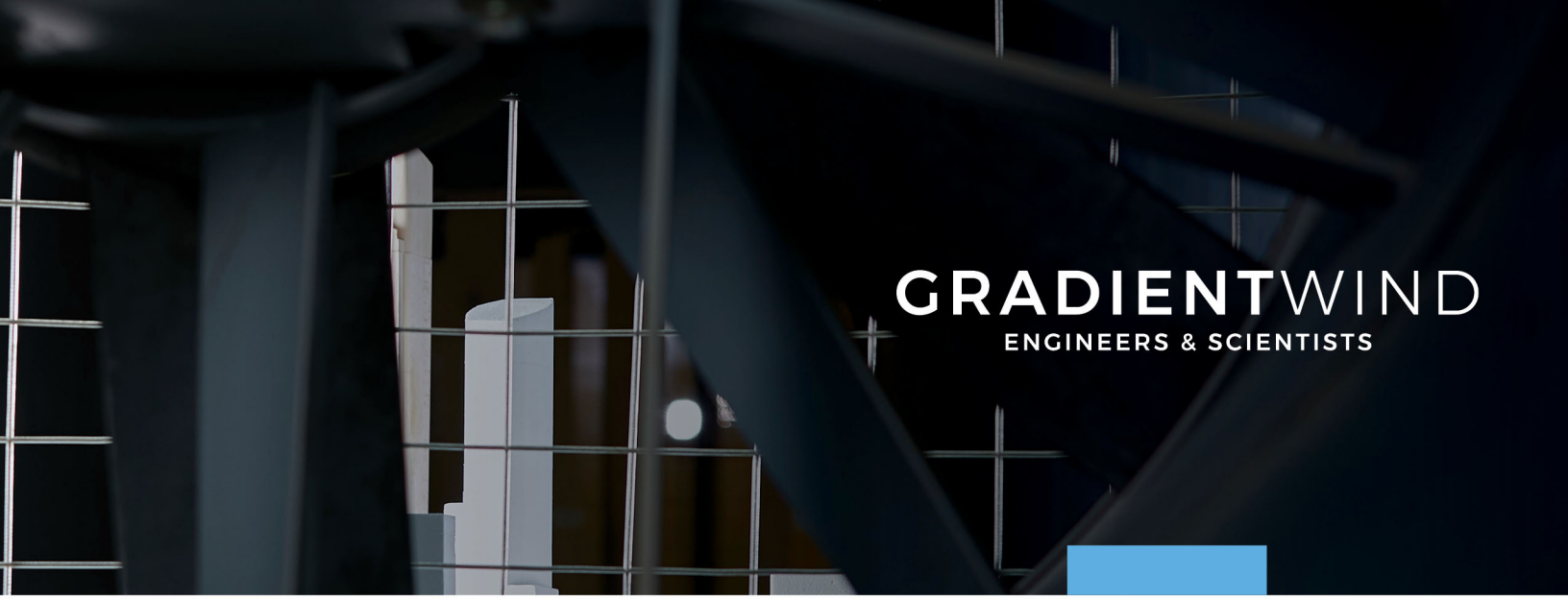
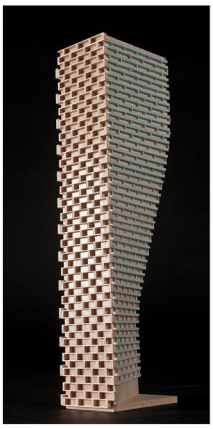


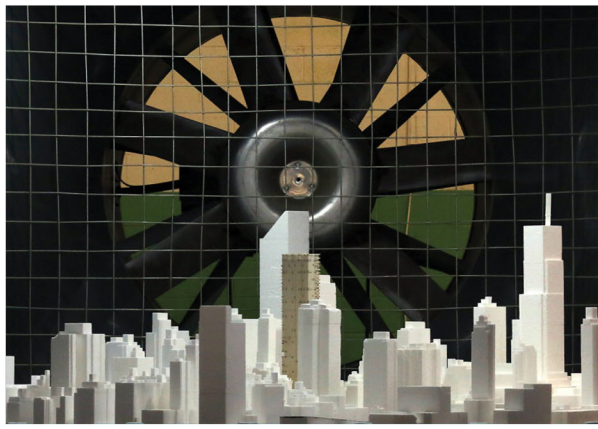
GRADIENTWIND
ENGINEERS & SCIENTISTS

STATIONARY NOISE ASSESSMENT

110 O'Connor Street
Ottawa, Ontario

REPORT: 24-056-Stationary Noise





January 23, 2025

PREPARED FOR

Édifice 110 O'Connor Inc.
630 rue Saint-Paul Ouest, Bureau 600
Montréal, QC H3C 1L9

PREPARED BY

Ben Page, AdvDip, Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for a proposed mixed-use development located at 110 O'Connor Street in Ottawa, Ontario. The proposed development comprises a 25-storey mixed-use building with a 6-storey 'L' shaped podium and topped with a mechanical penthouse (MPH) level. The site is surrounded by high and mid-rise buildings in all directions, with a parking structure to the immediate west and low-rise buildings located along Bank Street further to the west. The major sources of stationary noise include air-handling equipment, an emergency generator, and various exhaust/supply fans. Figure 1 illustrates a site plan with the 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 Geiger Huot Architectes in April 2024; and (iv) mechanical engineering drawings and data provided by MEP Engineering Consultants in January 2025.

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the NPC-300 and ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are followed and the suggested maximum permissible noise levels are included during the detailed design process, such as:

1. Ensuring the cooling tower has a noise attenuating package, such as a low noise fan that does not exceed the sound power levels described in Table. 2.
2. The air intakes and ensue to the generator room have silencer bank or acoustic lovers so the exterior sound power level at the lover is no higher than that described in Tabel 2.
3. The combustion exhaust of the generator will have an upgraded muffler to ensure the outlet end of the stack meets the maximum sound levels listed in Table 2. This may include a Hospital Grade muffler.

With these measures, the proposed development is expected to be compatible with the existing and proposed noise-sensitive land uses. Our review and recommendations are based upon the plans and drawings available at the time of writing of this report. Should there be any design changes, such as

moving or substitution of the mechanical equipment, a review should be conducted by our office or another qualified acoustical engineering firm to ensure the building remains compliant with the ENCG sound level limits.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Édifice O'Connor Inc. to undertake a stationary noise assessment for the proposed mixed-use development located at 110 O'Connor Street in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise assessment.

The present scope of work involves assessing exterior noise levels generated by air-handling equipment, an emergency generator, and various exhaust/supply fans. The assessment was performed based on theoretical noise calculation methods conforming to the City of Ottawa[1] and Ministry of the Environment, Conservation and Parks (MECP) NPC-300[2] guidelines; architectural drawings provided by Geiger Huot Architectes in April 2024; mechanical engineering drawings and sound data provided by MEP Engineering Consultants in January 2025; and surrounding street layouts obtained from the City of Ottawa and recent site imagery.

2. TERMS OF REFERENCE

The subject site is located at 110 O'Connor Street to the southwest at the intersection of O'Connor Street and Slater Street, bounded by Slater Street to the north, O'Connor Street to the east, a mid-rise building at 124 O'Connor Street to the south, and a parking structure at 170 Slater Street to the west. The proposed development comprises a 25-storey mixed-use building with a 6-storey 'L' shaped podium and topped with a mechanical penthouse (MPH) level. Figure 1 illustrates a site plan with the surrounding context.

Above the underground parking, the ground floor of the proposed development includes a lobby near the southeast corner, a commercial space to the north fronting O'Connor Street and Slater Street, and a garbage room and an indoor amenity to the west. A basement garage entrance is located to the south, accessed via O'Connor Street, and an outdoor amenity is located at the southwest corner of the subject site, adjoining the indoor amenity. Levels 2-6 are reserved for residential occupancy. At Level 7, the building steps back from the northwest, north, east, and south elevations and this level comprises an

[1] City of Ottawa Environmental Noise Control Guidelines, January 2016
[2] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

indoor amenity to the north and residential units throughout the remainder of the level. A common amenity terrace is accommodated to the north atop the podium. Levels 8-24 are reserved for residential occupancy, while at Level 25, an indoor amenity is located to the southeast and the remainder of the level comprises residential units. At the MPH Level, residential units are located to the north and a mechanical space is situated to the southwest. A rooftop common amenity terrace is situated to the southeast atop the building. Thirteen receptor locations were selected for the study site, as illustrated in Figure 2

The subject site surroundings are characterized by high and mid-rise buildings in all directions, with the above-noted parking structure to the immediate west and low-rise buildings located along Bank Street further to the west. The major sources of stationary noise include air-handling equipment, an emergency generator, and various exhaust/supply fans, as shown in Figure 3.

2.1 Assumptions

The following assumptions have been made in the analysis:

(i) The locations, quantity and tonnage of rooftop units have been based on architectural and mechanical drawings provided.

(ii) Sound data for all noise sources for the development have been based on mechanical drawings and schedules provided.

(iii) Sound data for the emergency generator exhaust louvre, the emergency generator combustion exhaust, and the cooling tower were based on Gradient Wind's experience with comparable systems.

(iv) The cooling tower was assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.

(v) The emergency generator exhaust louvre and the emergency generator combustion exhaust were assumed to operate continuously over a 1-hour period during the daytime.

(vi) The parking level exhaust/supply fans were assumed to operate for 10 minutes and 5 minutes over a 1-hour period during the daytime and nighttime periods, respectively. This is due to the fact that the fans only operate periodically when internal CO levels in the parking levels exceed a specific threshold. As a conservative approach, it was also assumed that all fans would operate at a given time.

(vii) The ground region was conservatively modelled as reflective due to the presence of hard ground (pavement).

3. OBJECTIVES

The main goals of this work are to (i) calculate the future on-site and off-site noise levels produced by stationary sources and (ii) ensure that exterior noise levels do not exceed the allowable limits specified by the ENCG, as outlined in Section 4 of this report.

4. METHODOLOGY

The impact of the external stationary noise sources on the nearby residential areas was determined by computer modelling. Stationary noise source modelling is based on the software program *Predictor-Lima* developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2. This computer program simulates three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. This methodology has been used on numerous assignments and has been accepted by the MECP as part of Environmental Compliance Approvals applications.

4.1 Perception of Noise

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 source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Its measurement 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 represents the noise perceived by the human ear. With this scale, a doubling of sound power at the source results in a 3 dBA increase in measured noise levels at the receiver and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

Stationary sources are defined in NPC-300 as "a source of sound or combination of sources of sound that are included and normally operated within the property lines of a facility and includes the premises of a person as one stationary source unless the dominant source of sound on those premises is construction"[3].

4.2 Stationary Noise Criteria

The equivalent sound energy level, L_{eq}, provides a weighted 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 selected period of time. For stationary sources, the L_{eq} is commonly calculated on an hourly interval, while for roadways, the L_{eq} is calculated on the basis of a 16-hour daytime/8-hour nighttime split.

Noise criteria taken from the ENCG and NPC-300 apply to outdoor points of reception (POR). A POR is defined under NPC-300 as "any location on a noise-sensitive land use where noise from a stationary source is received"[4]. A POR can be located on an existing or zoned for future use premises of permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, campgrounds, and noise-sensitive buildings such as schools and places of worship. The recommended maximum noise levels for a Class 1 area in an urban environment adjacent to arterial roadways at a POR are outlined in Table 1 below. The study site is considered to be Class 1 as it is located within the "Urban Area" boundary as defined in Schedule A and B of the City of Ottawa Official Plan[5]. These conditions indicate that the sound field is dominated by manmade sources.

Additionally, when analyzing standby power equipment such as emergency generators, NPC-300 specifies a noise level limit of 55 dBA for daytime testing. Generators are also investigated separately, without the combined effect of other equipment.

[3] NPC – 300, page 16
[4] NPC – 300, page 14
[5] City of Ottawa Official Plan Vol 1: Section 6

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

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

4.3 Determination of Noise Source Power Levels

Mechanical information for the development was provided by MEP Engineering Consultants in January 2025. Table 2 summarizes the sound power of each source used in the analysis. The table summarizes the unmitigated noise levels based on the data provided, as well as the maximum permissible noise levels to ensure on-site and off-site noise levels do not exceed NPC-300 and ENCG criteria.

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source	Description	Height Above Grade/Roof (m)	Correction Applied	Frequency (Hz)								
				63	125	250	500	1000	2000	4000	8000	Total
PODIUM / TOWER												
FAL-01-01	Supply Fan (SF-01-04)	2	Unmitigated	77	85	78	73	71	71	71	70	**79**
FAL-01-02	Supply Fans (SF-01-02) (SF-01-03)	2	Unmitigated	82	84	92	91	89	85	80	74	**93**
FAL-01-03	Supply Fan (SF-01-05)	2	Unmitigated	77	85	78	73	71	71	71	70	**79**
EL-01-02	Exhaust Fans (EF-01-01) (EF-01-02) (EF-01-03)	2.5	Unmitigated	88	93	90	94	89	85	82	71	**94**
EL-26-01	Generator Exhaust Louvre	3	Max Permissible	**90 dBA***								

*Maximum permitted sound power level (10^{-12} W)

TABLE 2 CONTINUED: EQUIPMENT SOUND POWER LEVELS (dBA)

Source	Description	Height Above Grade/Roof (m)	Correction Applied	Frequency (Hz)								
				63	125	250	500	1000	2000	4000	8000	Total
PODIUM / TOWER												
Generator Combustion Exhaust	Generator Combustion Exhaust	4	Max Permissible	**90 dBA***								
FAL-26-01	Generator Supply Louvre	3	Max Permissible	**90 dBA***								
CT-26-01	Cooling Tower	2	Max Permissible	**94***								

*Maximum permitted sound power level (10^{-12} W)

4.4 Stationary Source Noise Predictions

The impact of stationary noise sources on nearby noise-sensitive areas was determined by computer modelling using the software program Predictor-Lima. This program was developed from the International Standards Organization (ISO) standard 9613 Parts 1 and 2 and is capable of representing three-dimensional surfaces and first reflections of sound waves over a suitable spectrum for human hearing. The methodology has been used on numerous assignments and has been accepted by the Ministry of the Environment, Conservation and Parks (MECP) as part of Environmental Compliance Approval applications.

A total of thirteen receptor locations were chosen around the site to measure the noise impact at points of reception (POR) during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). POR locations include outdoor points of reception (OPOR) and the plane of windows (POW) of the adjacent residential properties. Sensor locations are described in Table 4 and illustrated in Figure 2. The units were represented as point sources and emitting facade objects in the Predictor model. Table 3 below contains Predictor-Lima calculation settings. These are typical settings that have been based on ISO 9613 standards and guidance from the MECP.

Ground absorption over the study area was determined based on topographical features (such as water, concrete, grassland, etc.). An absorption value of 0 is representative of hard ground, while a value of 1

represents grass and similar soft surface conditions. Existing and proposed buildings were added to the model to account for screening and reflection effects from building façades. Predictor-Lima modelling data is available upon request.

TABLE 3: CALCULATION SETTINGS

Parameter	Setting
Meteorological correction method	Single value for C0
Value C0	2.0
Ground attenuation factor for lawn areas	1
Ground attenuation factor for roadways and paved areas	0
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

TABLE 4: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade/Roof (m)
R1	POW – 110 O'Connor Street – North Façade	75
R2	POW – 110 O'Connor Street – West Façade	75
R3	POW – 110 O'Connor Street – South Façade	75
R4	POW – 110 O'Connor Street – East Façade	75
R5	OPOR – 110 O'Connor Street – Outdoor Amenity North	21
R6	OPOR – 110 O'Connor Street – Outdoor Amenity Southeast	78
R7	POW – 124 O'Connor Street – North Façade	30.5
R8	POW – 124 O'Connor Street – East Façade	30.5
R9	POW – 124 O'Connor Street – West Façade	30.5
R10	POW – 150 Slater Street – West Façade	72.5
R11	POW – 150 Slater Street – South Façade	72.5
R12	POW – 251 Laurier Ave W – West Façade	32.5
R13	POW – 251 Laurier Ave W – North Façade	32.5

5. RESULTS AND DISCUSSION

Noise levels on the surroundings produced by the mechanical equipment and the emergency generator associated with the proposed development are presented in Tables 5 and 6, respectively. The sound levels are based on the assumptions outlined in Section 2.1. It should be noted that the results were generated using the unmitigated noise levels, with the exclusion of the emergency generator exhaust and supply louvres, the emergency generator combustion exhaust, and the cooling tower, which were modelled with the maximum permissible noise levels, as summarized in Table 2.

TABLE 5: NOISE LEVELS FROM HVAC STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	POW – 110 O'Connor Street North Façade	75	36	33	50	45	**Yes**	**Yes**
R2	POW – 110 O'Connor Street West Façade	75	49	45	50	45	**Yes**	**Yes**
R3	POW – 110 O'Connor Street South Façade	75	43	40	50	45	**Yes**	**Yes**
R4	POW – 110 O'Connor Street East Façade	75	42	39	50	45	**Yes**	**Yes**
R5	OPOR – 110 O'Connor Street Outdoor Amenity North	21	33	N/A*	50	N/A*	**Yes**	**Yes**
R6	OPOR – 110 O'Connor Street Outdoor Amenity Southeast	78	42	N/A*	50	N/A*	**Yes**	**Yes**
R7	POW – 124 O'Connor Street North Façade	30.5	48	45	50	45	**Yes**	**Yes**
R8	POW – 124 O'Connor Street East Façade	30.5	39	37	50	45	**Yes**	**Yes**
R9	POW – 124 O'Connor Street West Façade	30.5	38	35	50	45	**Yes**	**Yes**
R10	POW – 150 Slater Street West Façade	72.5	42	40	50	45	**Yes**	**Yes**

TABLE 5 CONTINUED: NOISE LEVELS FROM HVAC STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R11	POW – 150 Slater Street South Façade	72.5	40	37	50	45	**Yes**	**Yes**
R12	POW – 251 Laurier Ave W West Façade	32.5	48	45	50	45	**Yes**	**Yes**
R13	POW – 251 Laurier Ave W North Façade	32.5	48	45	50	45	**Yes**	**Yes**

*Noise levels at OPORs during the nighttime period are not considered as per ENCG

TABLE 6: NOISE LEVELS FROM EMERGENCY STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	POW – 110 O'Connor Street North Façade	75	32	N/A*	55	N/A*	**Yes**	N/A*
R2	POW – 110 O'Connor Street West Façade	75	54	N/A*	55	N/A*	**Yes**	N/A*
R3	POW – 110 O'Connor Street South Façade	75	55	N/A*	55	N/A*	**Yes**	N/A*
R4	POW – 110 O'Connor Street East Façade	75	36	N/A*	55	N/A*	**Yes**	N/A*
R5	OPOR – 110 O'Connor Street Outdoor Amenity North	21	31	N/A*	55	N/A*	**Yes**	N/A*
R6	OPOR – 110 O'Connor Street Outdoor Amenity Southeast	78	46	N/A*	55	N/A*	**Yes**	N/A*
R7	POW – 124 O'Connor Street North Façade	30.5	46	N/A*	55	N/A*	**Yes**	N/A*
R8	POW – 124 O'Connor Street East Façade	30.5	35	N/A*	55	N/A*	**Yes**	N/A*
R9	POW – 124 O'Connor Street West Façade	30.5	48	N/A*	55	N/A*	**Yes**	N/A*

TABLE 6 CONTINUED: NOISE LEVELS FROM EMERGENCY STATIONARY SOURCES

Receptor Number	Receptor Location	Height Above Grade/Roof (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R10	POW – 150 Slater Street West Façade	72.5	36	N/A*	55	N/A*	**Yes**	N/A*
R11	POW – 150 Slater Street South Façade	72.5	44	N/A*	55	N/A*	**Yes**	N/A*
R12	POW – 251 Laurier Ave W West Façade	32.5	45	N/A*	55	N/A*	**Yes**	N/A*
R13	POW – 251 Laurier Ave W North Façade	32.5	44	N/A*	55	N/A*	**Yes**	N/A*

*Noise levels during the nighttime period are not considered as per ENCG

As Tables 5 and 6 summarize, noise levels fall below ENCG criteria at all receptors. Noise contours at 75 metres above grade for HVAC and emergency equipment sources can be seen in Figures 4-6 for daytime and nighttime conditions. The results indicate that different equipment will have a greater contribution to the noise impact at nearby facades depending on their position and orientation. It is recommended that the maximum permissible noise levels be used within the design, where noted, to ensure noise levels meet the criteria outlined in NPC-300 and ENCG. This can be achieved by incorporating quieter units for the cooling tower, and installing silencers or acoustic louvers at the generator air intake and exhaust, and using an upgraded muffler on the combustion exhaust. As a general recommendation, rooftop equipment should be located toward the centre of the rooftop area, avoiding direct line of sight with noise-sensitive areas, if possible.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the NPC-300 and ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are followed and the suggested maximum permissible noise levels are included during the detailed design process, such as:

1. Ensuring the cooling tower has a noise attenuating package, such as a low noise fan that does not exceed the sound power levels described in Table. 2.

2. The air intakes and ensue to the generator room have silencer bank or acoustic lovers so the exterior sound power level at the lover is no higher than that described in Tabel 2.
3. The combustion exhaust of the generator will have an upgraded muffler to ensure the outlet end of the stack meets the maximum sound levels listed in Table 2. This may include a Hospital Grade muffler.

With these measures, the proposed development is expected to be compatible with the existing and proposed noise-sensitive land uses. Our review and recommendations are based upon the plans and drawings available at the time of writing of this report. Should there be any design changes, such as moving or substitution of the mechanical equipment, a review should be conducted by our office or another qualified acoustical engineering firm to ensure the building remains compliant with the ENCG sound level limits.

This concludes our stationary 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.

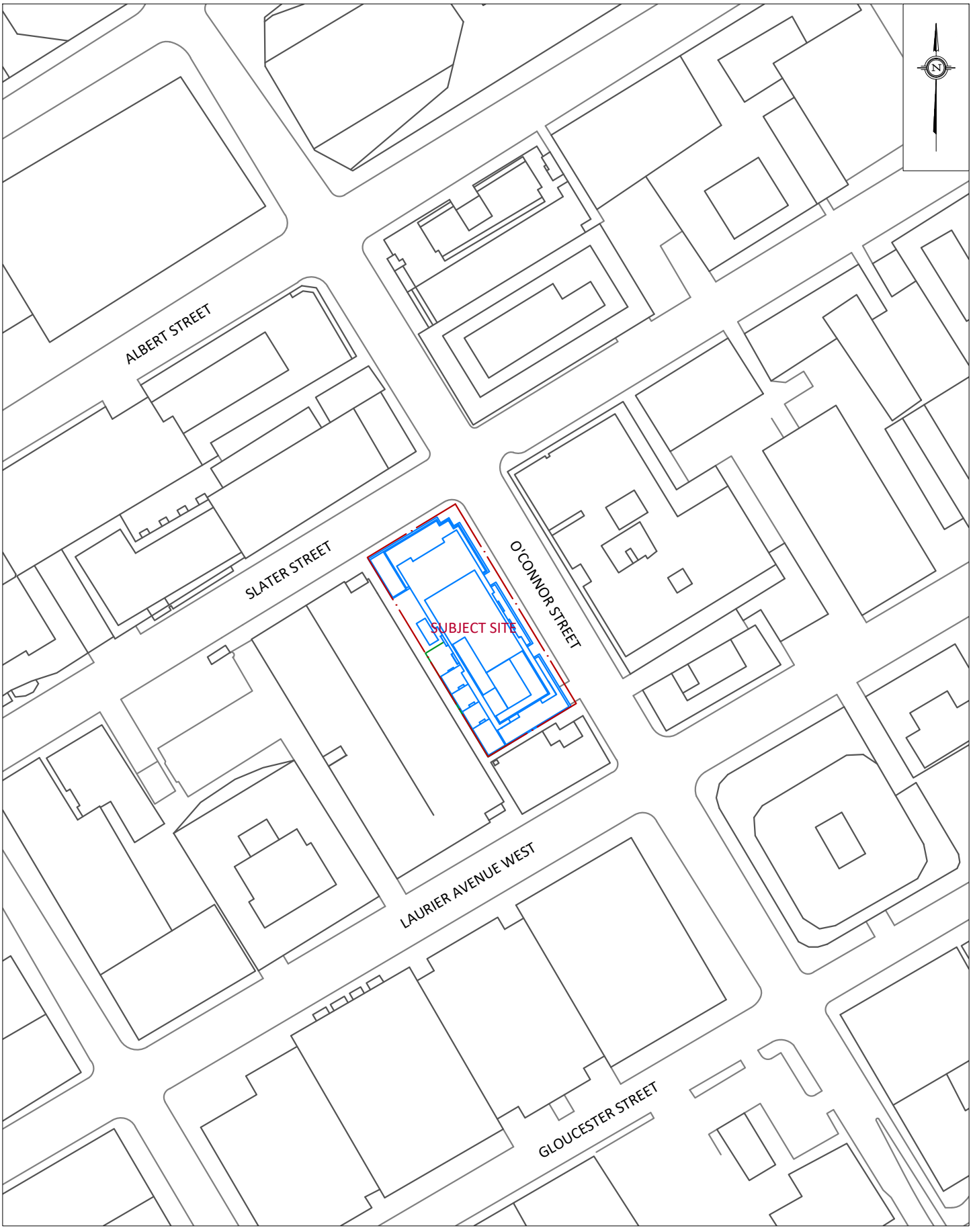
Sincerely,

Gradient Wind Engineering Inc.

Ben Page, AdvDip.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #24-056 – Stationary Noise



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PROJECT	110 O'CONNOR STREET, OTTAWA STATIONARY NOISE STUDY
SCALE	1:1500
DRAWING NO.	24-056-FIG1
DATE	JANUARY 13, 2025
DRAWN BY	B.P.

DESCRIPTION

FIGURE 1:
PROPOSED SITE PLAN AND SURROUNDING CONTEXT

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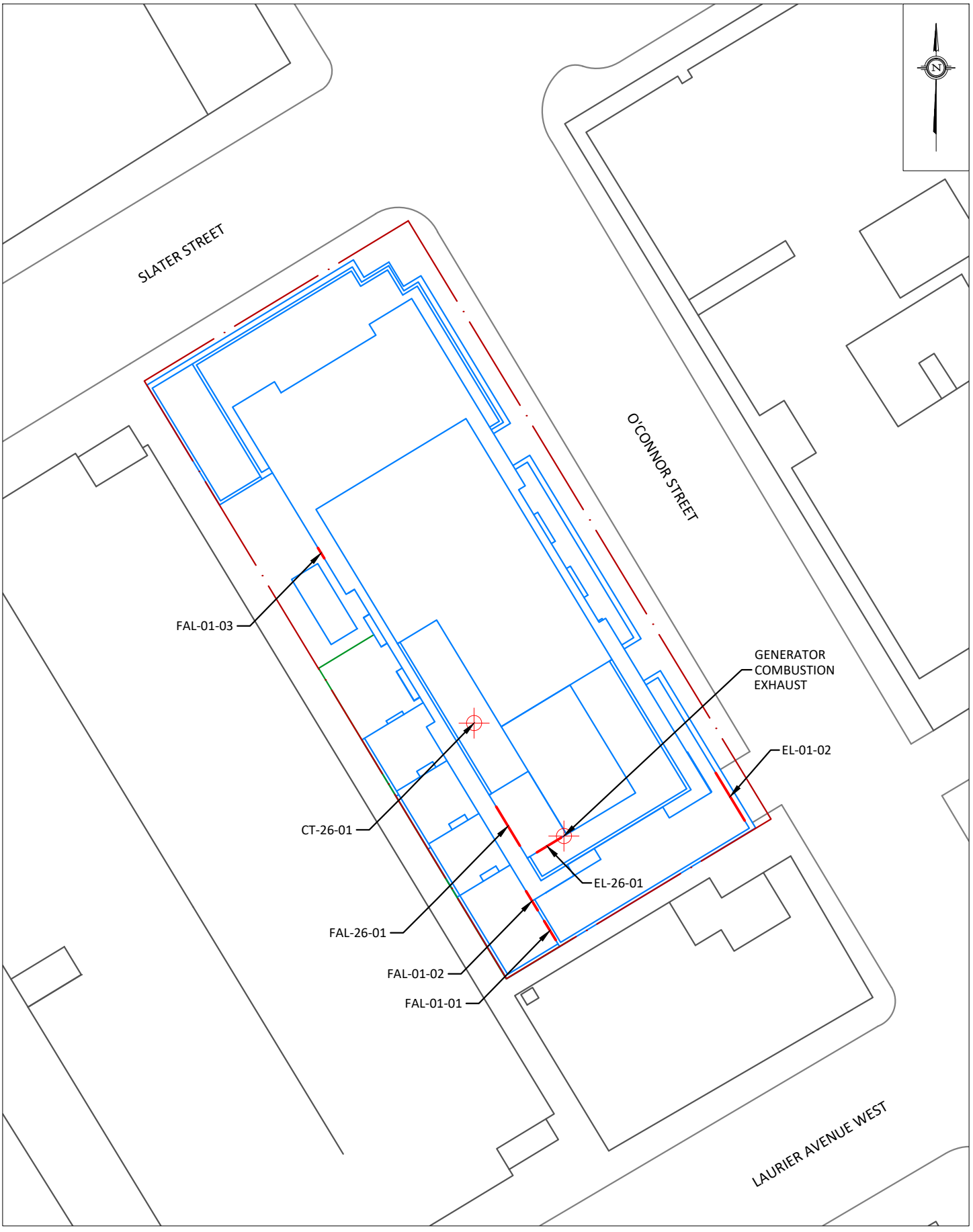
PROJECT	110 O'CONNOR STREET, OTTAWA STATIONARY NOISE STUDY		DESCRIPTION
SCALE	1:750	DRAWING NO. 24-056-FIG2	FIGURE 2: RECEPTOR LOCATIONS
DATE	JANUARY 13, 2025	DRAWN BY B.P.	



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PROJECT	110 O'CONNOR STREET, OTTAWA STATIONARY NOISE STUDY
SCALE	1:500
DRAWING NO.	24-056-FIG3
DATE	JANUARY 13, 2025
DRAWN BY	B.P.

DESCRIPTION

FIGURE 3:
STATIONARY NOISE SOURCES

FIGURE 4: DAYTIME STATIONARY NOISE CONTOURS – HVAC EQUIPMENT (75 METERS ABOVE GRADE)

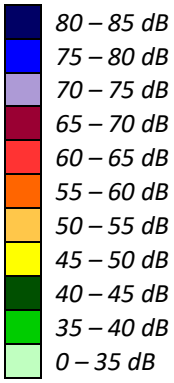

FIGURE 5: NIGHTTIME STATIONARY NOISE CONTOURS – HVAC EQUIPMENT (75 METERS ABOVE GRADE)

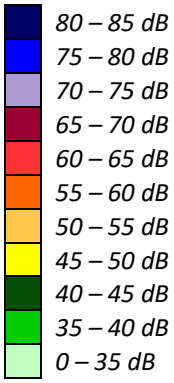

FIGURE 6: DAYTIME STATIONARY NOISE CONTOURS – EMERGENCY EQUIPMENT (75 METERS ABOVE GRADE)