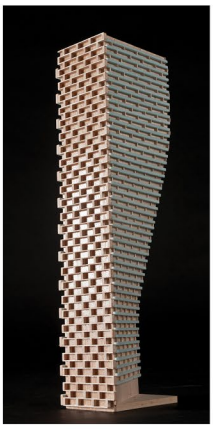
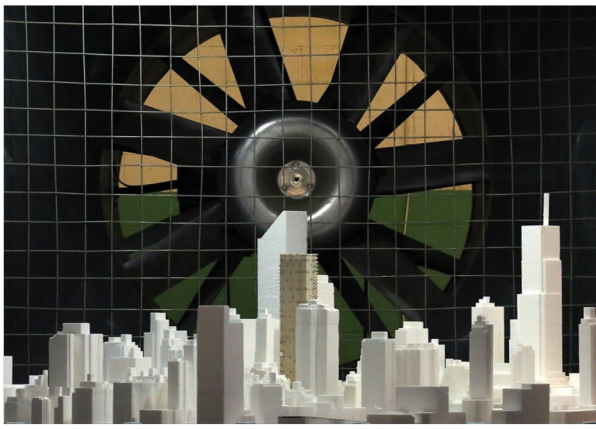
GRADIENTWIND
ENGINEERS & SCIENTISTS

ENVIRONMENTAL NOISE ASSESSMENT

Wateridge Village
Block 5
Ottawa, Ontario

REPORT: GW23-174-Environmental Noise





December 20th, 2023

PREPARED FOR
The Rohit Group
15 Fitzgerald Road, Suite 200
Ottawa, ON K2H 9G1

PREPARED BY
Adam Bonello, Basc., Junior Environmental Scientist
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EXECUTIVE SUMMARY

This report describes an environmental noise assessment performed for Block 5 of the proposed residential development referred to as Wateridge Village, located on Hemlock Road in Ottawa, Ontario. Block 5 (hereafter referred to as the study site), comprises of a 4-storey, multi-tenant, residential building. The major source of roadway traffic noise is Hemlock Road. Figure 1 illustrates a complete 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) architectural drawings provided by NORR Architects and Engineers Limited in November 2023; (iv) future roadway traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications; and (vi) satellite imagery of the surrounding properties.

The results of the current analysis indicate that noise levels will range between 54 and 62 dBA during the daytime period (07:00-23:00) and between 46 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) occurs at the South façade of Block 5, which is nearest and most exposed to Hemlock Rd.

Results of the calculations indicate that standard building components will be sufficient to achieve acceptable indoor noise levels. However, the study site will require forced air heating systems, with provisions for central air conditioning to be added by the homeowners if desired. Installation of air conditioning would allow windows and doors to remain close, thus providing a quiet and comfortable indoor environment. Due to the nature of the development, air conditioning is likely to be provided. Therefore, the following Type D Warning Clause[1] will also be required on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

[1] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 8

Regarding stationary noise impacts from the development on the surroundings, these can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. Due to the size and nature of the development, the HVAC equipment is expected to be small roof top equipment and is expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by The Rohit Group to undertake an environmental noise assessment for Block 5 of the proposed residential development, referred to as Wateridge Village. This report summarizes the methodology, results, and recommendations related to an environmental noise assessment.

The present scope of work involves assessing exterior and interior noise levels generated by local roadway traffic and existing stationary sources. The assessment was performed on the basis of 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 architectural drawings provided by NORR Architects and Engineers Limited in November 2023, with future roadway traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The proposed development comprises of a 4-storey residential building. The L-shaped building is located on the corner of Hemlock Road and the proposed Oshedinaa Street. The building also has underground parking, with entrance in the rear. The study site, block 5, is the first of 4 blocks to be studied which form Wateridge Village.

The major source of roadway traffic noise is Hemlock Road. The study site is surrounded by existing low-rise residential properties, parks, and local outdoor amenity areas. Figure 1 illustrates a complete site plan with surrounding context.

Other sources of traffic noise such as Aviation Parkway, and Promenade Sir George Etienne Cartier were deemed insignificant due to the large offset distances between them and the site. Nearby existing and proposed local roads such as Codd's Road, Oshedinaa, and Kijigon Streets were also deemed insignificant, due to their low traffic volumes.

[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

The nearby Rockcliffe Airport was also researched as a potential noise influence. However, the study site is well outside of the 25 NEF Contour and outside the Macdonald–Cartier airport vicinity development zone, thus aircraft noise was deemed to be insignificant.

Regarding stationary noise impacts from the development on the surroundings, these can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. Due to the size and nature of the development, the HVAC equipment is expected to be small roof top equipment and is expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the study building produced by local transportation, (ii) ensure that interior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4 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. The NPC-300 guidelines specify that the recommended indoor noise limit range (that is relevant to this study) is 50, 45 and 40 dBA for general offices/retail stores, residence living rooms and hotel sleeping quarters, and sleeping quarters respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD) [4]

Type of Space	Time Period	L_{eq} (dBA)
		Road
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
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
Living/dining, den areas of residences, hospitals, nursing homes, etc. (except schools or daycare centres)	23:00 - 07:00	45
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of residences, nursing/retirement homes, etc.	07:00 - 23:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

[4] Adapted from Table C-2, Part C, Section 3.2.3 of NPC-300

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[5]. 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 triggers the need for forced air heating with provision for central air conditioning. Where noise levels exceed 65 dBA daytime and 60 dBA nighttime, air conditioning will be required and building components will require higher levels of sound attenuation[6].

For designated Outdoor Living Areas (OLAs), the sound level limit is 55 dBA during the daytime period. An excess above the limit, between 55 dBA and 60 dBA, is acceptable only in cases where the required noise control measures are not feasible for technical, economic, or administrative reasons. Furthermore, balconies and terraces extending less than 4 metres in depth from the façade do not require consideration as Outdoor Living Areas and were excluded from the analysis.

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 Plan[7] 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 2 (below) summarizes the AADT values used for each roadway included in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Class	Speed Limit (km/h)	Ultimate AADT	Day/Night Split	Truck Volume Percentages	
					Medium Truck	Heavy Truck
Hemlock Rd.	2-Lane Urban Collector	40	8,000	92/8	7	5

[5] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[6] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3
[7] City of Ottawa Transportation Master Plan, November 2013

4.2.3 Theoretical Traffic 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 a separate line source of noise, and by using proposed and existing building locations as noise barriers. In addition to the traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- Vehicle parameters such as truck traffic volume percentages, posted speed limit, and day/night split are summarized in Table 2.
- Default ground surfaces were taken to be reflective due to the presence of hard (paved) ground.
- Topography was assumed to be a flat/gentle slope surrounding the study building.
- Noise receptors were strategically placed at 3 locations around the study area (see Figure 2).
- Where the separation distance from receptor to Hemlock Rd. was measured less than 15 m, the separation distance was modelled as 15 m due to the modelling limitation within STAMSON 5.04.
- For select sources where appropriate, receptors considered the proposed and existing building as a barrier partially or fully obstructing exposure to the source.
- Due to lack of building height specifications, each floor of the study site was assumed to be 3m tall.
- Receptor distances and exposure angles are illustrated in Figure A1.

5. RESULTS

5.1 Roadway Traffic Noise Levels

The results of the current analysis indicate that noise levels will range between 54 and 62 dBA during the daytime period (07:00-23:00) and between 46 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) occurs at the South façade of Block 5, which is nearest and most exposed to Hemlock Rd.

TABLE 5: EXTERIOR NOISE LEVELS DUE TO ROADWAY TRAFFIC SOURCES

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON Roadway Noise Level (dBA)	
			Day	Night
R1	13.5	POW: Level 4 – Front Façade	62	55
R2	13.5	POW: Level 4 – Side Façade 1	57	49
R3	13.5	POW: Level 4 – Side Façade 2	54	46

5.2 Noise Control Measures

The noise levels predicted due to roadway traffic do not exceed the 65 dBA criteria listed in Section 4.2 for building components for the development. Thus, building components compliant with Ontario Building Code Standards will be sufficient to attenuate indoor noise levels.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 54 and 62 dBA during the daytime period (07:00-23:00) and between 46 and 55 dBA during the nighttime period (23:00-07:00). The highest noise level (62 dBA) occurs at the South façade of Block 5, which is nearest and most exposed to Hemlock Rd.

Results of the calculations indicate that standard building components will be sufficient to achieve acceptable indoor noise levels. However, Block 5 will require forced air heating systems, with provisions for central air conditioning to be added by the homeowners if desired. Installation of air conditioning would allow windows and doors to remain close, thus providing a quiet and comfortable indoor environment. Due to the nature of the development, air conditioning is likely to be provided. Therefore, the following Type D Warning Clause[8] will also be required on all Lease, Purchase and Sale Agreements, as summarized below:

[8] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 8

Type D:

> *"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

Regarding stationary noise impacts from the development on the surroundings, these can be minimized by judicious placement mechanical equipment such as its placement on a roof or in a mechanical penthouse, or the incorporation of silencers and noise screens as necessary. Due to the size and nature of the development, the HVAC equipment is expected to be small roof top equipment and is expected to be in compliance with the MECP's noise guideline NPC-216 - Residential Air Conditioning and City of Ottawa Noise By-Law No. 2017-255.

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.

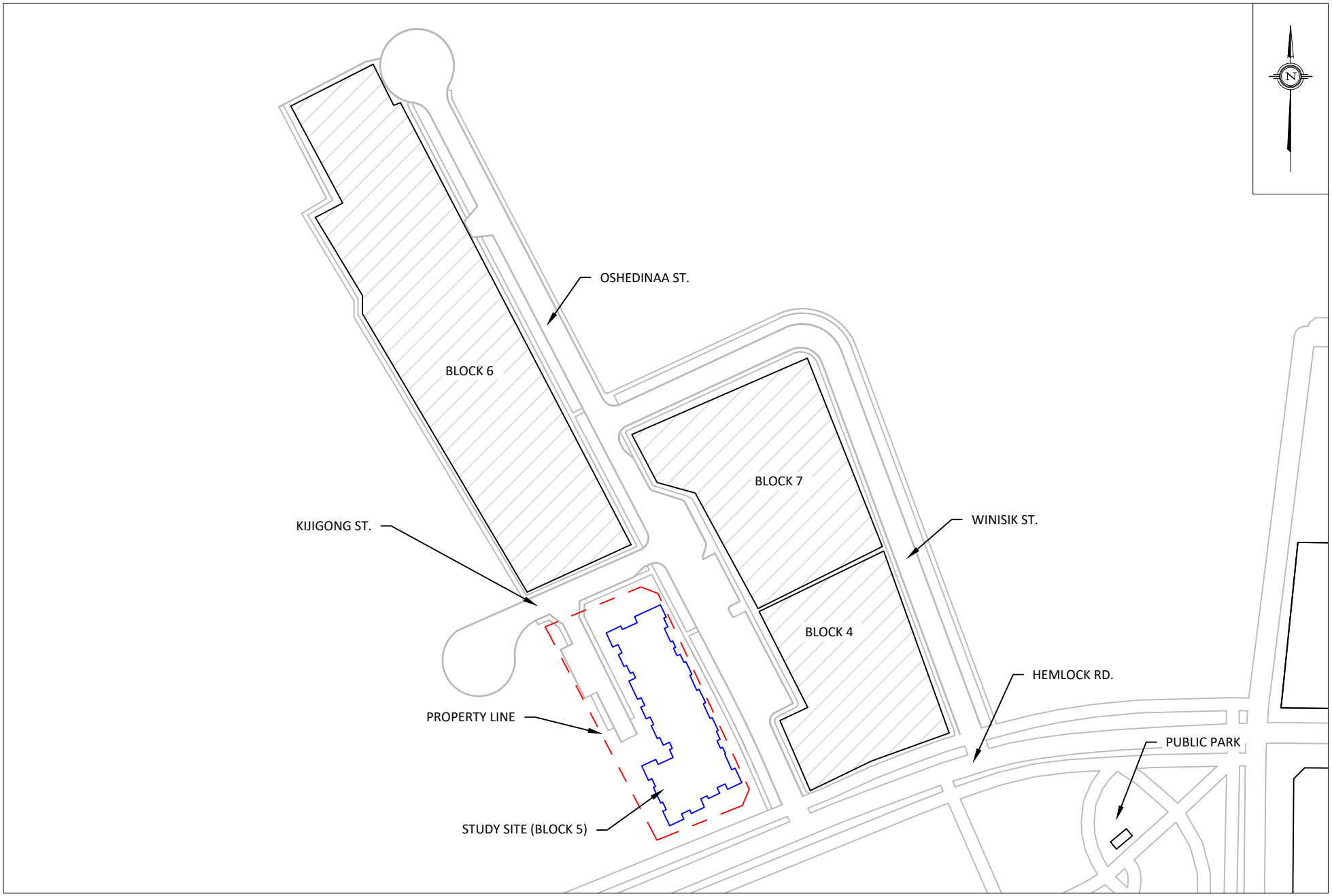
Sincerely,

Gradient Wind Engineering Inc.

Adam Bonello, BASc.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #23-174-Environmental Noise



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PROJECT	WATERIDGE VILLAGE: BLOCK 5, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GWE23-174-1
DATE	DECEMBER 20, 2023
DRAWN BY	A.B.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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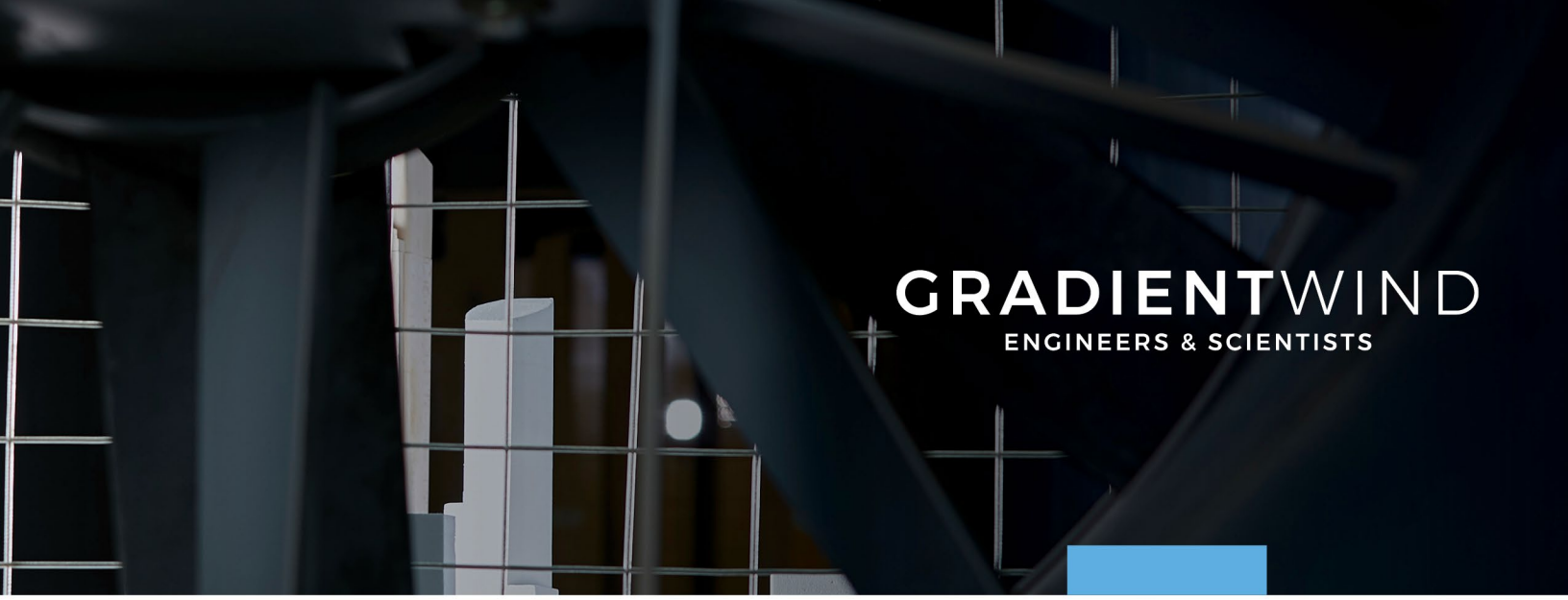
PROJECT	WATERIDGE VILLAGE: BLOCK 5, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:500 (APPROX.)	DRAWING NO.	GW23-174-2
DATE	DECEMBER 20, 2023	DRAWN BY	A.B.

FIGURE 2:
TRAFFIC NOISE RECEPTOR LOCATIONS



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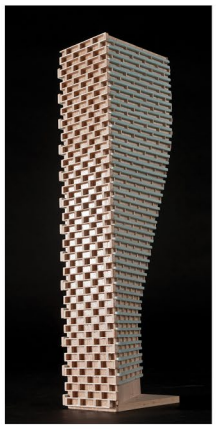

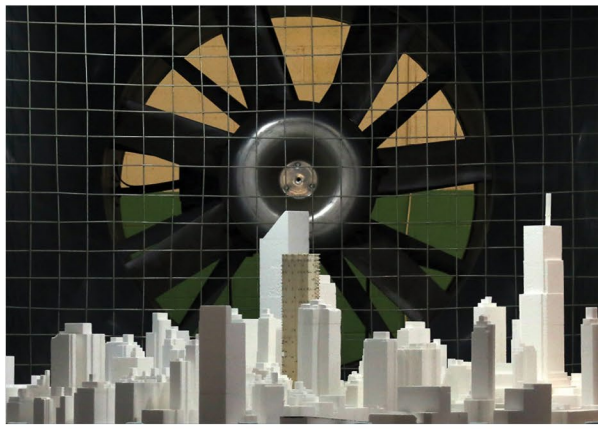

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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PROJECT	WATERIDGE VILLAGE: BLOCK 5, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-174-A1
DATE	DECEMBER 20, 2023	DRAWN BY	A.B.

DESCRIPTION

FIGURE A1:
RECEPTOR DISTANCES AND EXPOSURE ANGLES

STAMSON 5.0 NORMAL REPORT Date: 20-12-2023 10:57:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R1.te Time Period: Day/Night 16/8 hours
Description:

```
Road data, segment # 1: Hemlock (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: Hemlock (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  :  22.00 / 22.00  m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Hemlock (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.29 + 0.00) = 62.29 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  -1.66   0.00   0.00   0.00   0.00  62.29
-------------------------------------------------------------------------------

Segment Leq : 62.29 dBA

Total Leq All Segments: 62.29 dBA

Results segment # 1: Hemlock (night)
------------------------------------
```

```
Source height = 1.50 m

ROAD (0.00 + 54.70 + 0.00) = 54.70 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  -1.66   0.00   0.00   0.00   0.00  54.70
-------------------------------------------------------------------------------

Segment Leq : 54.70 dBA

Total Leq All Segments: 54.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.29
                           (NIGHT): 54.70
```

```
STAMSON 5.0          NORMAL REPORT          Date: 20-12-2023 10:58:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R2.te                    Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Hemlock (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: Hemlock (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  :  40.00 / 40.00  m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Hemlock (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 56.69 + 0.00) = 56.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  63.96   0.00  -4.26  -3.01   0.00   0.00   0.00  56.69
-------------------------------------------------------------------------------

Segment Leq : 56.69 dBA

Total Leq All Segments: 56.69 dBA

Results segment # 1: Hemlock (night)
------------------------------------
```

```
Source height = 1.50 m

ROAD (0.00 + 49.09 + 0.00) = 49.09 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  56.36   0.00  -4.26  -3.01   0.00   0.00   0.00  49.09
-------------------------------------------------------------------------------

Segment Leq : 49.09 dBA

Total Leq All Segments: 49.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.69
                           (NIGHT): 49.09
```

```
STAMSON 5.0          NORMAL REPORT          Date: 20-12-2023 10:59:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: R3.te                    Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Hemlock (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: Hemlock (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  :  75.00 / 75.00  m
Receiver height           :  13.50 / 13.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Hemlock (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 53.96 + 0.00) = 53.96 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  63.96   0.00  -6.99  -3.01   0.00   0.00   0.00  53.96
-------------------------------------------------------------------------------

Segment Leq : 53.96 dBA

Total Leq All Segments: 53.96 dBA

Results segment # 1: Hemlock (night)
------------------------------------
```

```
Source height = 1.50 m

ROAD (0.00 + 46.36 + 0.00) = 46.36 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -90      0   0.00  56.36   0.00  -6.99  -3.01   0.00   0.00   0.00  46.36
-------------------------------------------------------------------------------

Segment Leq : 46.36 dBA

Total Leq All Segments: 46.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.96
                           (NIGHT): 46.36
```