of land bounded by Innes Road to the north, Mer-Bleue Road to the east, future bus rapid transit corridor (Cumberland Transitway) and Brian Coburn Boulevard to the south, and Pagé Road to the west. The subdivision comprises a mixture of single-family detached dwellings, townhomes, and high-density residential blocks and parks situated along the southern perimeter of the site.

Gradient Wind considered environmental noise sources affecting the site, including roadway traffic noise and stationary noise. The major sources of traffic noise on the residential subdivision are Brian Coburn Boulevard, Mer-Bleue Road, and the Cumberland Transitway. Also, internal roadways Fern Casey Boulevard, Van Guard Drive, and Frank Bender Street, are defined as collector and major collector roadways in the development area. The primary source of the stationary noise is the existing Mer-Bleue Road Snow Disposal Facility (SDF) that is located to the east of the development.

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[2] City of Ottawa Environmental Noise Control Guidelines, January 2016
[3] Ontario Ministry of the Environment, Conservation and Parks – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study buildings produced by local roadway traffic, (ii) calculate stationary noise levels generated by the Innes (Mer Bleue) Snow Disposal Facility (SDF), and (iii) explore potential noise mitigation where required.

4. METHODOLOGY

4.1 Background

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

4.2 Roadway Traffic Noise

4.2.1 Criteria for Roadway Traffic Noise

For vehicle traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specifies that the recommended Outdoor Living Area (OLA) noise limit is 55 dBA during the daytime period. As per the ENCG, OLAs do not need to be considered during the nighttime period.

Predicted noise levels at the outdoor living area 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 5.1.1. 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 detailed noise study.

4.2.2 Theoretical Roadway Noise Predictions

Noise predictions were determined by computer modelling using two programs: Predictor-Lima and STAMSON 5.04. 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 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 MECP computerized noise assessment program, STAMSON 5.04, at two sample receptor locations coinciding with the receptor locations in Predictor as shown in Figure 2. Receptor distances and exposure angles are also illustrated in Figures 2. 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, 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.
- Ground surfaces were conservatively modelled as hard ground (i.e. pavement, concrete).
- The study site was treated as having flat or gently sloping topography.
- No massing considered as potential noise screening elements.
- Eight receptors were strategically placed throughout the study area. Six (6) of them are defined on plane of window (POW) at the assumed massing and two (2) of them at potential outdoor living areas (OLA).

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 Plan[4] 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. Traffic volumes for the proposed Cumberland Transitway are based on Gradient Wind's experience with other developments in the area. Table 1 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 1: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Brian Coburn Boulevard	4-Lane Urban Arterial Undivided (4-UAU)	70	**30,000**
Fern Casey Boulevard	4-Lane Major Collector (4-UMCU)	60	**24,000**
Frank Bender Street	4-Lane Major Collector (4-UMCU)	60	**24,000**
	2-Lane Urban Collector (2-UCU)	40	**8,000**
Vanguard Drive	4-Lane Major Collector (4-UMCU)	60	**24,000**
	2-Lane Urban Collector (2-UCU)	40	**8,000**
Cumberland Transitway	Buses	60	**460/40***

* - Daytime/nighttime volumes

4.3 Stationary Noise

4.3.1 Stationary Noise Criteria

For stationary sources, the equivalent sound energy level (L_{eq}) is commonly calculated on an hourly interval for daytime, evening and nighttime periods. Noise criteria taken from the ENCG and NPC-300 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"[5]. 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, campgrounds, and noise-sensitive buildings such as schools and daycares. As

[4] City of Ottawa Transportation Master Plan, November 2013
[5] City of Ottawa Environmental Noise Guidelines, page 9

the site is bordered by an arterial road and a bus rapid transit corridor, the development site is considered as a Class 1 area as per the ENCG. The applicable sound level limit is the higher of the exclusionary limit outlined in Table 3, or background noise levels generated by other sources, such as roadway traffic. For this study, the sound level limits outlined in Table 2 were applied.

TABLE 2: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Point of Reception (POR)	
	Outdoor Points of Reception (OPOR)	Plane of Window (POW)
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

4.3.2 Stationary Noise Assumptions

The primary stationary noise source is the Innes (Mer Bleue) Snow Disposal Facility (SDF) which is situated at 2170 Mer Bleue Road to the east of the development. The impact of the SDF on the development area 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 the Environment, Conservation and Parks (MECP) as part of the Draft Plan of Subdivision Applications (DPA).

The following assumptions have been made in the analysis:

- The sound power levels of snow disposal facility activities were obtained from the Innes Road Snow Disposal Facility Environmental Study and Design Report by Stantec.
- The trucks were modelled as a point source in the analysis.
- The SDF activities (bulldozers and truck activity) were modelled as a point source at the engine height of the Caterpillar D7 bulldozers, 2.4 metres, at the center of the site.

- The maximum sound emission levels for the bulldozers (CAT model D6 and D7) are based on the manufacturer data provided in the Innes Road Snow Disposal Facility Environmental Study and Design Report.
- The truck movements were modelled as moving sources and the number of trucks per hour was assumed 70 as per the Innes Road Snow Disposal Facility Environmental Study and Design Report worst-case scenario.
- Ground surfaces were conservatively modelled as hard ground (i.e. pavement, concrete).
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- The existing berms and the noise fence around the SDF are modelled in the analysis.
- Eight receptors were strategically placed throughout the study area.

4.3.3 Determination of Noise Source Power Levels

Table 3 summarizes the sound power of each source used in the analysis. The stationary noise source locations can be seen in Figure 3.

TABLE 3: EQUIPMENT SOUND POWER LEVELS (dBA)

Source ID	Description	Height Above Grade (m)	Total (dBA)
S1	Caterpillar D6 or D7	2.4	**112**
S2	4-5 bulldozers plus truck activity	2.7	**108**

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 4 below. The results of the current analysis indicate that noise levels will range between 61 and 68 dBA during the daytime period (07:00-23:00) and between 53 and 60 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the east of Block 72, which is directly exposed to the noise generated by Frank

Bender Street traffic, a major collector. Figures 5 and 6 illustrate daytime and nighttime noise contours throughout the site at a height of 1.5 m above grade.

TABLE 4: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor ID	Receptor Location	Receptor Height (m)	PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night
R1	Block 63 – South	1.5	65	57
R2	Block 69 – East	1.5	67	59
R3	Block 72 – East	1.5	68	60
R4	Block 43 – North	1.5	67	60
R5	Block 7 – South	1.5	64	55
R6	Block 78 (102) – South	1.5	61	53
R7	Block 58-60 – South	1.5	63	55
R8	Block 63-64 – East	1.5	63	55

Table 5 below shows a comparison between Predictor-Lima and STAMSON. Noise levels calculated in STAMSON were found to have good correlation with Predictor-Lima and variability between the two programs was within an acceptable level of ±1-3 dBA.

TABLE 5: RESULT CORRELATION WITH STAMSON

Receptor Number	Receptor Location	Receptor Height (m)	STAMSON 5.04 Noise Level (dBA)		PREDICTOR-LIMA Noise Level (dBA)	
			Day	Night	Day	Night
R1	Block 63 – South	1.5	66	58	65	57
R5	Block 7 – South	1.5	64	57	64	55

5.1.1 Noise Control Measures

The noise levels predicted due to roadway traffic exceed the criteria listed in the ENCG for potential outdoor living areas (OLA). 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 at some receptors:

- 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

Examining the noise control measures listed above, these conclusions consider the possibility that not all of the proposed buildings will be oriented to provide screening elements for outdoor living areas against roadway traffic sources. Distance setback, insertion of non-noise sensitive land uses, and building orientation to provide sheltered zones in rear yards may not be feasible due to the requirements of the Community Development Plan. It is also not feasible to have shared outdoor amenity areas for this development with respect to rear yards, as this would have a significant impact on marketability. Therefore, the most feasible measures are insertion of earth berms or acoustic wall barriers between the sensitive rear yards and sources of noise, as mentioned in Section 5.1. By siding lots along the collector roadway, the extent of barriers are minimized. The use of earth berms or acoustic barriers will depend on the grading plan when it becomes available. Both options have the ability to reduce OLA noise levels to below 55 dBA. Potential noise barrier locations can be seen in Figure 4.

Regarding Figure 5, the area(s) with noise levels under 55 dBA (yellow and light orange) have no mitigation requirements. The area(s) with noise levels between 55 and 65 dBA (orange and light red) may require forced air heating with provision for central air conditioning. The area(s) with noise levels greater than 65 dBA (dark red and purple) may require air conditioning and upgraded building components.

5.2 Stationary Noise Levels

Noise levels produced by the Innes (Mer Bleue) Snow Disposal Facility (SDF) are presented Table 6. Noise levels at all receptors due to the stationary noise sources fall below ENCG criteria provided that our assumptions in Section 4.4.2 are adhered to. Noise contours at 1.5 m above grade can be seen in Figure 7 for daytime/nighttime conditions.

TABLE 6: EXTERIOR NOISE LEVELS DUE TO STATIONARY NOISE SOURCES

Receptor ID	Receptor Location	Receptor Height Above Grade (m)	PREDICTOR-LIMA Noise Level (dBA)		Sound Level Limits (dBA)		Meets ENCG Criteria	
			Day/ Evening	Night	Day/ Evening	Night	Day/ Evening	Night
R1	Block 63 – South	1.5	39	39	50	45	Yes	Yes
R2	Block 69 – East	1.5	42	42	50	45	Yes	Yes
R3	Block 72 – East	1.5	41	41	50	45	Yes	Yes
R4	Block 43 – North	1.5	35	35	50	45	Yes	Yes
R5	Block 7 – South	1.5	28	28	50	45	Yes	Yes
R6	Block 78 (102) – South	1.5	32	32	50	45	Yes	Yes
R7	Block 66-67 – East	1.5	42	42	50	45	Yes	Yes
R8	Block 63-64 – East	1.5	41	41	50	45	Yes	Yes

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels produced by local roadway traffic will range between 61 and 68 dBA during the daytime period (07:00-23:00) and between 53 and 60 dBA during the nighttime period (23:00-07:00). The highest noise level (68 dBA) occurs at the east of Block 72, which is directly exposed to the noise generated by Frank Bender Street traffic, which is classified as a major collector.

Building components with a higher Sound Transmission Class (STC) rating will be required where exterior noise levels exceed 65 dBA. The results of the calculations indicate that the buildings that are directly exposed to major collector roadways will require STC rated building components as well as central air conditioning. For the other blocks, forced air heating with provision for the installation of central air conditioning will be required except for those outside the 55 dBA contour. Additionally, Warning Clauses will also be required to be placed on all Lease, Purchase and Sale Agreements.

Results of the roadway traffic noise calculations also indicate that outdoor living areas bordering and having direct exposure to traffic noise may require noise control measures. Mitigation measures are described in Section 5.1.1, 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 to determine specific noise control measures for the development.

A stationary noise assessment was conducted to assess the noise impact from the Innes (Mer Bleue) Snow Disposal Facility on the proposed subdivision. The results indicate that the noise levels produced by activities associated with the SDF are within the noise level limits of the ENCG of the City of Ottawa.

This concludes our environmental noise feasibility 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.

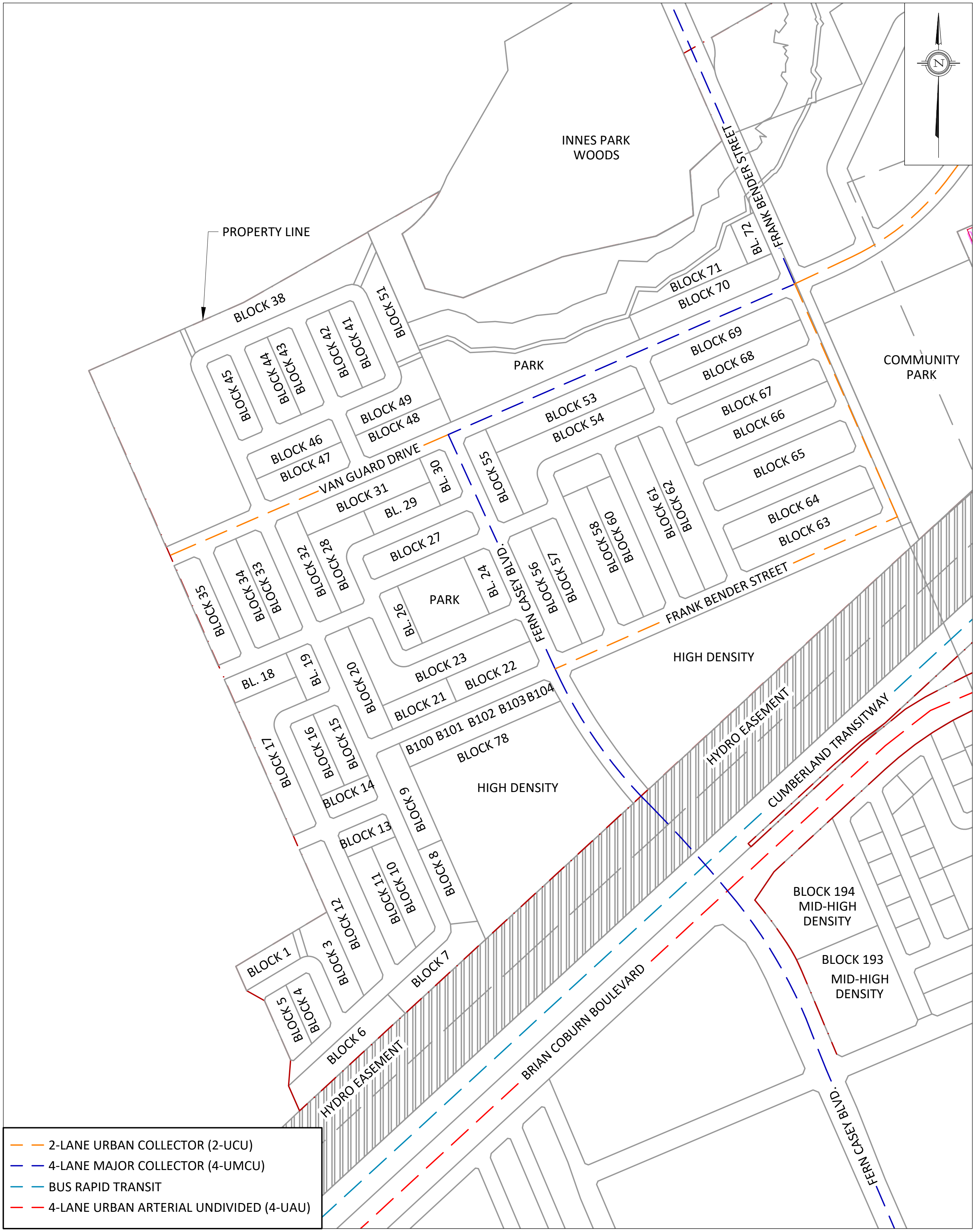
Sincerely,

Gradient Wind Engineering Inc.

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #20-170-Environmental Noise



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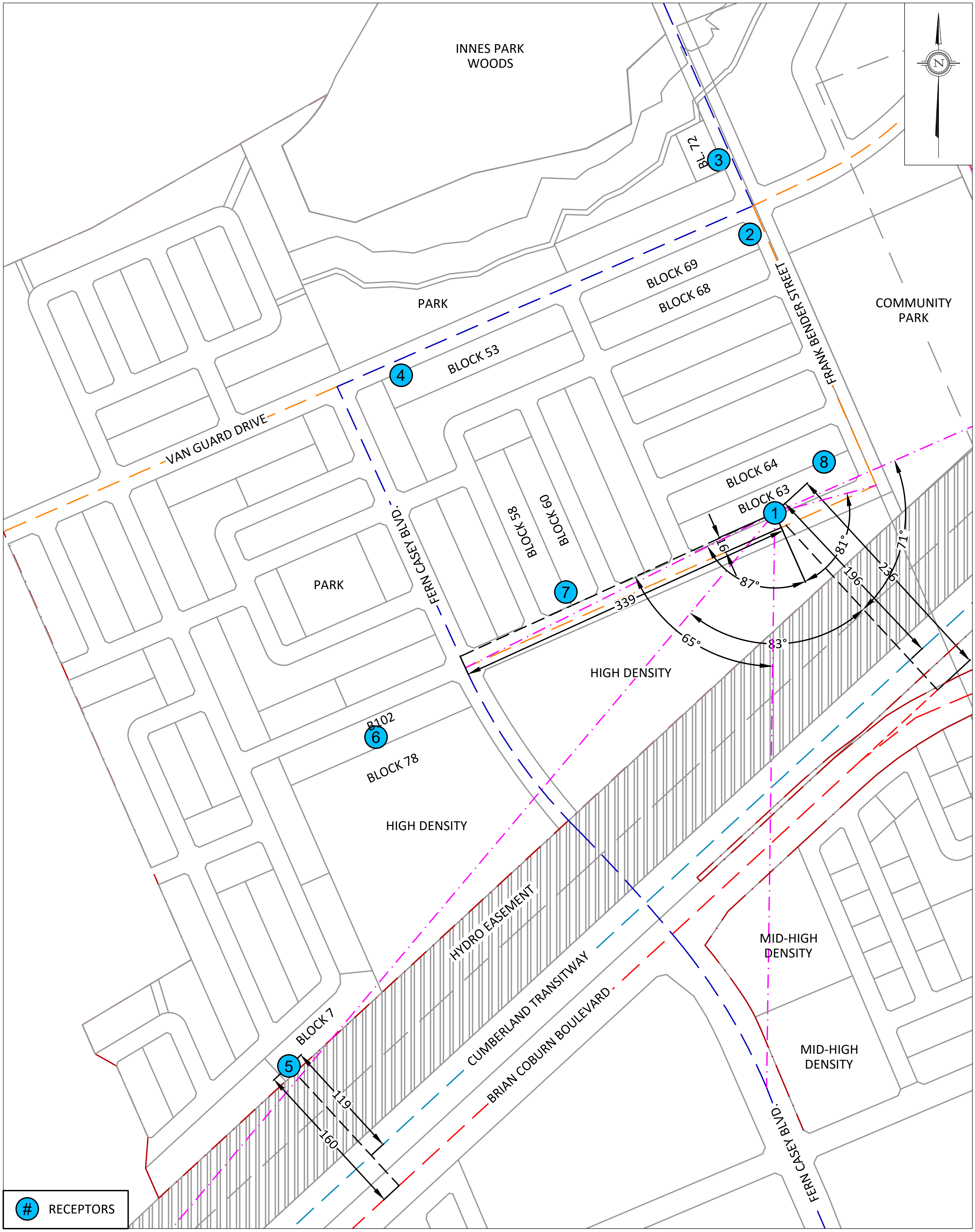
PROJECT		DESCRIPTION
TRAILSEDGE NORTH, OTTAWA ENVIRONMENTAL NOISE ASSESSMENT		FIGURE 1: SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:6000 (APPROX.)	DRAWING NO.: GW20-170-1	
DATE: SEPTEMBER 14, 2020	DRAWN BY: E.K.	



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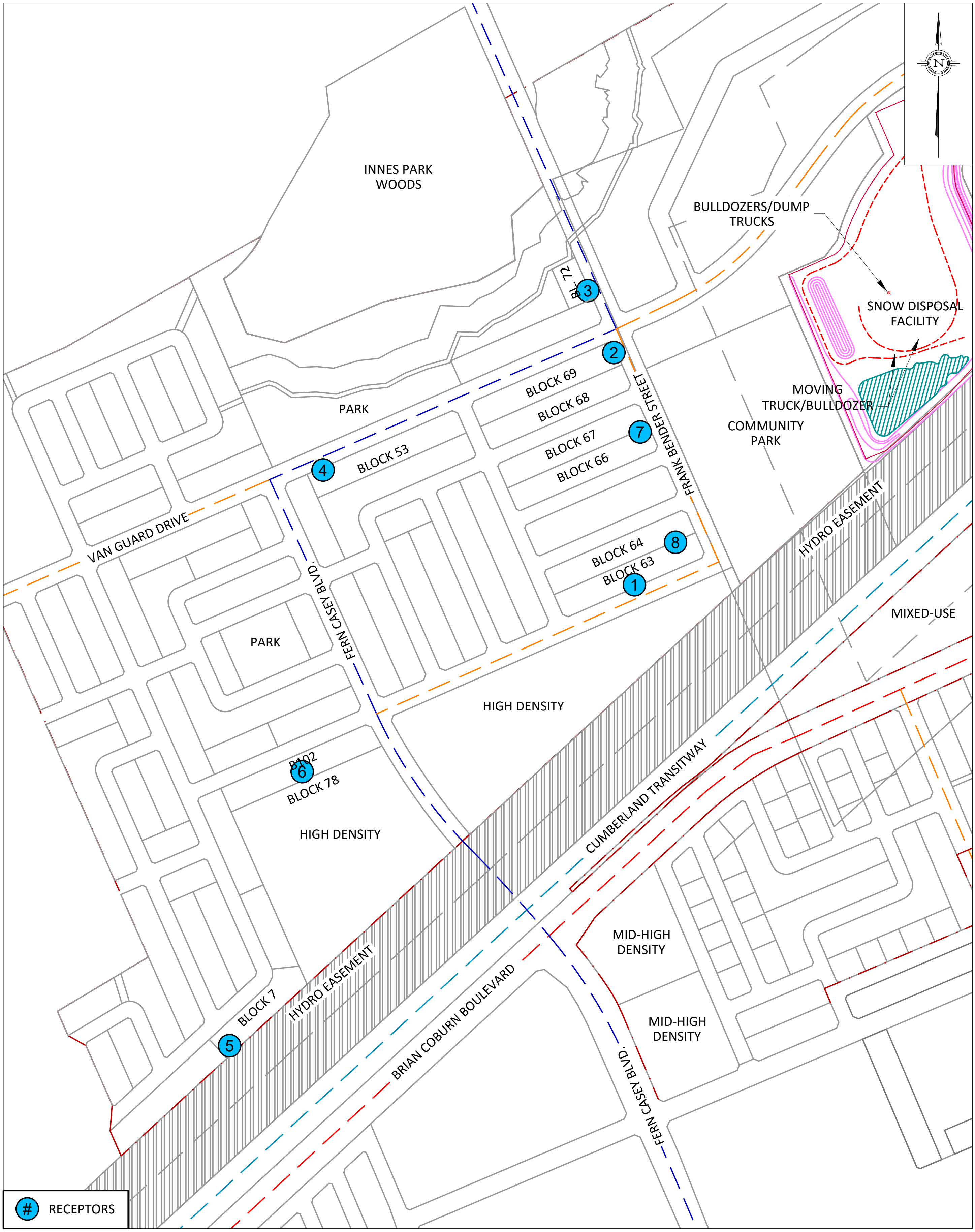
PROJECT	TRAILSEDGE NORTH, OTTAWA ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION
SCALE	1:5000 (APPROX.)	DRAWING NO. GW20-170-2	FIGURE 2: ROADWAY NOISE RECEPTOR LOCATIONS & STAMSON INPUT DATA FOR RECEPTORS 1 & 5
DATE	SEPTEMBER 14, 2020	DRAWN BY E.K.	



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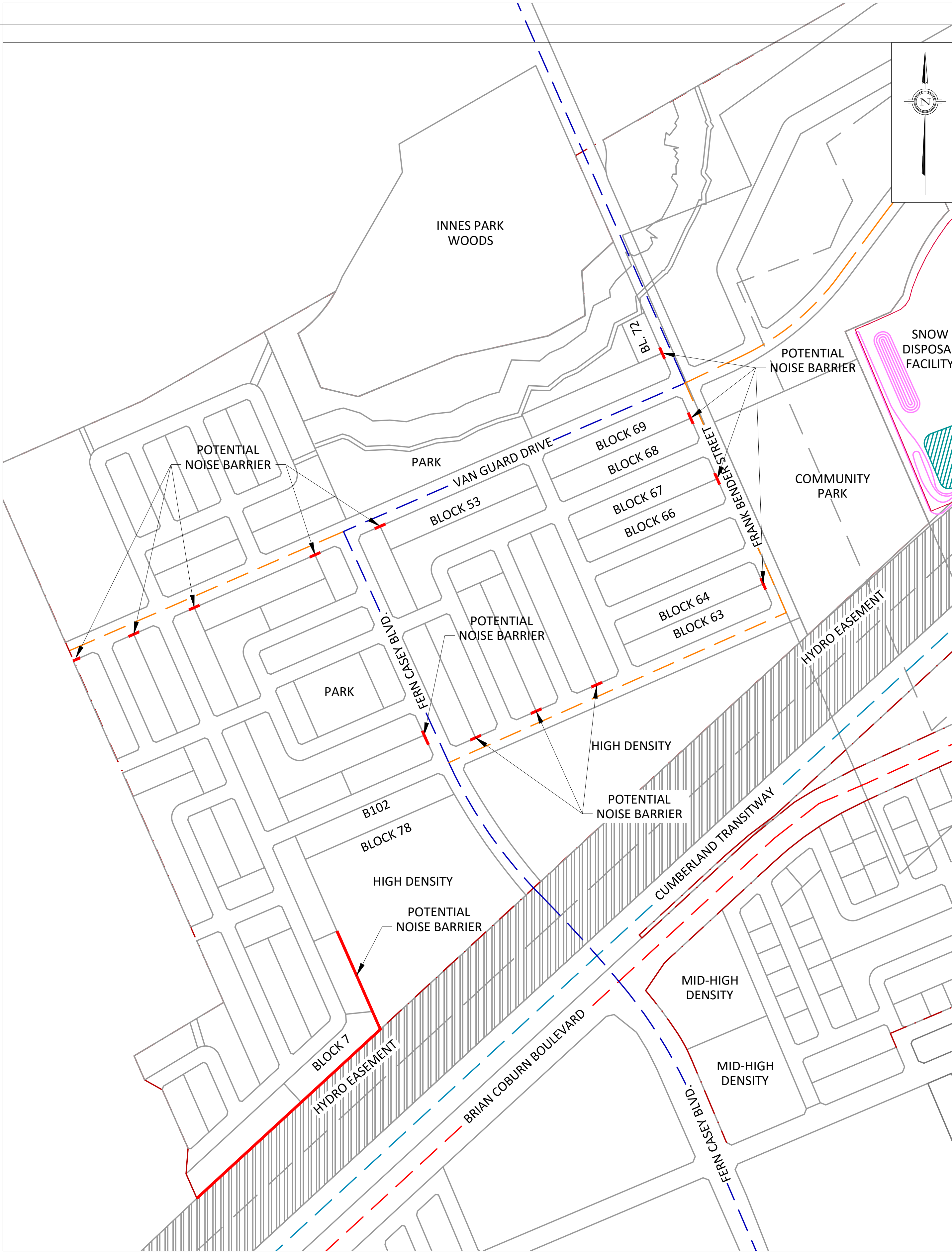
PROJECT	TRAILSEDGE NORTH, OTTAWA ENVIRONMENTAL NOISE ASSESSMENT		
SCALE	1:6000 (APPROX.)	DRAWING NO.	GW20-170-3
DATE	SEPTEMBER 14, 2020	DRAWN BY	E.K.

DESCRIPTION

FIGURE 3:
STATIONARY NOISE RECEPTOR & SOURCE LOCATIONS



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PROJECT: TRAILSEDGE NORTH, OTTAWA ENVIRONMENTAL NOISE ASSESSMENT		DESCRIPTION: FIGURE 4: POTENTIAL BARRIER LOCATIONS
SCALE: 1:6000 (APPROX.)	DRAWING NO.: GW20-170-4	
DATE: SEPTEMBER 14, 2020	DRAWN BY: E.K.	

FIGURE 5: DAYTIME TRAFFIC NOISE CONTOURS
(1.5 M ABOVE GRADE)

80 – 85 dB
75 – 80 dB
70 – 75 dB
65 – 70 dB
60 – 65 dB
55 – 60 dB
50 – 55 dB
45 – 50 dB
40 – 45 dB
35 – 40 dB
0 – 35 dB

FIGURE 6: NIGHTTIME TRAFFIC NOISE CONTOURS
(1.5 M ABOVE GRADE)

80 – 85 dB
75 – 80 dB
70 – 75 dB
65 – 70 dB
60 – 65 dB
55 – 60 dB
50 – 55 dB
45 – 50 dB
40 – 45 dB
35 – 40 dB
0 – 35 dB

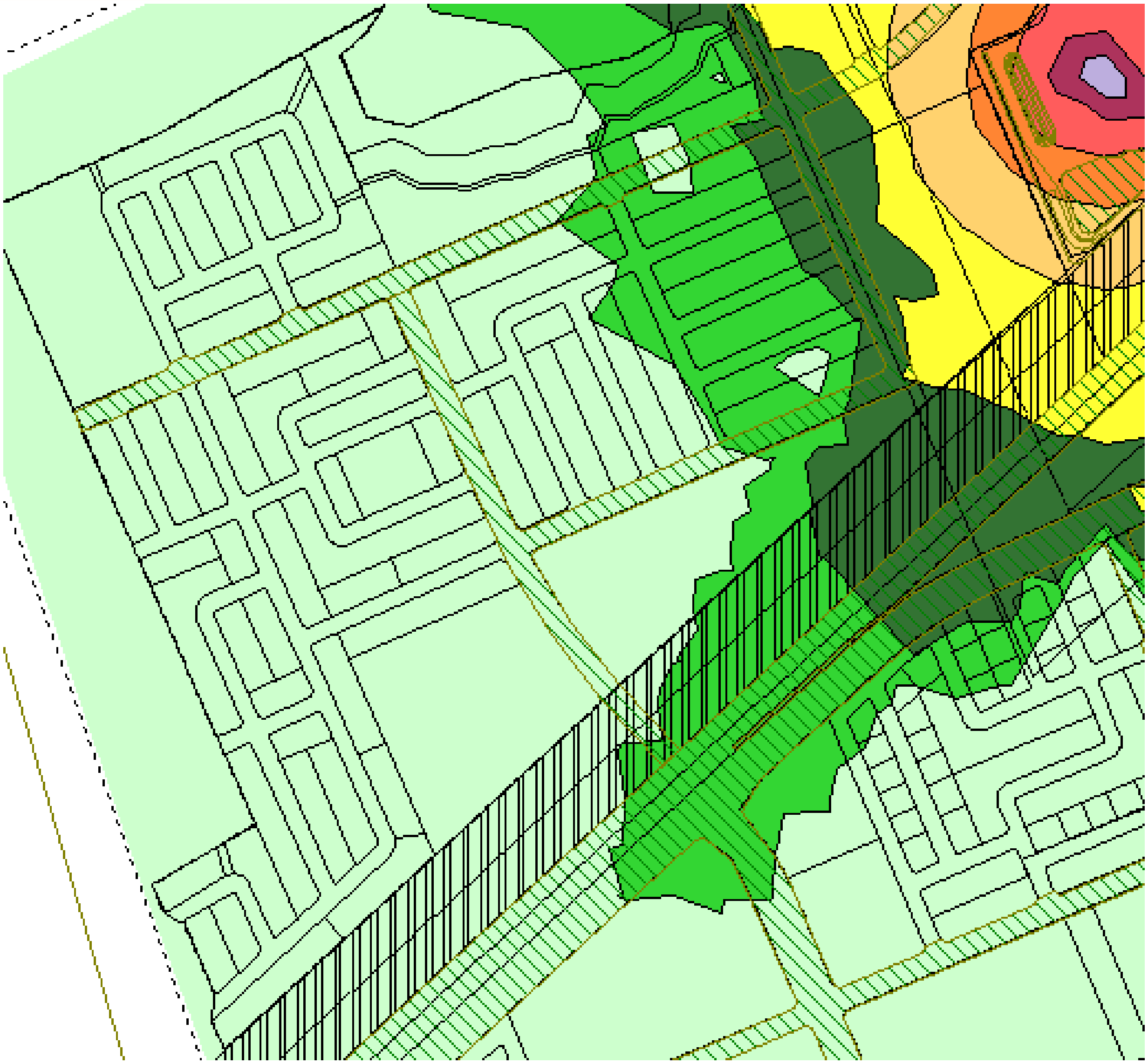
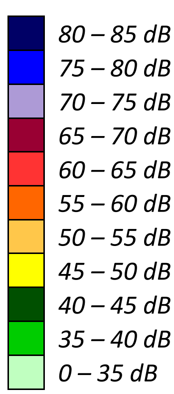
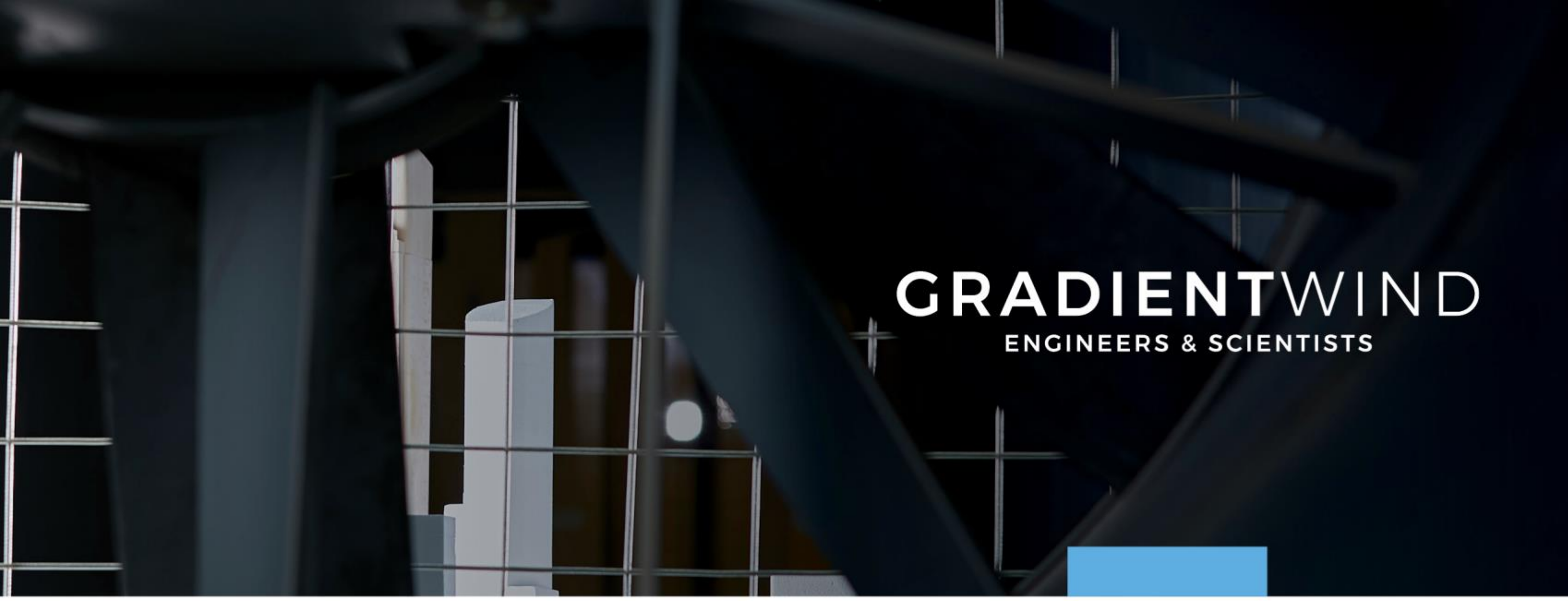


FIGURE 7: DAYTIME/NIGHTTIME STATIONARY NOISE CONTOURS (1.5 M ABOVE GRADE)





APPENDIX A

STAMSON INPUT-OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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STAMSON 5.0 NORMAL REPORT Date: 02-09-2020 13:03:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Brian Coburn (day/night)

Angle1 Angle2 : -71.00 deg 83.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 236.00 / 236.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Angle1 Angle2 : -81.00 deg 87.00 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 : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

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

Car traffic volume : 19430/1690 veh/TimePeriod *
Medium truck volume : 1546/134   veh/TimePeriod *
Heavy truck volume : 1104/96   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): 24000
Percentage of Annual Growth   : 0.00
Number of Years of Growth   : 0.00
Medium Truck % of Total Volume   : 7.00
Heavy Truck % of Total Volume   : 5.00
Day (16 hrs) % of Total Volume   : 92.00

Data for Segment # 3: Fern Casey (day/night)

Angle1   Angle2   : -65.00 deg   0.00 deg
Wood depth   :   0   (No woods.)
No of house rows   :   0 / 0
Surface   :   2   (Reflective ground surface)
Receiver source distance : 339.00 / 339.00 m
Receiver height   : 1.50 / 1.50   m
Topography   :   1   (Flat/gentle slope; no barrier)
Reference angle   :   0.00

Results segment # 1: Brian Coburn (day)

Source height = 1.50 m

ROAD (0.00 + 61.68 + 0.00) = 61.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	83	0.00	74.33	0.00	-11.97	-0.68	0.00	0.00	0.00	61.68

Segment Leq : 61.68 dBA

Results segment # 2: Frank Bender (day)

Source height = 1.50 m

ROAD (0.00 + 63.38 + 0.00) = 63.38 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	87	0.00	63.96	0.00	-0.28	-0.30	0.00	0.00	0.00	63.38

Segment Leq : 63.38 dBA

Results segment # 3: Fern Casey (day)

Source height = 1.50 m

ROAD (0.00 + 54.07 + 0.00) = 54.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-65	0	0.00	72.04	0.00	-13.54	-4.42	0.00	0.00	0.00	54.07

Segment Leq : 54.07 dBA

Total Leq All Segments: 65.92 dBA

Results segment # 1: Brian Coburn (night)

Source height = 1.50 m

ROAD (0.00 + 54.08 + 0.00) = 54.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	83	0.00	66.73	0.00	-11.97	-0.68	0.00	0.00	0.00	54.08

Segment Leq : 54.08 dBA

Results segment # 2: Frank Bender (night)

Source height = 1.50 m

ROAD (0.00 + 55.78 + 0.00) = 55.78 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-81	87	0.00	56.36	0.00	-0.28	-0.30	0.00	0.00	0.00	55.78

Segment Leq : 55.78 dBA

Results segment # 3: Fern Casey (night)

Source height = 1.50 m

ROAD (0.00 + 46.47 + 0.00) = 46.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-65	0	0.00	64.44	0.00	-13.54	-4.42	0.00	0.00	0.00	46.47

Segment Leq : 46.47 dBA

Total Leq All Segments: 58.32 dBA

RT/Custom data, segment # 1: BRT (day/night)
----
1 - Bus:
Traffic volume : 460/40 veh/TimePeriod
Speed : 60 km/h

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

Angle1 Angle2 : -71.00 deg 83.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 196.00 / 196.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 48.41 + 0.00) = 48.41 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-71	83	0.00	60.25	-11.16	-0.68	0.00	0.00	0.00	48.41

Segment Leq : 48.41 dBA

Total Leq All Segments: 48.41 dBA

Results segment # 1: BRT (night)

Source height = 0.50 m

```
RT/Custom (0.00 + 40.81 + 0.00) = 40.81 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -71     83   0.00  52.65 -11.16  -0.68   0.00   0.00   0.00  40.81
----------------------------------------------------------------------
```

Segment Leq : 40.81 dBA

Total Leq All Segments: 40.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.99
(NIGHT): 58.39

STAMSON 5.0 NORMAL REPORT Date: 02-09-2020 13:04:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

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

Car traffic volume : 24288/2112 veh/TimePeriod *
Medium truck volume : 1932/168 veh/TimePeriod *
Heavy truck volume : 1380/120 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

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

24 hr Traffic Volume (AADT or SADT): 30000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Brian Coburn (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 : 160.00 / 160.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Brian Coburn (day)

Source height = 1.50 m

ROAD (0.00 + 64.05 + 0.00) = 64.05 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	74.33	0.00	-10.28	0.00	0.00	0.00	0.00	64.05

Segment Leq : 64.05 dBA

Total Leq All Segments: 64.05 dBA

Results segment # 1: Brian Coburn (night)

Source height = 1.50 m

ROAD (0.00 + 56.45 + 0.00) = 56.45 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	66.73	0.00	-10.28	0.00	0.00	0.00	0.00	56.45

Segment Leq : 56.45 dBA

Total Leq All Segments: 56.45 dBA

RT/Custom data, segment # 1: BRT (day/night)
----
1 - Bus:
Traffic volume : 460/40 veh/TimePeriod
Speed : 60 km/h

Data for Segment # 1: BRT (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 : 119.00 / 119.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: BRT (day)

Source height = 0.50 m

RT/Custom (0.00 + 51.25 + 0.00) = 51.25 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.25	-8.99	0.00	0.00	0.00	0.00	51.25

Segment Leq : 51.25 dBA

Total Leq All Segments: 51.25 dBA

Results segment # 1: BRT (night)

Source height = 0.50 m

RT/Custom (0.00 + 43.65 + 0.00) = 43.65 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	52.65	-8.99	0.00	0.00	0.00	0.00	43.65

Segment Leq : 43.65 dBA

Total Leq All Segments: 43.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.27
(NIGHT): 56.67