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McIntosh Perry – 379 Cooper Street
Traffic Noise Study

Dear Curtis,

We are pleased to present the following traffic noise study for the existing residential building located at 379 Cooper Street in Ottawa, Ontario, which has requested a noise study to be performed as the building is being rezoned due to renovations. The building is an 8-unit, three storey residential building located on Cooper Street between Bank Street and O'Connor Street. This type of study is required by the City of Ottawa under the Environmental Noise Control Guidelines 2016 (ENCG), compliant with the Ministry of Environment's NPC-300.

This study considers acoustic concerns regarding traffic noise from Bank Street, which is located approximately 65 m to the West from the property, O'Connor Street, located approximately 100 m to the East from the property and Somerset Street West, located approximately 85m to the South. These three noise sources are the only sources considered in this study and are the only sources of noise that will have an impact on the development.

The summary of our results may be found in Section 5.5 along with our acoustic recommendations.

If you have any questions, please do not hesitate to contact us.

Regards,

Patrick Richard, M.Sc.E.
Acoustic Consultant

Rebecca Sondermeyer
Acoustic Consultant

1.0 Introduction

State of the Art Acoustik Inc. was commissioned by McIntosh Perry to complete a traffic noise study as required by the City of Ottawa for the proposed rezoning and renovation of the residential building at 379 Cooper Street in Ottawa, Ontario. We have followed the 2016 Environmental Noise Control Guidelines, which are compliant with the Ministry of Environment's NPC-300.

In Section 2.0, the site plan of the building is shown and surrounding area is analyzed for possible noise sources which would impact the proposed development. This study only includes noise from road sources, as there are no other nearby sources.

In Section 3.0, the noise impact calculation procedure is described and in Section 4.0, the predicted noise impact from Bank Street, Somerset Street and O'Connor Street onto this development has been analyzed. Section 5.0 is an AIF analysis recommendations for any required upgrades to the exterior envelope of the building are discussed.

2.0 Site Plan Evaluation

2.1 Project Description

The proposed development consists of rezoning and renovating an existing residential building. The building is located at 379 Cooper Street in Ottawa, Ontario. The area surrounding the development consists of two residential buildings on the south side of Cooper Street, a mid-size office building between Bank Street and the property, as well similarly sized residential houses to the-east of the building and a church between 379 Cooper Street and O'Connor Street. These buildings act as partial noise barriers between 379 Cooper and the three surrounding streets which are analyzed as noise sources. We have considered traffic noise from Bank Street, Somerset Street and O'Connor Street as the only noise sources for this location.

2.2 Site Plan Review

The following Figure, 2.1, shows the location of the building and the surrounding area including surface transportation noise sources. Bank Street, Somerset Street and O'Connor Street are the only surface transportation noise sources that must be considered as they are located 70 m, 95 m and 100 m away from the building, respectively. According to the City of Ottawa Environmental Noise Control Guidelines, if the development is within 100 m of an arterial road, a noise study is required. The type of road is defined in the City of Ottawa Schedules E and F.

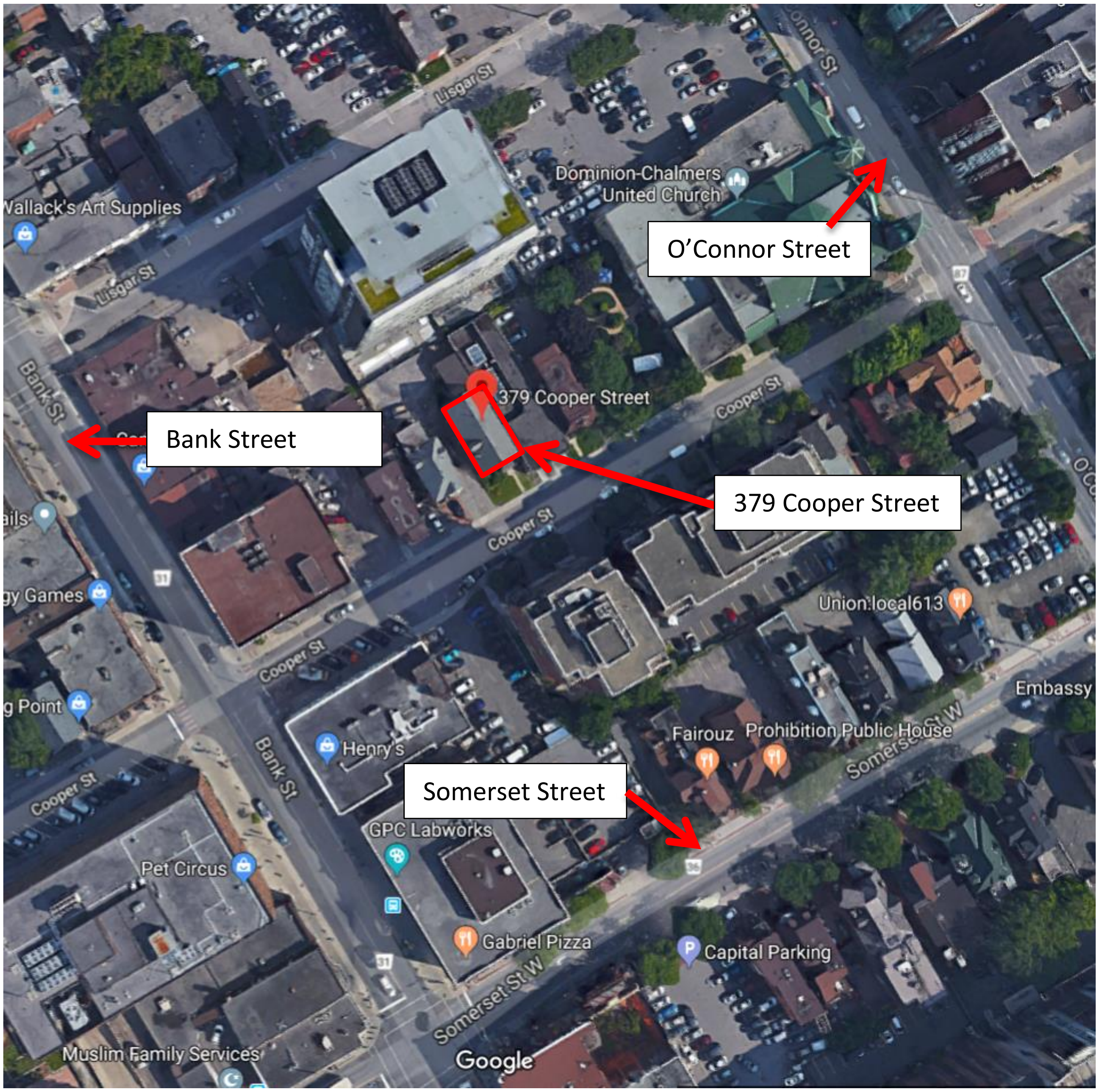

Figure 2.1 – Surrounding area and location of 379 Cooper Street

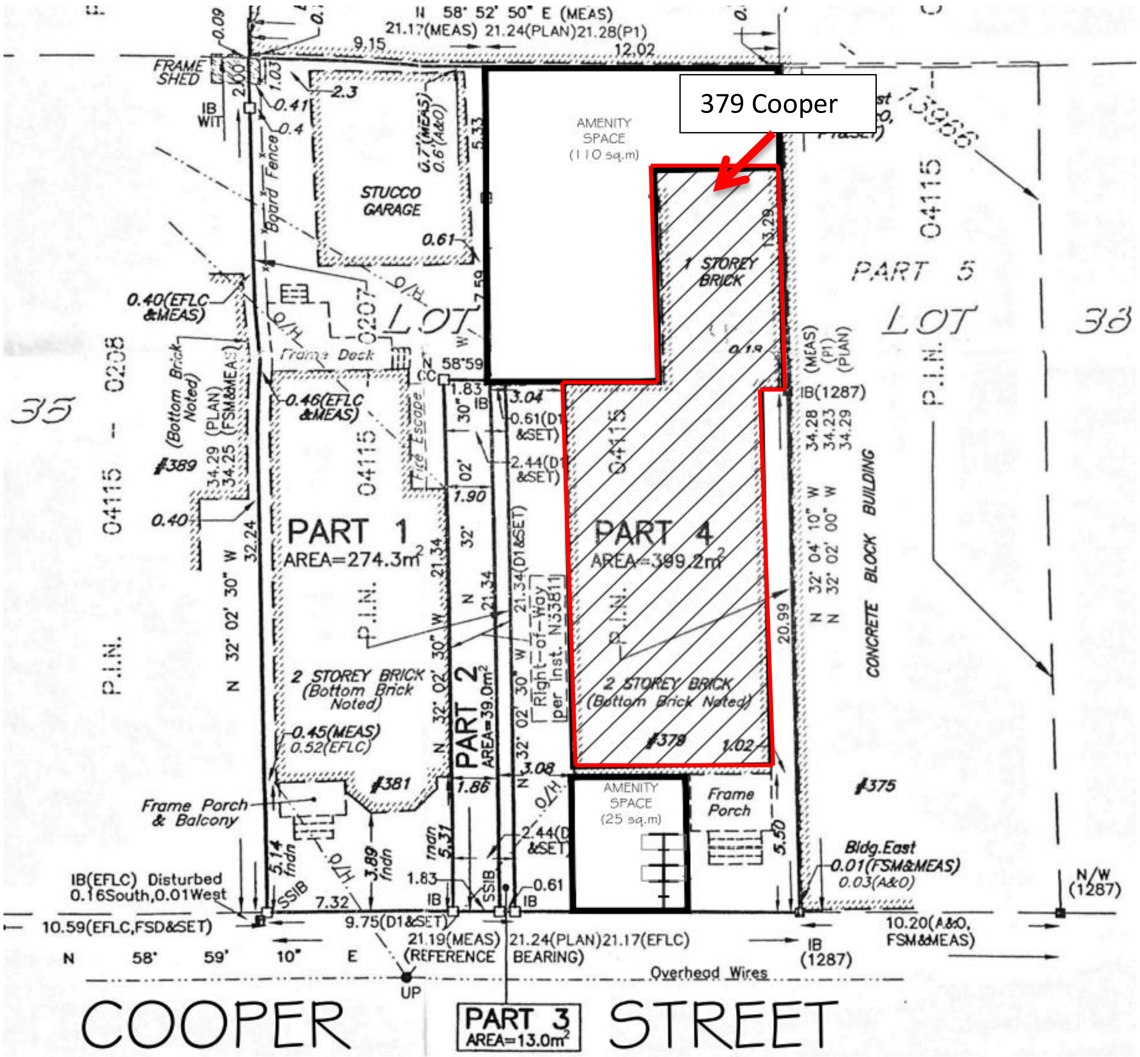

Figure 2.2 – Site plan of 379 Cooper Street.

3.0 NOISE IMPACT PROCEDURE

3.1 Procedure Used to Assess Noise Impacts

This assessment uses the City of Ottawa Environmental Noise Control Guidelines (ENCG), dated January 2016, to assess and mitigate noise from roads, transit ways, railways and aircraft. The maximum road noise levels for indoor areas that apply to this building are taken from Table 2.2b of the ENCG and summarized in Table 3.1 below with outdoor level limits shown in Table 3.2.

Time	**Indoor Leq Levels (dBA) Class 1, 2 & 3 Areas**
	Road Traffic/Light Rail Noise Level Limit (dBA)
07:00 – 23:00	**45** for living/dining areas of residences and sleeping quarters
23:00 - 07:00	**40** for sleeping quarters

Table 3.1 – Criteria for Indoor Area Road and Rail Noise Levels

The ENCG states that noise control studies are to be prepared when the indoor area is within the following setback distances from the road, highway and railway noise sources:

- 100m from an arterial road or a major collector, light rail corridor or bus rapid transitway
- 250m from an existing or proposed highway
- 300m from a proposed or existing rail corridor or secondary main railway line
- 500m from a 400-series provincial highway or principle main railway line

This noise control study is required as the building is less than 100m from Bank Street, O'Connor Street and Somerset Street.

3.2 Noise Attenuation Requirements

This section outlines the required noise control measures and warning clauses and when to apply them, as stipulated by the ENCG for placement within purchase agreements.

If sound levels are predicted to be less than the specified criteria, no attenuation measures are required on the part of the proponent. If the predicted noise exceeds the criteria, the City of Ottawa recommends several attenuation measures.

These attenuation measures may include any or all of the following:
- construction of a noise barrier wall and/or berm;
- installation of a forced air ventilation system with provision for central air;
- installation of central air;
- acoustically selected building façade components

Where excessive noise levels may adversely affect the property or its use, the ENCG requires notices in the form of a Warning Clause to be placed on title in order to alert the buyer or renter of a possible environmental noise condition or a limitation on his/her property rights. The notices on title must be included in the Development Agreement(s) and in the Agreement(s) or Offer(s) of Purchase and Sale.

The City of Ottawa requires a Warning Clause whenever noise could meet or exceed 55 dBA 16 hour Leq at the Outdoor Living Area or Plane of Window of any living or sleeping area prior to any noise mitigation.

Table 3.2 provides the types of warning clauses and example text to be adapted into warning clauses. These warning clauses should be taken as _*example only*_ and are taken from Appendix A of the ENCG which also states:
"A warning clause is not considered a form of noise mitigation. It is not acceptable therefore to use warning clauses in place of physical noise control measures to identify an excess over the MOE or City noise limits."

TYPE	Example Text	Notes
Generic	Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transit way traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this development has been designed so as to provide an indoor environment that is within provincial guidelines. Measures for sound attenuation include: • multi-pane glass; • brick veneer; • concrete panels;	The generic warning clause outlines that MOE sound levels may be exceeded but the indoor environment is within guidelines. Mitigation measures are described including urban design features. Mention is also made of landscaping to screen the development visually from the source of noise.
Extensive mitigation of indoor and outdoor amenity area	"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road/rail/Light Rail/transitway traffic may, on occasion, interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this development may include: • multi-pane glass; • brick veneer; • construction of a solid fence in backyard area To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features. This dwelling unit has also been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning will allow windows and exterior doors to remain closed, thereby	The warning clause makes reference to MOE sound levels being exceeded from time to time and that there are sound attenuation features and landscaping within the development that should be maintained.

	ensuring that the indoor sound levels are within the sound level limits of the City and the Ministry of the Environment.	
No outdoor amenity area	Purchasers/tenants are advised that sound levels due to increasing road/rail/Light Rail/transitway traffic will interfere with outdoor activities as the sound levels exceed the sound level limits of the City and the Ministry of the Environment. To help address the need for sound attenuation this development may includes • multi-pane glass; • brick veneer; • construction of a solid fence in backyard area To ensure that provincial sound level limits are not exceeded it is important to maintain these sound attenuation features. This dwelling unit has been supplied with a central air conditioning system and other measures 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 City and the Ministry of the Environment.	This warning clause notes that only an indoor environment is being provided for.

Table 3.3 - Warning Clause Types and Example Text from the City of Ottawa (from ENCG Table A1)

3.3 Building Component Assessment (AIF Analysis)

According to the ENCG, when noise levels could exceed 55 dBA at the Plane of Windows (POW) of a living area (day) or sleeping quarters (night) the exterior cladding system of the building envelope must be acoustically designed to ensure the indoor noise criteria is achieved. The City of Ottawa recognizes the Acoustic Insulation Factor (AIF[1]) method as an appropriate analysis technique.

To comply with the City of Ottawa policies, the building envelope will require a minimum AIF rating to provide the indoor noise level required for living, dining and bedrooms of residential dwellings as described below.

The City of Ottawa's ENCG outlines the following maximum indoor Leq limits:

- maximum daytime indoor L_{eq} for living spaces should be 45 dBA
- maximum nightime indoor L_{eq} for bedrooms should be 40 dBA

For the overall exterior wall of any room, the required AIF for road and rail transportation noise is:

Required AIF = Outside L_{eq} - Indoor L_{eq} (Req) + 2dB **(1)**

When the exterior is comprised of components, then the AIF required of each component is determined by the following equation[1]:

Required AIF = Outside L_{eq} - Indoor L_{eq} (Req) + 10 $\log_{10}$ (Number of Components) + 2dB (2)

The required AIF is based on the Outside L_{eq}, Indoor L_{eq} required and the total number of exterior façade components. The AIF method allows for the number of components to be reduced if any component significantly exceeds the required AIF[1]:

"If the AIF of any component exceeds the required AIF by 10 or more, the calculation should be repeated for the other components with the 'total number of components' reduced by one. This reduction in the number of components lowers the required AIF for the others."

[1] J.D. Quirt, Building Research Note: Acoustic Insulation Factor: A Rating for the Insulation of Buildings against Outdoor Noise, National Rearch Council [Revised June 1980]

4.0 Surface Transportation Study

The following section describes our analysis of the road noise impact on the building at 379 Cooper Street.

4.1 Road Traffic Information

For this study, the three surface transportation noise sources considered are traffic from Bank Street, O'Connor Street and Somerset Street. This building is farther than 100m from any other urban collector, therefore no other surface noise sources are considered.

Table 4.1 below summarizes the roadway's parameters obtained from Table B1 on p. 75 of The City of Ottawa Environmental Noise Control Guidelines 2016, "Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions" for the respective roadway class.

Roadway	Implied Roadway Class	Annual Average Daily Traffic (AADT) Veh/Day	Posted Speed	Day/Night Split (%)	Medium Trucks (%)	Heavy Trucks (%)
Bank Steet	2 Lane Urban Arterial	15,000	50 km/h	92/8	7	5
Somerset Street	2 Lane Urban Arterial	15,000	50 km/h	92/8	7	5
O'Connor Street	2 Lane Urban Arterial	15,000	50 km/h	92/8	7	5

Table 4.1 – Summary of Major Roadway Noise Sources.

4.2 Procedure Used for Roadway and Railway Noise Analysis

In order to calculate the road noise impact at the proposed development, we utilized the Ministry of Environment's STAMSON modeling software version 5.04. This program allows us to input variables of a road or railway such as traffic volume, types of vehicles, speed, barrier locations and topography to determine the environmental noise impact at a point of reception.

4.3 Points of Reception

To determine the worst case noise impact on the façade of the building, we have chosen one location at the south west corner of the building. POR1 is located in Room 1 on the first floor on the south-west corner of the building. We have chosen this POR to represent this scenario for traffic noise from Bank Street, Somerset Street and Cooper Street as the worst case scenario of all traffic noise as it is the closest point to the closest traffic noise source (Bank Street). Units on the first floor were chosen as traffic will be the most apparent at street level. The façade on the first floor is identical to the façade of the rest of the building. The position of our Point of reception is shown in Figure 4.1, indicated by the blue cross.

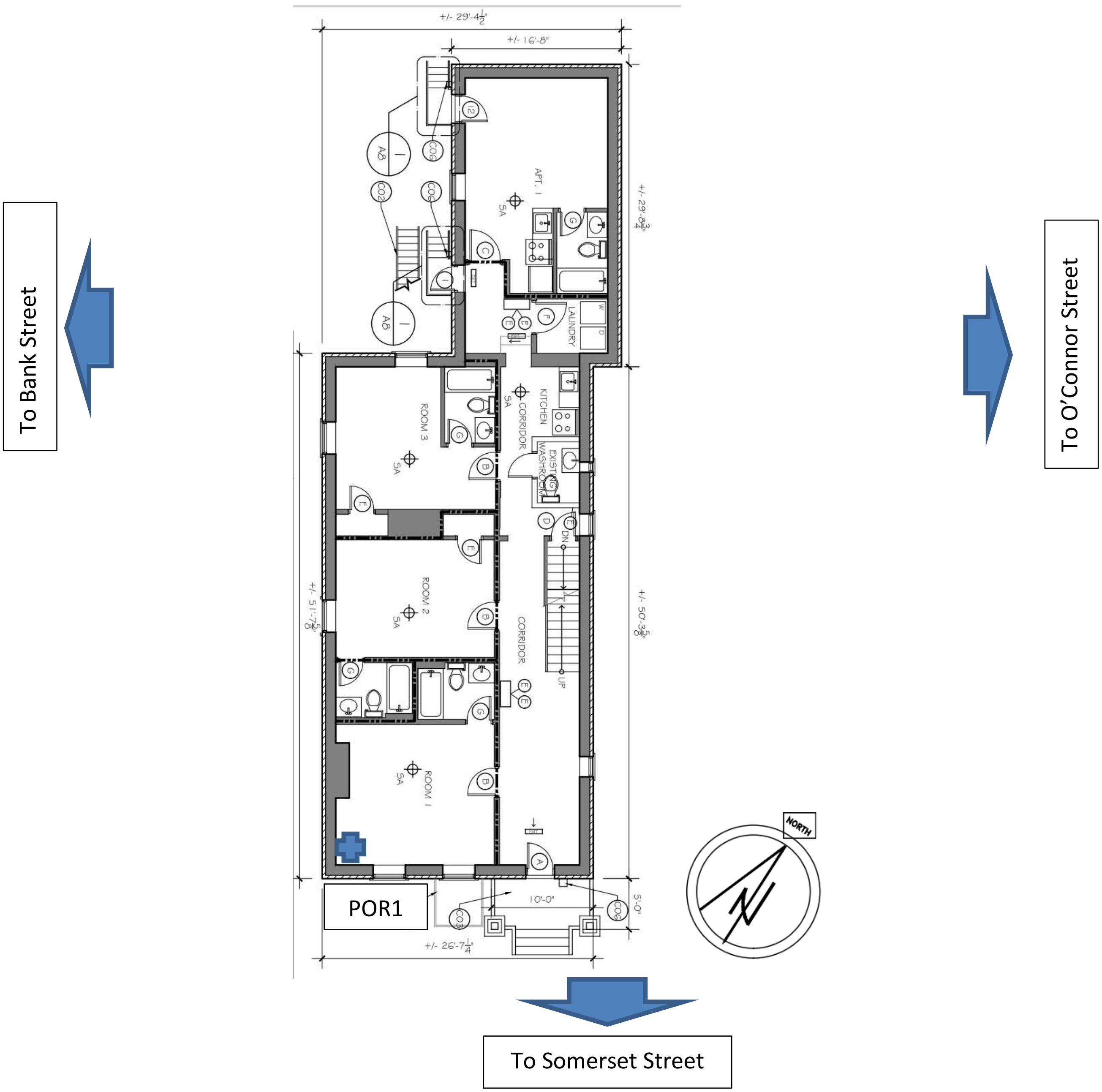

Figure 4.1 – Site Plan showing the Point of Reception (POR1).

4.4 Parameters Used for Analysis

The parameters used in STAMSON to assess the noise impact at POR 1 are shown below in Table 4.2:

Parameter	Values Used
Roadway:	**Bank Street**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	3
Density of First Row%	40
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	70
Roadway:	**Somerset Street**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	2
Density of First Row%	95
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	95
Roadway:	**O'Connor Street**
Time Period	16h/8h
Topography	Flat/gentle slope no barrier
Rows of Houses	4
Density of First Row%	60
Intermediate Surface	Reflective
Receiver Height (m)	1.5
Source Receiver Distance (m)	100

Table 4.2 – Parameters used in STAMSON model at POR 1 (201 Living Room)

We have assessed daytime levels as well as nighttime levels for POR1. It should be noted that there are buildings surrounding the property which act as sound barriers to POR1 at 379 Cooper Street. There is an 11 meter tall residential building between Bank Street and the property as well as a 12 meter tall building between 379 Cooper Street and O'Connor Street and finally there is a large residential building across the street which almost completely blocks Somerset Street which stands at approximately 39 meters tall.

4.5 Surface Transportation Noise Levels

The following table summarizes the predicted sound pressure levels at the points of reception from the results of the STAMSON environmental noise software calculation (Appendix A).

	POR 1 (dBA)	
	Day	**Night**
Bank Street	56.8	49.2
Somerset Street	50.0	42.4
O'Connor Street	52.3	44.7
Total	**58.7**	**51.1**

Table 4.5 – Predicted Road Noise at the Point of Reception

Table 4.5 shows the predicted sound pressure levels at the plane of window for the worst case scenario POR at the 379 Cooper Street. It should be noted that the noise during both the daytime and nighttime at the POR is dominated by noise from Bank Street, as it is closer to 379 Cooper Street. Additionally, there is significant shielding from O'Connor Street and Somerset from the surrounding buildings which act as barriers.

4.6 Roadway Noise Summary and Analysis

We have calculated the predicted noise level caused by traffic using STAMSON and have shown that a 16h L_{eq} at POR1, located on the 1st floor of the South façade of the building, is 58.7 dBA. The nighttime 8h L_{eq} was calculated to be 51.1 dBA. As the levels during the day are above 55 dBA, an evaluation of exterior building components is undertaken in Section 5 in order to verify that building components will achieve the required daytime indoor sound level of 45 dBA for living spaces. The calculated daytime levels account for a worst case scenario in terms of traffic noise.

5.0 Exterior Building Component Analysis

In this section, we determine if the building complies with the City of Ottawa's ENCG indoor noise requirements based on the existing or proposed wall and window construction. We compare the required minimum façade AIF to the estimated AIF of the currently selected façade materials.

5.1 Building Components and Room Dimensions

The current design of the building's south building façade is made up of 2 different components:

1) Glazing
2) Exterior wall

The existing exterior wall composition of the south and west walls was provided by McIntosh Perry. This wall type is sufficiently similar to wall type EW5 described in the Canada Mortgage and Housing Corporation (CMHC) document "Road and Rail Noise: Effects on Housing". Table 5.1 shows a comparison of both these wall compositions.

Ext. Wall Assembly fr. McIntosh Perry	Wall Type EW5 from CMHC Road and Rail Noise
-90mm Brick Veneer -25mm Air Space -13mm Fiberboard Sheathing -89mm Studs @ 400mm o.c. Fiberglass Batt insul. With paper backing vapour barrier -19mm x 63mm Horizontal wood lath -19mm Plaster finish painted	-100mm Brick Veneer -25mm Air Space -Sheathing -38 by 89mm studs Studs @with 50mm of Batt insulation or thicker -Vapour barrier -12.75mm gypsum board

Table 5.1 – Comparison of 379 Cooper Street building exterior wall and equivalent wall from CMHC, Road and Rail Noise: Effects on Housing.

The current window composition for the building is wood frame single pane – non insulated glass. Proposed new windows are to be vinyl frame windows with double pane hermetically sealed glazing as per information from McIntosh Perry.

The calculation of AIF for each building component depends on the ratio of the area of a given component on the exterior to the total floor area of the corresponding interior room. Using plan view and elevation drawings, we have determined these dimensions for Room 1 for which we determined the noise impact at POR1. The areas of the exterior wall components and ratios to the floor are given in Table 5.2 below. The layout of Room 1 is shown in Figure 5.1.

	POR1 (Room 1)
Floor Area [m^2]	**19.8**
Window Area [m^2] (ratio to floor area)	3.2 (16.2%)
Wall Area [m^2] (ratio to floor area)	23.1 (116.7%)

Table 5.2 – Shows the areas of Exterior Building Components and the Floor Area at POR1.

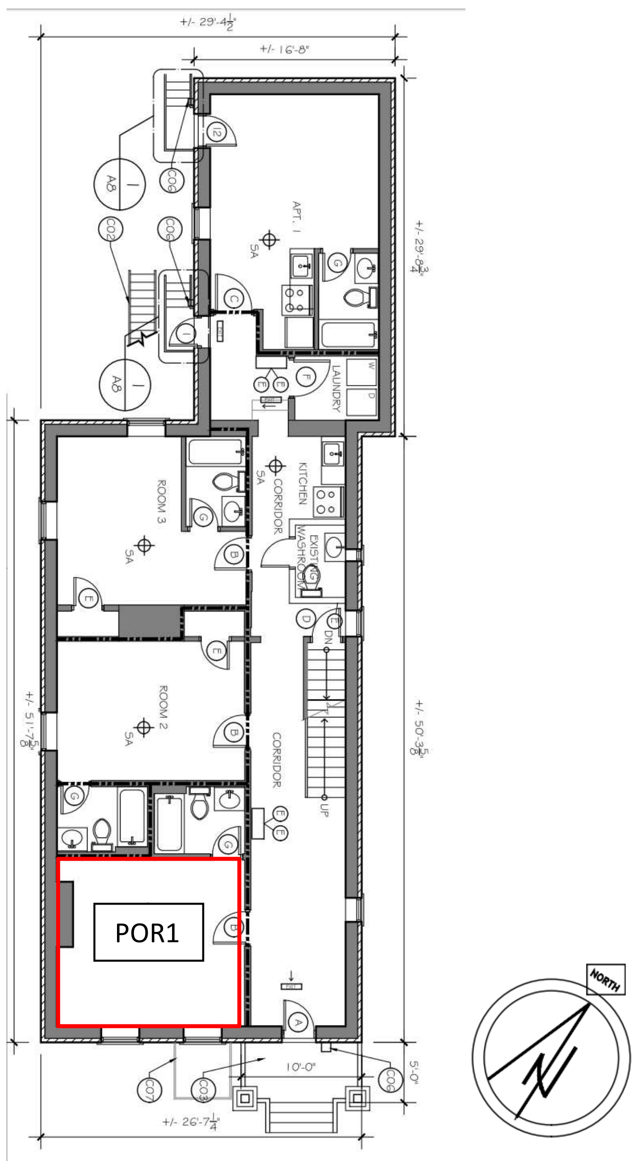

Figure 5.1 – Layout of Room 1 used for analysis indicated in red.

5.2 Required Overall AIF

Using Equation (2), the required overall AIF for POR1 (Room 1) for the envelope is calculated as follows, allowing for the possibility of noise-sensitive uses requiring an indoor level for living areas of 45 dBA:

POR 1: Required AIF = 59 (Outside L_{eq}) – 45 (Required Indoor L_{eq}) + $10\log_{10}(2)$ + 2 = 19 (3)

Thus the daytime AIF requirement of POR 1 is 19. This case will be used for the remainder of our analysis.

5.3 Initial Calculation of AIF per Wall Component

The building exterior at POR1 and POR2 is made up of two components as described above. The calculation of the number of components is outlined in the CMHC "Road and Rail Noise: Effects on Housing" publication. As shown by Equation 3, we have calculated that the required overall AIF for the two component façade is 19.

We first determine the AIF of the currently designed exterior wall for POR1, according to Table 6.3 in CMHC "Road and Rail Noise: Effects on Housing".

Using ratios of 116.7% (~120%) of wall area to floor area for POR1, the AIF for the exterior wall, which we have assumed to be sufficiently similar to CMHC wall type EW5, is **46** at POR1. The AIF was calculated from CMHC data and wall area to floor area ratios. The AIF of the wall component of the façade is much greater than the minimum overall AIF of 19.

As stated in Section 3.3 from the CMHC "Road and Rail Noise: Effect on Housing" document, if the AIF of any component exceeds the minimum required AIF by more than 10, the minimum AIF should be re-calculated with the number of components reduced. This is calculated below in Equation 5:

POR 1: Required AIF = 59 (Outside L_{eq}) – 45 (Required Indoor L_{eq}) + 2 = 16 (5)

Therefore the new minimum AIF is 16, which will dictate the window requirement.

5.4 Exterior Glazing Requirements Based on Minimum AIF

If the exterior wall envelope is constructed as described above, the minimum AIF of 16 dictates the overall window construction at both PORs.

Using ratios of window area to floor area of 16.2% for POR1 and table 6.2 in the CMHC "Road and Rail Noise: Effect on Housing" we conclude that the new proposed window composition with double pane glazing is acceptable for any pane thickness, as the required AIF is well below the AIF achieved for any double paned window. Table 5.3 summarizes various possible window compositions which could be used and their AIF values compared to the requirements.

Windows	Glass Thickness	Interplane Spacing	Window area to floor area	AIF of window	AIF Requirement
Room 1	3 mm & 3 mm	13mm	16%	32	16
Room 1	3 mm & 6 mm	6mm	16%	33	16

Table 5.3 – Glazing analysis for Room 1 at 379 Cooper Street, data taken from CMHC "Road and Rail Noise: Effect on Housing" Table 6.2.

5.5 Summary

Exterior Walls (Section 5.3)

Typical Floor Ext. Wall Assembly
-90mm Brick Veneer
-25mm Air Space
-13mm Fiberboard Sheathing
-89mm Studs @ 400mm o.c. Fiberglass Batt insul. With paper backing vapour barrier
-19mm x 63mm Horizontal wood lath
-19mm Plaster finish painted

The AIF value for the exterior wall exceeds the requirements significantly and no changes are required.

Exterior Glazing (Section 5.4)

Two options for the proposed double pane glazing assembly are shown in Table 5.3. The AIF values for this type of window exceed the requirements by 16-17 points and any double pane glazing will meet the AIF requirement of AIF 16..

Overall, no modifications are necessary to the existing or proposed façade components.

6.0 Conclusion

We have analyzed the traffic noise impact for road sources for the existing residential building on 379 Cooper Street. A detailed building component analysis was completed due to levels over 55 dBA at the Plane of Window (POW). It was determined that the existing walls and proposed new windows for the building met or exceeded AIF requirements. A summary of our analysis can be found in Section 5.5, and a more detailed analysis for each component can be found in Section 5.3 and 5.4. STAMSON calculations have been included in Appendix.

If you have any questions or concerns regarding this report, please let us know.

Sincerely,

Patrick Richard, M.Sc.E.
Acoustic Consultant

Rebecca Sondermeyer
Acoustic Consultant

Approved By:

LICENSED PROFESSIONAL ENGINEER
D. E. BUCHAN
AUG 9, 2018
PROVINCE OF ONTARIO

Donald Buchan, P.Eng
Principal
Buchan Lawton Parent Ltd.

Appendix A
STAMSON Calculations

STAMSON 5.0 NORMAL REPORT Date: 31-07-2018 17:29:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 379coop.te Time Period: Day/Night 16/8 hours
Description:

Road data, segment # 1: Bank (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 : 10.00
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 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 3 / 3
House density : 40 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 70.00 / 70.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Somerset (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 : 10.00
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: Somerset (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 2 / 2
House density : 95 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 95.00 / 95.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: Oconnor (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 : 10.00
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: Oconnor (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg

Wood depth : 0 (No woods.)
No of house rows : 4 / 4
House density : 60 %
Surface : 2 (Reflective ground surface)
Receiver source distance : 100.00 / 100.00 m
Receiver height : 1.50 / 1.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Bank (day)

Source height = 1.50 m

ROAD (0.00 + 56.79 + 0.00) = 56.79 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.48	0.00	-6.69	0.00	0.00	-5.00	0.00	56.79

Segment Leq : 56.79 dBA

Results segment # 2: Somerset (day)

Source height = 1.50 m

ROAD (0.00 + 50.03 + 0.00) = 50.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.48	0.00	-8.02	0.00	0.00	-10.43	0.00	50.03

Segment Leq : 50.03 dBA

Results segment # 3: Oconnor (day)

Source height = 1.50 m

ROAD (0.00 + 52.27 + 0.00) = 52.27 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.48	0.00	-8.24	0.00	0.00	-7.97	0.00	52.27

Segment Leq : 52.27 dBA

Total Leq All Segments: 58.73 dBA

Results segment # 1: Bank (night)

Source height = 1.50 m

ROAD (0.00 + 49.19 + 0.00) = 49.19 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.88	0.00	-6.69	0.00	0.00	-5.00	0.00	49.19

Segment Leq : 49.19 dBA

Results segment # 2: Somerset (night)

Source height = 1.50 m

ROAD (0.00 + 42.43 + 0.00) = 42.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.88	0.00	-8.02	0.00	0.00	-10.43	0.00	42.43

Segment Leq : 42.43 dBA

Results segment # 3: Oconnor (night)

Source height = 1.50 m

ROAD (0.00 + 44.68 + 0.00) = 44.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	60.88	0.00	-8.24	0.00	0.00	-7.97	0.00	44.68

Segment Leq : 44.68 dBA

Total Leq All Segments: 51.13 dBA