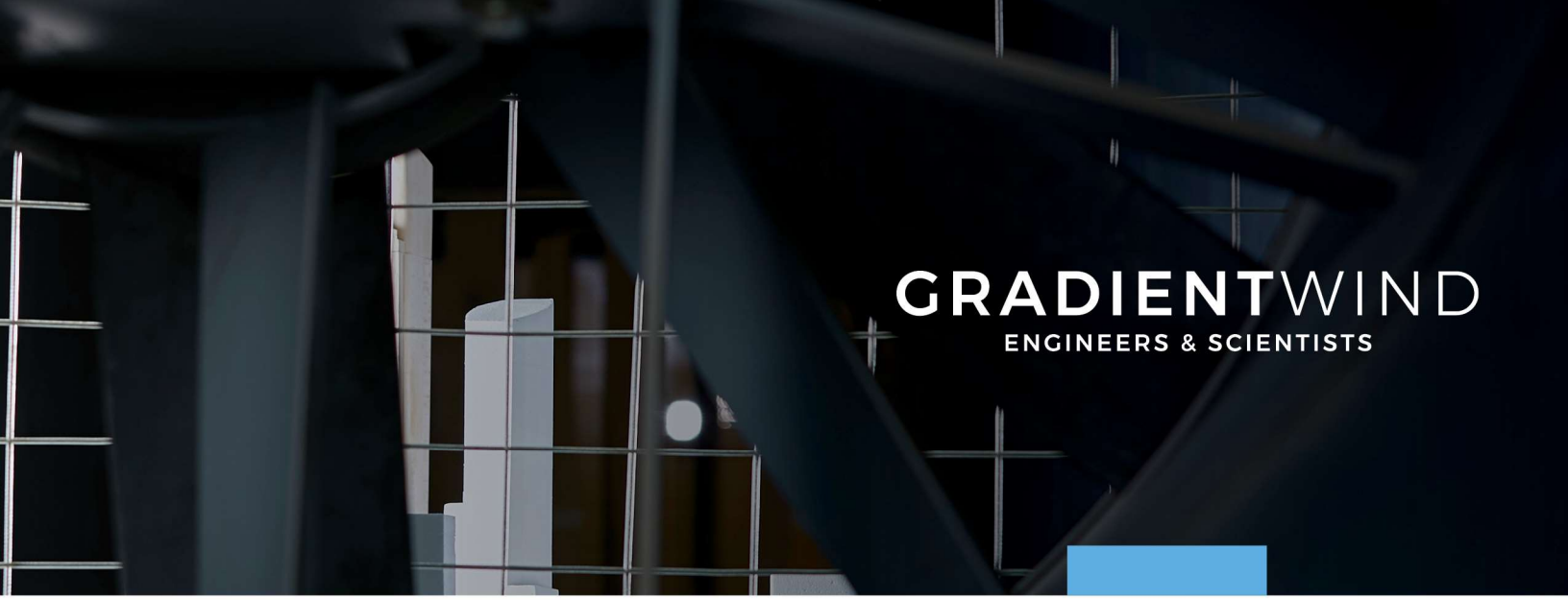

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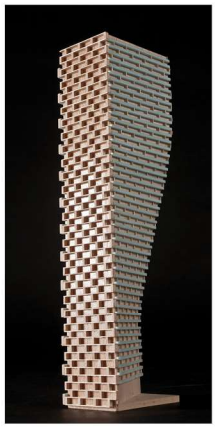
ROADWAY TRAFFIC NOISE ASSESSMENT

330 McLeod Street & 233 Argyle Avenue
Ottawa, Ontario

REPORT: 21-290 – Traffic Noise



October 14, 2021

PREPARED FOR
Smart Living Properties
226 Argyle Avenue
Ottawa, ON K2P 1B9

PREPARED BY
Tanyon Matheson-Fitchett, B.Eng., Junior Environmental Scientist
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GRADIENTWIND.COM

EXECUTIVE SUMMARY

This report describes a roadway traffic noise assessment undertaken in support of a Site Plan Control (SPC) application for the proposed developments at 330 McLeod Street and 233 Argyle Avenue in Ottawa, Ontario. 330 McLeod Street comprises an existing rectangular 5-storey residential building to the north and a rectangular 4-storey addition with 30 rooming units to the south. 233 Argyle Avenue comprises an existing near rectangular 3-storey office building to the south and a near rectangular 3-storey addition with 13 bachelor units to the north. The major sources of traffic noise are Bank Street to the west, O'Connor to the east, and Highway 417 approximately 200 metres to the south. As the proposed developments are located towards the middle of a cluster of buildings, they are generally well protected from traffic noise sources. 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) future vehicular traffic volumes based on the City of Ottawa's Official Plan roadway classifications; and (iv) architectural drawings of 330 McLeod Street and 233 Argyle Avenue prepared by Open Plan Architects Inc. dated July 15, 2021, and June 24, 2021, respectively.

The results of the current analysis indicate that noise levels will range between 46 and 57 dBA during the daytime period (07:00-23:00) and between 39 and 52 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the south façade of 330 McLeod Street, which is most exposed to O'Connor Street and Highway 417.

Results of the calculations indicate that building design for 330 McLeod Street should consider the need for occupants to keep windows and doors closed at their discretion to maintain a comfortable living environment. Therefore, 330 McLeod Street should be designed with forced air heating and the provision to accommodate the installation of central air conditioning at the occupant's discretion. A Warning Clause[1] will also be required on all Lease, Purchase and Sale Agreements for units of 330 McLeod Street as summarized in Section 6.

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

Exterior noise levels at 233 Argyle Avenue are expected to fall below 55 dBA, therefore, noise mitigation and warning clauses are not required. No spaces requiring consideration as outdoor living areas were identified.

With regards to stationary noise impacts from the building on the surroundings and itself, noise can be controlled by judicious selection of the mechanical equipment and its placement on a high roof or in a mechanical penthouse. Where necessary noise screens, silencers, or acoustic louvers can be incorporated into the design to ensure compliance with the ENCG sound level limits. A stationary noise study will be performed once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels meet ENCG criteria.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Smart Living Properties to undertake a traffic noise assessment in support of a Site Plan Control (SPC) application for the proposed developments at 330 McLeod Street and 233 Argyle Avenue 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.

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 architectural drawings of 330 McLeod Street and 233 Argyle Avenue prepared by Open Plan Architects Inc. dated July 15, 2021, and June 24, 2021, respectively, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications.

2. TERMS OF REFERENCE

The focus of this roadway traffic noise assessment is the proposed developments located at 330 McLeod Street and 233 Argyle Avenue in Ottawa, Ontario. The study sites are located in the middle of a downtown block bounded by McLeod Street to the northwest, O'Connor Street to the northeast, Argyle Avenue to the southeast and Bank Street to the southwest. For the purposes of this study, the elevations facing McLeod Street will be referred to as the north elevations.

The proposed developments are located midblock on a near rectangular parcel of land southwest to the intersection of McLeod Street and O'Connor Street and are back-to-back to each other with 330 McLeod Street to the north and 233 Argyle Avenue to the south. 330 McLeod Street comprises an existing rectangular 5-storey residential building to the north and a rectangular 4-storey addition with 30 rooming units to the south. The main entrance is located to the north, and the ground level houses recycling, waste, and bike rooms. 233 Argyle Avenue comprises an existing near rectangular 3-storey office building to the

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

south and a near rectangular 3-storey addition with 13 bachelor units to the north. The main entrance is located to the south, and the ground level houses mechanical and bike storage.

The near-field surroundings of the site comprise a mix of low- medium- and high-rise residential buildings in all directions. As the proposed developments are located towards the middle of a cluster of buildings, they are generally well protected from traffic noise sources. The Canadian Museum of Nature is located approximately one block east of the proposed developments, and the Highway 417 (Queensway) is located approximately 200 metres to the south.

The major sources of traffic noise are Bank Street to the west, O'Connor to the east, and Highway 417 to the south. Arterial and collector roadways beyond 100 metres of the study site are not included as sources influencing the study site as per ENCG Section 2.1. Figure 1 illustrates a complete site plan with surrounding context.

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, and (ii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the City of Ottawa's Environmental Noise Control Guidelines as outlined in Section 4.2 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 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 indoor noise limit range (that is relevant to this study) is 45 and 40 dBA for living rooms and sleeping quarters respectively for roadway as listed in Table 1.

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

Type of Space	Time Period	L_{eq} (dBA)
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
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters of **residences**, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[5]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[6]. 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

[4] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[5] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[6] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

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[7].

The sound level criterion for outdoor living areas is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation must be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion.

4.2.2 Theoretical Roadway Noise Predictions

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

Roadway traffic noise calculations were performed by treating each roadway segment as separate line sources of noise. In addition to the traffic volumes summarized in Table 2, 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 for all streets was taken to be 92%/8%, respectively.
- 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. Highway 417 is elevated approximately 2 m above local grade.
- Receptor height was taken to be 10.5 metres at Level 4 for the centre of the window (height to 4th floor slab + 1.5 metres) for Receptor 1, and 7.5 m at level 3 for Receptors 2 and 3.
- The surrounding mid- and high-rise buildings were considered as noise barriers partially or fully obstructing exposure to the source as illustrated by exposure angles in Figures 3 and 4.
- Noise receptors were strategically placed at 3 locations around the study area (see Figure 2).
- Receptor distances and exposure angles are illustrated in Figures 3 and 4.

[7] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

4.2.1 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[8] 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 Traffic Data	Speed Limit (km/h)	Traffic Volumes
O'Connor Street	2-Lane Urban Arterial (2-UAU)	50	**15,000**
Bank Street	4-Lane Urban Arterial (4-UAU)	50	**30,000**
Highway 417 (Queensway)	8-Lane Freeway	100	**146,664**

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2012) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

[8] City of Ottawa Transportation Master Plan, November 2013

As per Section 4.2, when daytime noise levels (from road and rail sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[9] considers:

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

Based on published research[10], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for site plan approval, detailed floor layouts and building elevations have not been finalized; therefore, detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

[9] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985
[10] CMHC, Road & Rail Noise: Effects on Housing

5. RESULTS AND DISCUSSION

5.1 Roadway Traffic Noise Levels

The results of the roadway traffic noise calculations are summarized in Table 3 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO ROAD TRAFFIC

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	STAMSON 5.04 Noise Level (dBA)	
			Day	Night
1	10.5	POW – 330 McLeod Street 4th Floor – South Façade	57	52
2	7.5	POW – 233 Argyle Avenue 3rd Floor – East Façade	49	41
3	7.5	POW – 233 Argyle Avenue 3rd Floor – West Façade	46	39

The results of the current analysis indicate that noise levels will range between 46 and 57 dBA during the daytime period (07:00-23:00) and between 39 and 52 dBA during the nighttime period (23:00-07:00). The highest noise level (57 dBA) occurs at the south façade of 330 McLeod Street, which is most exposed to O'Connor Street and Highway 417.

6. CONCLUSIONS AND RECOMMENDATIONS

Results of the calculations indicate that building design for 330 McLeod Street should consider the need for occupants to keep windows and doors closed at their discretion to maintain a comfortable living environment. Therefore, 330 McLeod Street should be designed with forced air heating and the provision to accommodate the installation of central air conditioning at the occupant's discretion. The following Warning Clause[11] will also be required be placed on all Lease, Purchase and Sale Agreements for units of 330 McLeod Street as summarized below:

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning will allow*

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

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."

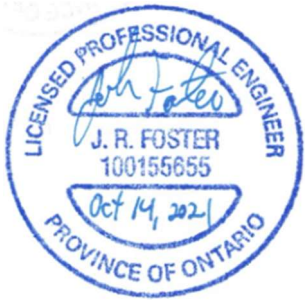
Exterior noise levels at 233 Argyle Avenue are expected to fall below 55 dBA therefore, noise mitigation and warning clauses are not required. No spaces requiring consideration as outdoor living areas were identified.

With regards to stationary noise impacts from the building on the surroundings and itself, noise can be controlled by judicious selection of the mechanical equipment and its placement on a high roof or in a mechanical penthouse. Where necessary noise screens, silencers, or acoustic louvers can be incorporated into the design to ensure compliance with the ENCG sound level limits. A stationary noise study will be performed once mechanical plans for the proposed building become available. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels meet ENCG criteria.

This concludes our roadway 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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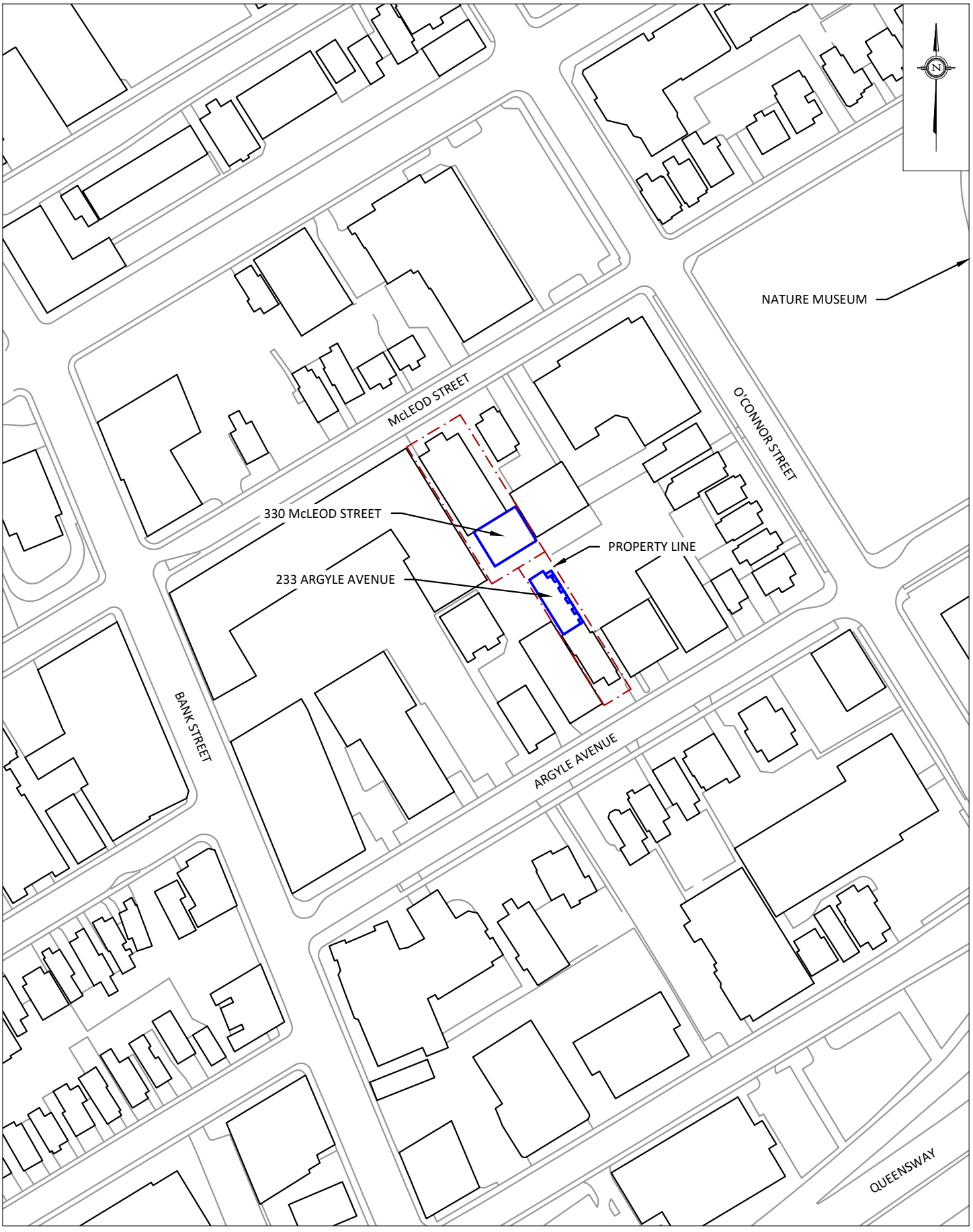
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #21-290



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PROJECT	330 McLEOD STREET & 233 ARGYLE AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1700 (APPROX.)	DRAWING NO.	GW21-290-1
DATE	SEPTEMBER 23, 2021	DRAWN BY	T.M.F.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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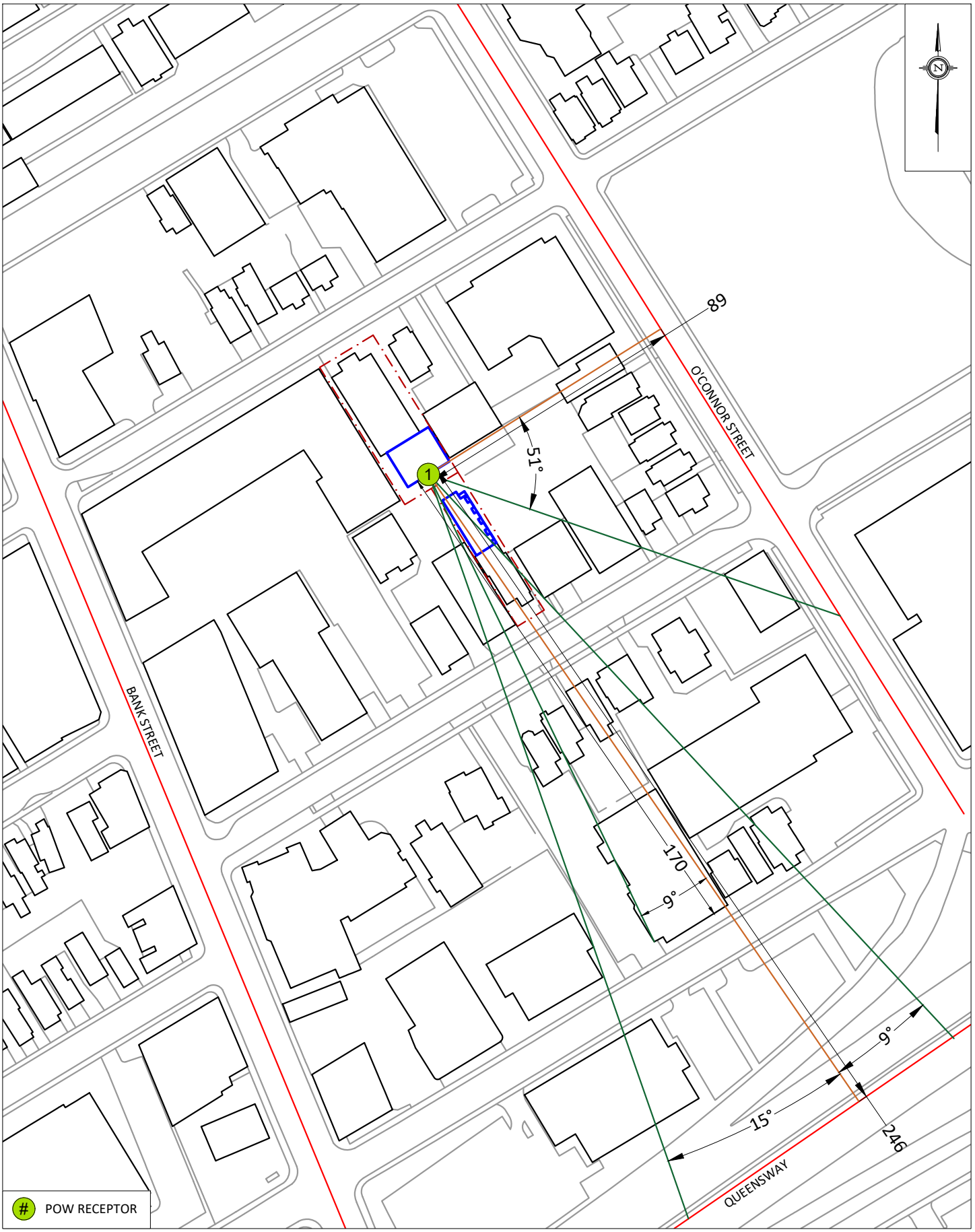
PROJECT	330 McLEOD STREET & 233 ARGYLE AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:700 (APPROX.)	DRAWING NO.	GW21-290-2
DATE	SEPTEMBER 23, 2021	DRAWN BY	T.M.F.

FIGURE 2:
RECEPTORS LOCATIONS



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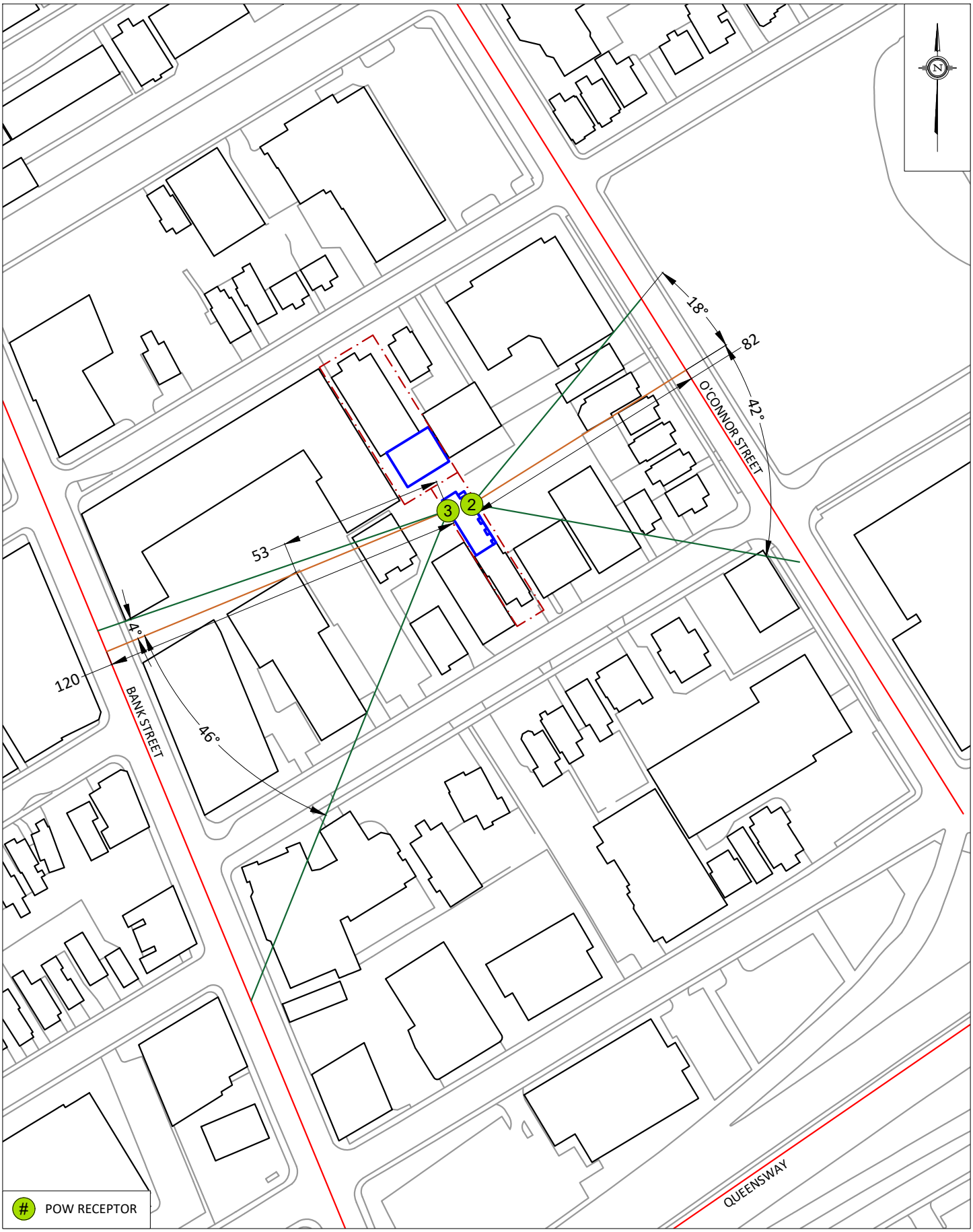
PROJECT	330 McLEOD STREET & 233 ARGYLE AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1700 (APPROX.)
DRAWING NO.	GW21-290-3
DATE	SEPTEMBER 23, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 3:
RECEPTOR 1 STAMSON INPUT PARAMETERS



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PROJECT	330 McLEOD STREET & 233 ARGYLE AVENUE, OTTAWA ROADWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1700 (APPROX.)
DRAWING NO.	GW21-290-4
DATE	SEPTEMBER 23, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 4:
RECEPTORS 2 AND 3 STAMSON INPUT PARAMETERS

APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
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```
STAMSON 5.0        NORMAL REPORT        Date: 23-09-2021 12:42:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: O'Connor (day/night)
-------------------------------------------
Angle1   Angle2           :   0.00 deg   51.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  89.00 / 89.00  m
Receiver height           :  10.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Road data, segment # 2: HWY 417 (day/night)
-------------------------------------------
Car traffic volume  : 118739/10325 veh/TimePeriod  *
Medium truck volume :  9445/821   veh/TimePeriod  *
Heavy truck volume  :  6747/587   veh/TimePeriod  *
Posted speed limit  :   100 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): 146664
    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: HWY 417 (day/night)
-----------------------------------------
Angle1   Angle2           :  -9.00 deg   15.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      2 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 246.00 / 246.00 m
Receiver height           :  10.50 / 10.50  m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            :  -9.00 deg   Angle2 : 9.00 deg
Barrier height            :   8.00 m
Barrier receiver distance : 170.00 / 170.00 m
Source elevation          :   2.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00

Results segment # 1: O'Connor (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 47.61 + 0.00) = 47.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     51   0.00  68.48   0.00  -7.73  -5.48   0.00  -7.66   0.00  47.61
-------------------------------------------------------------------------------

Segment Leq : 47.61 dBA
```

```
Results segment # 2: HWY 417 (day)
----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        5.66 !         5.66

ROAD (0.00 + 54.99 + 50.70) = 56.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -9      9   0.00  84.41   0.00 -12.15 -10.00   0.00  -6.79   0.00  55.47
    -9      9   0.00  84.41   0.00 -12.15 -10.00   0.00   0.00  -7.27  54.99
-------------------------------------------------------------------------------
     9     15   0.00  84.41   0.00 -12.15 -14.77   0.00  -6.79   0.00  50.70
-------------------------------------------------------------------------------

Segment Leq : 56.37 dBA

Total Leq All Segments: 56.91 dBA

Results segment # 1: O'Connor (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 40.02 + 0.00) = 40.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
     0     51   0.00  60.88   0.00  -7.73  -5.48   0.00  -7.66   0.00  40.02
-------------------------------------------------------------------------------

Segment Leq : 40.02 dBA
```

```
Results segment # 2: HWY 417 (night)
-----------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
-----------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !       10.50 !        5.66 !          5.66

ROAD (0.00 + 47.40 + 49.89) = 51.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
    -9      9   0.00  76.81   0.00 -12.15 -10.00   0.00   0.00  -7.27  47.40
-------------------------------------------------------------------------------
     9     15   0.00  76.81   0.00 -12.15 -14.77   0.00   0.00   0.00  49.89
-------------------------------------------------------------------------------

Segment Leq : 51.83 dBA

Total Leq All Segments: 52.11 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.91
                           (NIGHT): 52.11
```

```
STAMSON 5.0        NORMAL REPORT        Date: 23-09-2021 12:39:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


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

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

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

Data for Segment # 1: O'Connor (day/night)
----------------------------------------------
Angle1   Angle2           : -18.00 deg   42.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      1 / 1
House density             :     90 %
Surface                   :      2       (Reflective ground surface)
Receiver source distance  :  82.00 / 82.00  m
Receiver height           :   7.50 / 10.50  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00
```

```
Results segment # 1: O'Connor (day)
-----------------------------------

Source height = 1.50 m

ROAD (0.00 + 48.61 + 0.00) = 48.61 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -18     42   0.00  68.48   0.00  -7.38  -4.77   0.00  -7.72   0.00  48.61
-------------------------------------------------------------------------------

Segment Leq : 48.61 dBA

Total Leq All Segments: 48.61 dBA

Results segment # 1: O'Connor (night)
-------------------------------------

Source height = 1.50 m

ROAD (0.00 + 41.02 + 0.00) = 41.02 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -18     42   0.00  60.88   0.00  -7.38  -4.77   0.00  -7.72   0.00  41.02
-------------------------------------------------------------------------------

Segment Leq : 41.02 dBA

Total Leq All Segments: 41.02 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.61
                           (NIGHT): 41.02
```

```
STAMSON 5.0         NORMAL REPORT         Date: 23-09-2021 13:42:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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


Road data, segment # 1: Bank (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  :    50 km/h
Road gradient       :     0 %
Road pavement       :     1 (Typical asphalt or concrete)

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

    24 hr Traffic Volume (AADT or SADT):  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: Bank (day/night)
--------------------------------------
Angle1   Angle2           : -46.00 deg   4.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 120.00 / 120.00 m
Receiver height           :   7.50 / 7.50   m
Topography                :      2       (Flat/gentle slope; with barrier)
Barrier angle1            : -46.00 deg   Angle2 : 0.00 deg
Barrier height            :  16.00 m
Barrier receiver distance :  53.00 / 53.00  m
Source elevation          :   0.00 m
Receiver elevation        :   0.00 m
Barrier elevation         :   0.00 m
Reference angle           :   0.00
```

```
Results segment # 1: Bank (day)
--------------------------------

Source height = 1.50 m

Barrier height for grazing incidence
-------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        4.85 !          4.85

ROAD (0.00 + 36.63 + 45.93) = 46.41 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -46      0   0.00  71.49   0.00  -9.03  -5.93   0.00   0.00 -19.90  36.63
-------------------------------------------------------------------------------
     0      4   0.00  71.49   0.00  -9.03 -16.53   0.00   0.00   0.00  45.93
-------------------------------------------------------------------------------

Segment Leq : 46.41 dBA

Total Leq All Segments: 46.41 dBA
```

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

Source height = 1.50 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       1.50 !        7.50 !        4.85 !         4.85

ROAD (0.00 + 29.04 + 38.33) = 38.81 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------------
   -46      0   0.00  63.89   0.00  -9.03  -5.93   0.00   0.00 -19.90  29.04
-------------------------------------------------------------------------------
     0      4   0.00  63.89   0.00  -9.03 -16.53   0.00   0.00   0.00  38.33
-------------------------------------------------------------------------------

Segment Leq : 38.81 dBA

Total Leq All Segments: 38.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 46.41
                           (NIGHT): 38.81
```