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2024-02-09

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482 Preston Street Rooftop Patio - Noise Study R1

Dear Ainslie,

We have completed an environmental noise study for the proposed rooftop patio at 482 Preston Street in Ottawa, Ontario. Our study aims to assess the noise impact from patrons and loudspeakers on the patio to the nearest residential buildings. The three residential buildings closest to the rooftop patio include three single-family residences, 88, 89, and 90 Adeline Street, and the SoHo Italia Condominium building, 500 Preston Street. Additionally, this study compares the average predicted noise level due to patrons and loudspeakers on the patio to the ambient daytime noise level in the local environment, as calculated from four points of reception (background PORs).

Executive Summary of Results

The City of Ottawa Environmental Noise Control Guidelines (ENCG, 2016) mandate that sources of stationary noise located in a Class 1 (urban) area are not to exceed 50 dBA during the day (between 0700 and 2300 hours) and 45 dBA during the night (between 2300 and 0700 hours) at the plane of window of nearby residences. Using noise modelling and prediction software, we estimate the maximum noise level generated by patrons and loudspeakers on the patio.

We determined the maximum sound pressure level (SPL) of noise generated by patrons on the patio to be approximately 48 dBA at the plane of window of the nearest residence, 88 Adeline Street. Therefore, the noise generated by patrons on the patio will likely meet or exceed the ENCG nighttime limit of 45 dBA. However, no noise mitigation measures are required if the patio does not operate past 2300 hours. Otherwise, we demonstrate that the noise impact at 88 Adeline Street and SoHo Italia due to patrons on the patio can be reduced below the 45 dBA nighttime limit by installing a sufficient sound barrier as per **Section 3.1.**

The maximum SPL of the sound production devices that will be installed on the patio will need to meet the limits given in **Section 3.2** while following Ottawa's Noise Bylaw. We recommend the addition of a sound indicator to ensure that noise levels are kept at the given maximum SPL required by the City of Ottawa.

As long as the above requirements and recommendations are followed, the patio, per our simulation, will meet the City of Ottawa's ENCG requirements.

1.0 Site Description

482 Preston Street in Ottawa, Ontario, is the location of Avenue North Realty Inc. Brokerage. While not a restaurant, the building includes a rooftop patio where Avenue North Realty employees can work, meet with clients, and host client appreciation events such as BBQs, etc. Physically, the building consists of two storeys, with an approximately 3-meter-high stairwell structure on the roof, which allows access to the patio space. The total area of the rooftop patio (including the footprint of the penthouse structure) is approximately 127 m^2. A combination of wood and glazed barriers has been installed along the patio's perimeter (see **Figure 1.1**).

Figure 1.1 - 482 Preston Street. 88 and 90 Adeline Street, Dow's Lake Dental (484 Preston Street), and SoHo Italia (500 Preston Street) are also shown.

482 Preston Street is located at the south-west corner of the intersection of Preston and Adeline Street (see **Figure 1.2**) and is situated adjacent to Dow's Lake Dental (484 Preston St.). Most of the buildings surrounding 482 Preston Street are commercial buildings. The four residential buildings closest to the rooftop patio include three single-family residences at 88, 89, and 90 Adeline Street and the SoHo Italia Condominium building at 500 Preston Street.

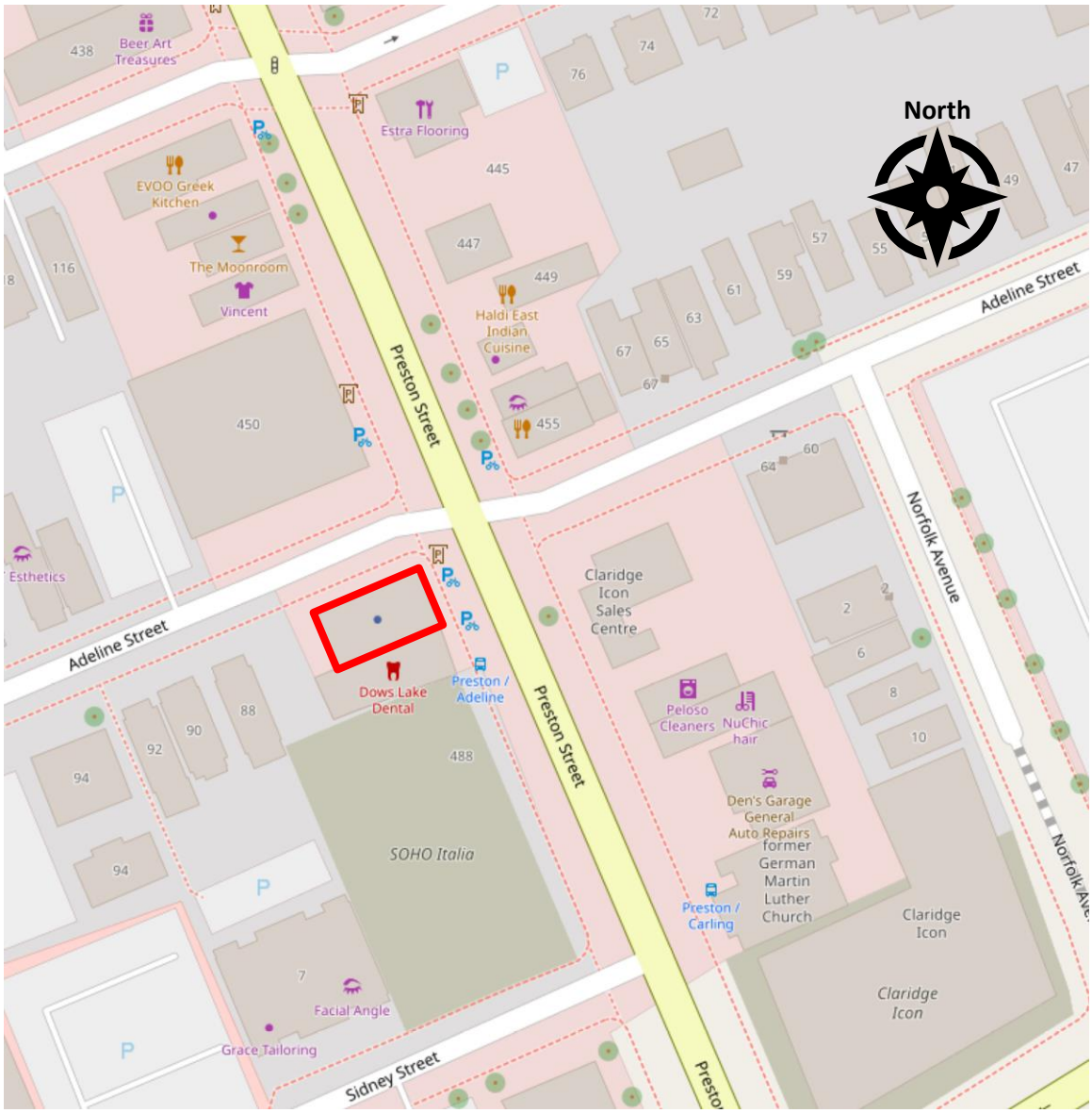


Figure 1.2 - Map view showing the location of 482 Preston Street (outlined in red) and the surrounding area.

2.0 Measurements and Methodology

2.1 Noise Sources

Patrons

To simulate the noise levels produced by patrons on the patio, we used empirical sound power levels obtained from our measurements of persons talking in raised voices, as this would be the situation expected for persons conversing outdoors or talking over nearby conversations. Two such measurements were taken using an Acculab RSS-400, which resulted in sound power levels of 66.1 dBA for Speaker A and 65.4 dBA for Speaker B. It should be noted that these measurements agree with the sound pressure levels (SPLs) presented in Standard S3.5 of the American National Standards Institute for speech at a raised volume, which is given as 59.2 dBA at a distance of 9 meters. Such a value is consistent with a sound power level of 66.1 dBA and our measurements. The spectral data of our measurements are presented in **Table 2.1**.

	Frequency [Hz]								Total [dBA]
Noise Source	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
1. Speaker A	55.2	64.5	66.8	66.1	58.5	54.6	52.7	46.0	66.1
2. Speaker B	51.0	59.1	63.9	65.9	57.7	56.1	47.7	44.1	65.4

Table 2.1 – Octave band sound power levels of speakers.

Loudspeakers

The specific loudspeakers planned for installation are the R800S Outdoor Sandstone-Finish Rock-Shaped Speakers by Proficient (refer to the **Appendix** for the cut sheet). These speakers feature an 8" graphite woofer and a 1" tweeter. Considering the variability in the noise spectrum for music, the loudspeakers were modelled using a single octave band centred at 1000 Hz.

2.2 Software

The noise predictions in this report were obtained using an environmental noise modelling software called CadnaA, which references ISO 9613. CadnaA predicts environmental noise through calculations based on a 3D model, which uses geometrical, landscape, and topography data combined with details of the building subject and the relevant noise source power levels.

2.3 Modeling Process

Using CadnaA, we created a 3D rendering of the neighbourhood around 482 Preston Street and placed noise sources (patrons) on the patio. It was explained to us that the maximum capacity of the rooftop patio at 482 Preston Street is 86 persons. However, one would not expect 86 persons to talk simultaneously in a typical situation. Instead, a reasonable assumption is that at any given time, only 43 out of a maximum of 86 persons will be talking (50%). Therefore, we placed 43 patrons in our model and evenly assigned them the sound power levels from **Table 2.1**.

It should be noted that it is impossible to predict the actual noise from patrons on a patio such as this and that our predictions cannot cover all scenarios. The patio noise may be louder or quieter than the levels predicted in this study. However, the method we have described reasonably approximates many people talking in an outdoor space.

Figure 2.1 below shows the environmental noise model for 482 Preston Street and the surrounding area, including the patio, 88 and 90 Adeline Street, and SoHo Italia. Blue crosses denote the noise sources, in this case, patrons talking. The scenario which has been modelled is 43 persons talking at once out of the maximum 86 people on the patio. The sources (patrons) were located at a height of 1.2 m above the patio, which is the average height of a seated person. The model only considers noise from patrons on the patio and does not include any music or other noise sources. The colours on the ground and buildings represent sound pressure levels at those locations. Sound power levels per octave band were entered into CadnaA at the source locations. The resulting sound pressure levels were evaluated at 4 residential PORs, 88, 89, 90 Adeline Street, and SoHo Italia.

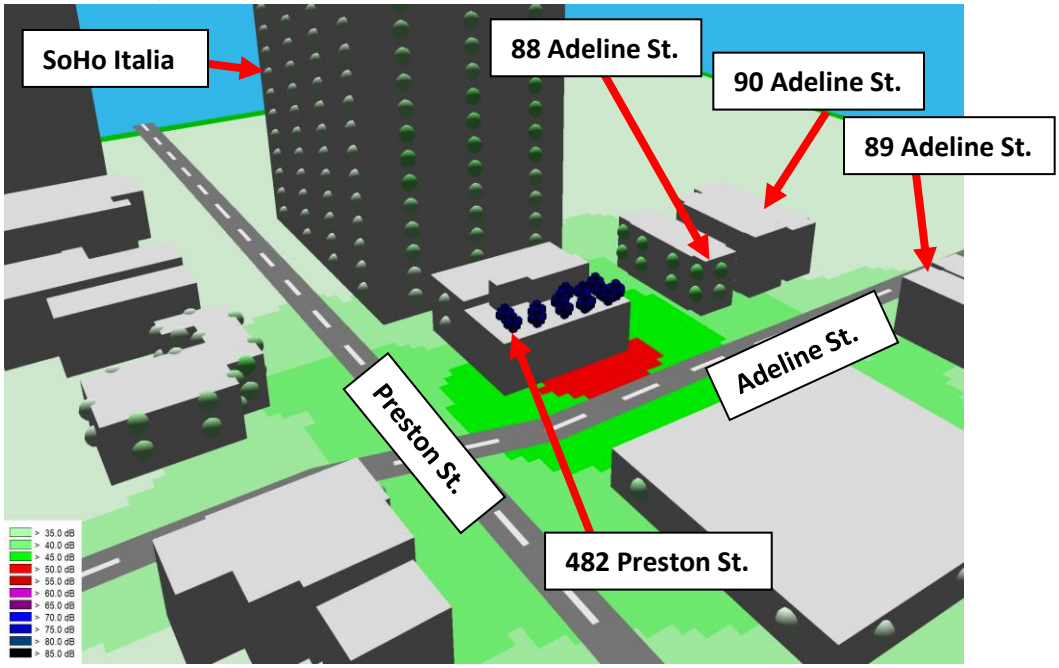


Figure 2.1 – 3D rendering of the environmental noise model for 482 Preston St., showing the patio layout, noise sources, and surrounding area. The perspective shown in the figure is approximately south-west facing.

We have assumed that a maximum of six loudspeakers will be installed on the patio, positioned to face the building façade, as depicted in **Figure 2.2**.

Figure 2.2 – Layout of the location of the six loudspeakers (red circle) and their directionality (red arrow) for 482 Preston Street's patio (imagery obtained via Google Maps)

2.4 Background Measurements

We have also measured the background noise over 15 minutes at three separate points of reception (background PORs) in the neighbourhood of 482 Preston Street. Measurements were taken using a CESVA SC310 Sound Level Meter at a sampling rate of 10 seconds. These measurements were then used to compute the equivalent continuous sound pressure level for 15 minutes, which is used as a comparison against the predicted noise from patrons on the patio. The background noise encompasses any traffic noise, mechanical noise from nearby buildings, and any other source. The following conditions were observed while taking measurements:

- Temperature: -7°C
- Winds: 7 km/h
- Humidity: 85%

Ideally, background noise measurements would have been taken at points along Adeline Street. However, background measurements could not be taken on Adeline Street due to the simultaneous construction at SoHo Italia. This is because the construction noise was too overwhelming to assess the representative background noise level in the neighbourhood accurately. Therefore, background noise measurements were taken a block north, at 3 PORs around Pamilla and Preston Street. While the measurements were being taken, it was noted that heavy trucks, medium trucks, fire trucks, and buses passed by on Preston Street. The traffic flow on Preston Street was constant but not heavy. Measurements were taken between 1200 and 1300 hours on January 12, 2022. The locations of the measurements are shown in **Figure 2.2**.

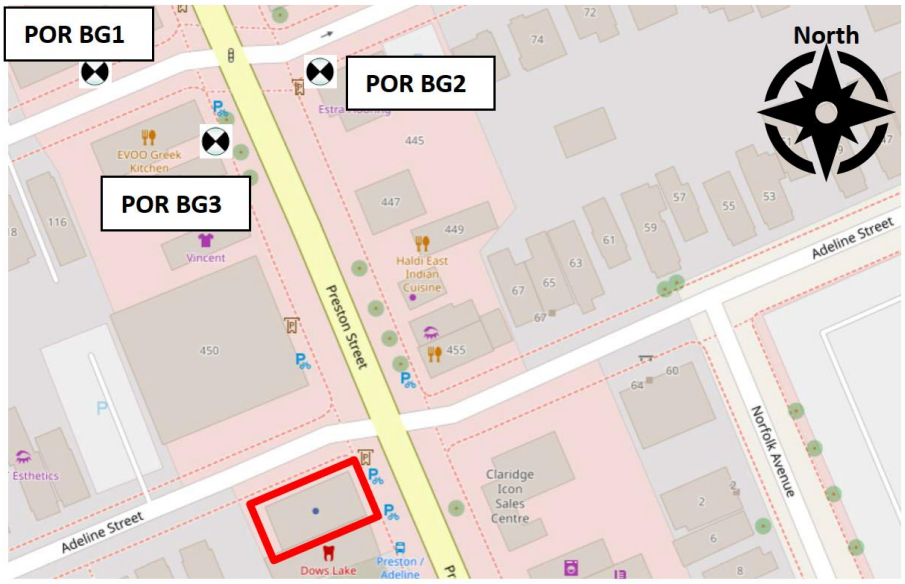


Figure 2.3 - Map view showing the location of 482 Preston Street (outlined in red), the surrounding area, and the locations of the background PORs.

The results of our measurements are listed in **Table 2.2,** where the average background noise in the neighbourhood of 482 Preston Street is 54.3 dBA.

POR BG ID	Average Measured Background Noise (dBA)
1	53.5
2	55.5
3	53.6

Table 2.2 – Average Measured Background Noise Levels at each POR detailed in **Figure 2.3**.

2.5 PORs

Following the modelling and noise calculation procedures described in **Sections 2.1 to 2.3**, we have selected four residential PORs. Three of these residences are 2-storey homes at 88, 89, and 90 Adeline Street. The fourth POR is located at SoHo Italia. As SoHo Italia is a 30-storey building, we have taken the height of the vertical midpoint of the nearest and most exposed storey to the 482 Preston Street patio, which is on the 5th floor.

POR Res ID	Height (m)	Address
1	4.5	90 Adeline Street
2	4.5	88 Adeline Street
3	18.0	SoHo Italia
4	4.5	89 Adeline Street

Table 2.3 – Table depicting height and address for each POR.

3.0 Results & Recommendations

3.1 Patio Patron Noise (Unamplified Noise)

Figure 3.1 illustrates the predicted noise generated by the patrons on the patio when the patio is full (86 patrons) without amplified music. Based on the information presented in **Section 2.0**, we have predicted sound pressure levels at the PORs indicated in **Section 2.5**. **Figure 3.1** illustrates the results of our simulation.

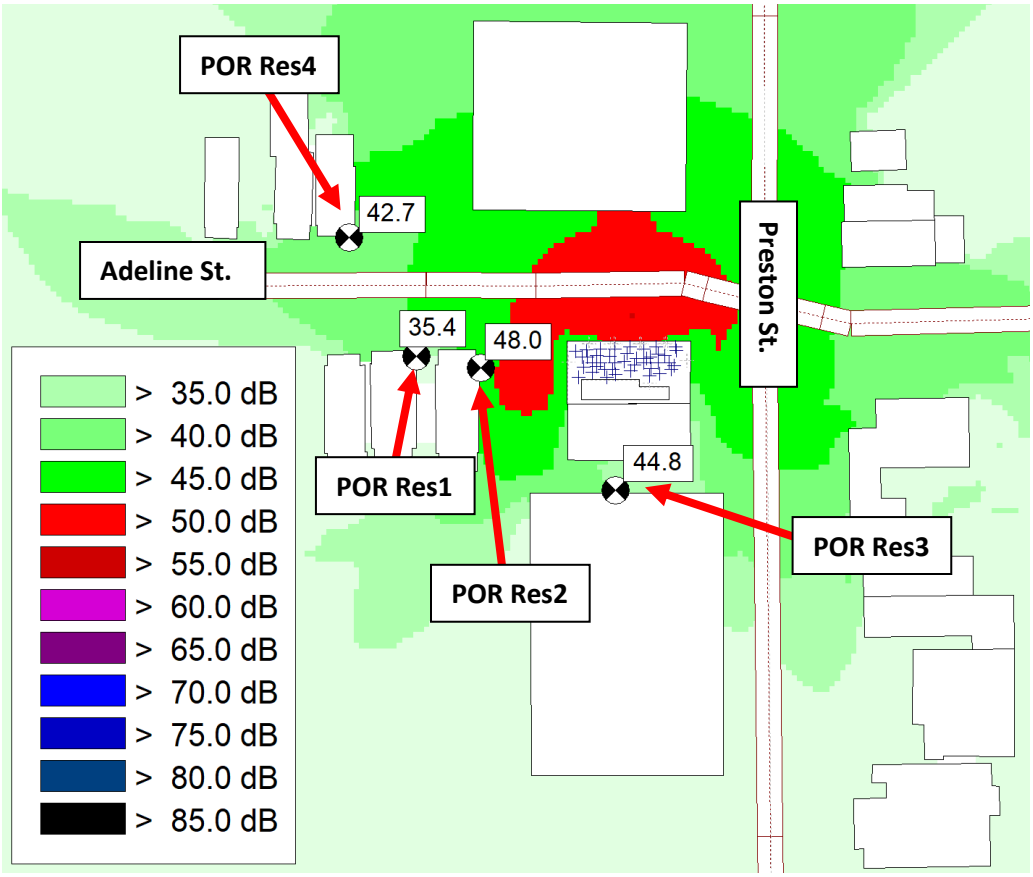


Figure 3.1 – 3D acoustic model showing predicted sound pressure levels as a result of patrons on the patio. The grid was measured at 4.5m.

According to our simulations, the noise impact from the patio will be below the 50 dBA daytime limit at all adjacent PORs. Based on the average sound pressure level of the traffic noise, we expect the noise generated by the patio to be comparable to the background noise levels in the area.

The predicted SPL at POR 2 and POR 3 is expected to exceed the allowable nighttime limit of 45 dBA. Therefore, if the patio is expected to be used between 2300 and 0700 hours, mitigation

measures will be required to reduce the impact on these PORs. This can be achieved by installing acoustical barriers on the west and south sides of the patio, as illustrated in **Figure 3.2**.

Currently, a wooden barrier exists on the west side of the rooftop patio, between the patio and 88 Adeline Street (**Figure 1.1**). However, due to the low surface density, the barrier does not meet the City of Ottawa's requirements for noise barriers. This barrier was not considered for the predicted and unmitigated SPL. If the patio is to be used during the nighttime, the west side barrier may be improved by installing plywood backing to the existing barrier such that its surface density increases to a minimum of 20lb/sqft. An additional barrier of 1.0m is also required on the roof of the building to the south of the patio to limit noise to the nearby residential tower at POR3. We have modelled this mitigated predicted noise and presented the results in **Table 3.1** and illustrated in **Figure 3.3**. We have modelled this mitigated situation using CadnaA, and the results are shown in **Table 3.1** and illustrated in **Figure 3.3**.

Figure 3.2 – Locations of the Recommended Barriers (in red) on the rooftop patio at 482 Preston Street (imagery obtained via Google Maps)

POR	Unmitigated SPL (dBA)	Mitigated SPL (dBA)	Will it meet 50 dBA (daytime ENCG limit)?	Will it meet 45 dBA (nighttime ENCG limit)
Res 1	35.4	30.3	Yes	Yes
Res 2	48.0	40.6	Yes	Yes
Res 3	44.8	41.2	Yes	Yes
Res 4	42.7	40.4	Yes	Yes

Table 3.1 – Results of the Installation of a 1.5m-tall Barrier is added to 482 Preston Street's Rooftop Patio between the patio and POR Res 2 and a 1.0m-tall Barrier is added between the patio and POR Res 3 when only patrons are present.

The results of adding the barrier to the simulation are illustrated in **Figure 3.4**.

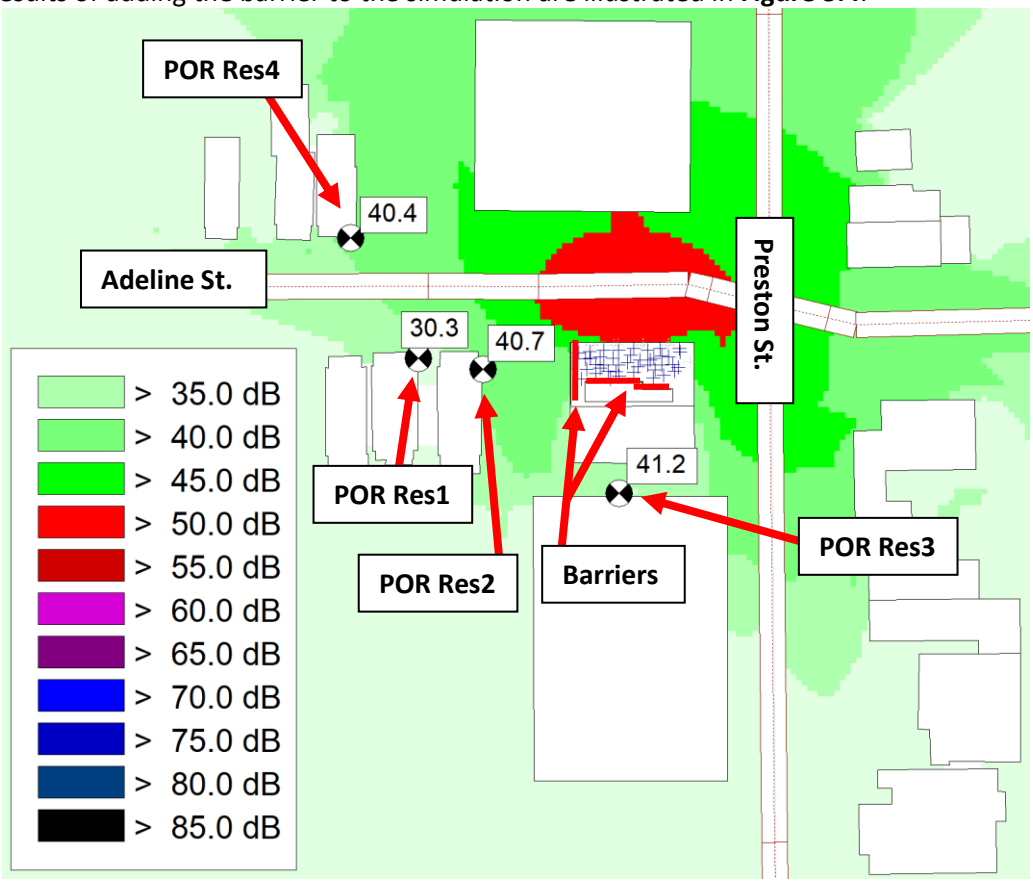


Figure 3.3 – 3D acoustic model showing predicted sound pressure levels as a result of patrons on the patio, both at the residential PORs and in the neighbourhood, with the addition of the barriers on the patio at the heights and locations in **Figure 3.2**. The grid was measured at 4.5m.

3.2 Sound Reproduction Device

Per **Section 2.3**, the loudspeakers that will be installed on the patio are the R800S Rock-Shaped Loudspeakers by Proficient (refer to the **Appendix** for the cut sheet). These loudspeakers will be positioned on the patio according to the specifications outlined in **Section 2.3** and will be oriented toward the building façade.

To comply with the City of Ottawa's daytime requirement of 50 dBA, the loudspeakers must be regulated when no patrons are present to have an average SPL of 65 dBA at the center of the patio (measured at 1.5m a.f.f.) and 62 dBA at the south perimeter of the patio (at the building façade / patio entrance). As outlined in Section 4 of the City of Ottawa Noise Bylaw (Bylaw No. 2017-255), loudspeakers must not be played between nighttime hours (2300 and 0700). Furthermore, on Saturdays, loudspeakers should not be used before 0900 hours, and on Sundays, statutory holidays, or public holidays, they should not be used before 1200 hours.

When patrons are present, the maximum sound level of the patio must meet 65 dBA at the building façade.

Table 3.2 provides simulated data and analysis of the patio when both the patrons and the six sound reproduction devices are active, considering the noise restrictions mentioned above:

POR	Patron and Loudspeaker SPL (dBA)	Will it meet 50 dBA (daytime ENCG limit)?
Res 1	36.3	Yes
Res 2	49.1	Yes
Res 3	48.7	Yes
Res 4	43.6	Yes

Table 3.2 – Results and Analysis of SPL at 482 Preston Street's Rooftop Patio with Both Loudspeakers and Patrons Present, Maintaining Loudspeaker at an average SPL of 65 dBA

To ensure that the patio is always below the maximum SPL of 65 dBA, installing a noise indicator can be valuable in alerting the patio owner(s) when the sound level exceeds the limit.

The SoundEar3-320X (see **Appendix**) is an example of an outdoor noise monitoring device. It will notify the owner when the noise level exceeds the set limit.

Alternatively, the NoiseSign (see **Appendix**) is another type of noise indicator with a visual alarm feature. It is an indoor wall-mounted sign connected to an outdoor microphone. The sign will light up when the noise levels exceed the set limit.

Conclusion

This report presents our analysis of the predicted sound pressure level generated by the proposed rooftop patio at 482 Preston Street in Ottawa. We have determined that the current patio will not generate noise in excess of the daytime limit of 50 dBA when the patio is at maximum capacity. We have also provided guidelines for the installation and use of sound reproduction devices (loudspeakers), which must be followed if music is to be played on the patio. If the patio is to be used during nighttime hours, mitigation measures will be required, as outlined in **Section 3.1**.

Our conclusions and recommendations regarding the noise produced by the patio patrons are in **Section 3.1**. Our regulations and recommendations for the sound reproduction device are in **Section 3.2**.

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

Sincerely,

Tiffany-Rose Filler, M.Sc.
Acoustic Consultant

APPENDIX

A1 – Loudspeaker Cutsheet
A2 – SoundEar 3-320X Cutsheet
A3 – NoiseSign Cutsheet

PROFICIENT
Outdoor™

Outdoor / Indoor Twin-Tweeter Speakers

AW600TTwht | blk

WHT	BLK	U/M
PAS42600	PAS42603	Each

One indoor/outdoor speaker with 6½" dual voice coil polypropylene woofer, two 1" pivoting Supernil soft dome tweeters and 125 watt power handling. Weather-resistant ABS housing, powder coated aluminum grille. Includes swivel mounting bracket. ***Order in white or black.***

- Power Handling: 125 Watts
- Frequency Response: 50Hz - 20kHz
- Impedance: 4Ω
- Sensitivity: 91dB 1W/1m
- Dimensions (H x W x D): 7" x 12" x 8"

AW500TTwht | blk

WHT	BLK	U/M
PAS42500	PAS42503	Each

One indoor/outdoor speaker with 5¼" dual voice coil polypropylene woofer, two 1" pivoting Supernil soft dome tweeters and 100 watt power handling. Weather-resistant ABS housing, powder coated aluminum grille. Includes swivel mounting bracket. ***Order in white or black.***

- Power Handling: 100 Watts
- Frequency Response: 60Hz - 20kHz
- Impedance: 4Ω
- Sensitivity: 89dB 1W/1m
- Dimensions (H x W x D): 7" x 11" x 6¼"

Rock Speakers

R800G / R800S

G	S	U/M
PAS10800	PAS10801	Pair

One pair of rock speakers with 8" graphite woofers, 1" polyamide dome tweeters and 90 watt power handling. ***Order in granite or sandstone.***

- Power Handling: 90 Watts
- Frequency Response: 65Hz - 20kHz
- Impedance: 8Ω
- Sensitivity: 95dB 1W/1m
- Weather-Resistant Design
- Dimensions (H x W x D): 14½" x 14½" x 11"

R650G / R650S

G	S	U/M
PAS10650	PAS10651	Pair

One pair of rock speakers with 6½" graphite woofers, 1" polyamide dome tweeters and 60 watt power handling. ***Order in granite or sandstone.***

- Power Handling: 60 Watts
- Frequency Response: 80Hz - 20kHz
- Impedance: 8Ω
- Sensitivity: 88dB 1W/1m
- Weather-Resistant Design
- Dimensions (H x W x D): 11½" x 9½" x 8¼"

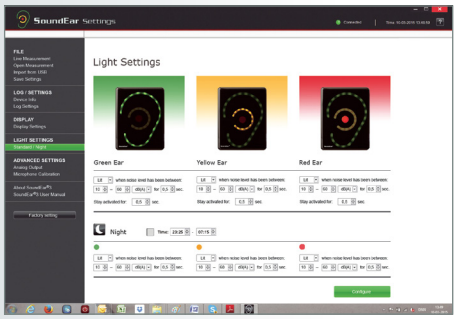
SoundEar®3

Measure, monitor and manage the noise with SE3-320

SoundEar®3 – back


External microphone.

USB key for export of data.



SoundEar®3 software

SoundEar®3 – 320 Specifications

Parameters:	Measures 3 measurements simultaneously LAF; LAS; LCpeak; Laeq, 1s, Laeq ¼ h, Laeq 1/2h, Laeq 1 h.
Resolution:	0,1 dB for all parameters
Measuring Ranges:	RMS: Total 30 – 120 dB
Deviation:	+/- 0,5 dB
Frequency Range:	20Hz- 20 kHz
Frequency Weightings:	A- weighting (RMS), C-weighting (Peak)
Time Weighting:	Slow(1S) & Fast (125 ms)
Dynamic Range:	90 dB and peak detection
2 x outputs:	0-10 V or 4-20 mA
2 xUSB outputs:	Micro USB (power & PC) , USB OTG (Log, configuration)
Power Supply:	5VDC (Micro USB) / 24VDC (Screw terminal)
Current Consumption:	max 2,5 W
Internal memory:	16 MB(128 Mbit) (5-90 days log time, depending on log settings)

SoundEar A/S
www.soundear.dk

Real Time Clock:	Hi-precision type with battery backup (CR2032)
Microphone:	20 Hz- 20 kHz
Measurement 320:	Length: 150mm, Width: 120mm, Height: 45mm, Weight: 0.450 kg.

Standards: IEC61672-2-2002, Type 2, ANSI 51,4 Type 260601-1: Medical electrical equipment- Part 1: general requirements for basic safety and essential performance. 60601-1-2_ Medical equipment – Part 1.2: General requirement – Part 1-2: General requirement for Basic safety and essential performance.

Connectivity accessories: GSM module, 4 G module for Cloud solution

NoiseMeters
Phone: 888 206 4377
Email: info@noisemeters.ca

NoiseSign - Noise Activated Warning Sign

(c) NoiseMeters

Features

- Lights up when sound levels are too high
- Variable trigger level from 40 to 114 dB(A)
- Low energy, high output LED technology
- Adjustable brightness
- Remote flashing beacon option

Applications

- Factories and Industrial Sites
- Warn when Hearing Protection Needed
- Entertainment Venues

NoiseSign Overview

The NoiseSign is a wall-mounted sign that lights up when the noise levels are too high. It can be used to warn workers to reduce the noise levels or fit hearing protection.

The level at which the sign lights up can be set using controls on the back of the unit to anywhere between 40 and 114 dB(A) in 1 dB steps. It can be set to switch off immediately when the level falls, or to remain lit for 30 seconds. A small plate can be fitted over the controls to avoid tampering.

The Noise Sign is easily mounted to the wall using two screws, making it suitable for use on brick, wooden or plaster surfaces. It is lightweight so there is very little strain on the mountings.

Display Settings

For use in differing environments the brightness of the NoiseSign can be adjusted. In a factory it would be set to its brightest.

To deal with short and intermittent noise levels the NoiseSign display can be set to remain lit for 30 seconds.

For environments where the sign might not be easily seen, up to three remote LED beacons can be attached. These beacons can be set to flash to make it clear that the noise levels are too high.

Noise Trigger Levels

Due to its very wide range of operation, 40 to 114 dB(A), the NoiseSign is suitable for most applications. In factories and other industrial applications, the trigger level will be set to warn workers that the noise levels have exceeded 80 or 85 dB(A).

A hand-held sound level meter is useful during the setting up process as the sign should be set to light up when the sound level at the working position reaches a given level, rather than just setting it to trigger on levels at the sign's mounting point.