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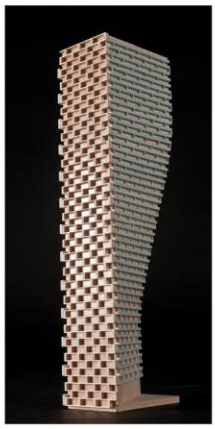
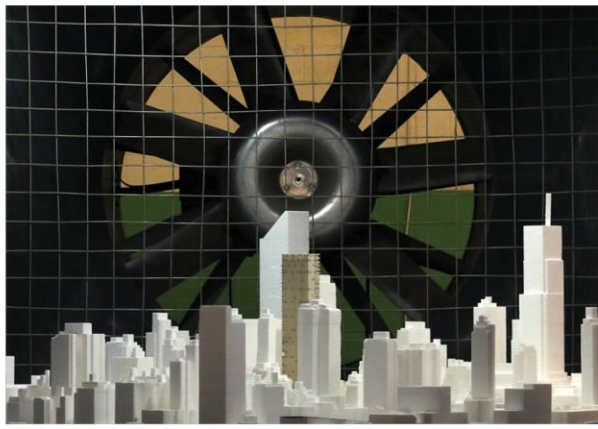
# STATIONARY NOISE ASSESSMENT

398, 402, 406 Roosevelt Avenue
Ottawa, Ontario

REPORT: GW17-179 – Stationary Noise





August 24, 2022

PREPARED FOR

**ML Westboro Inc.**
651 Churchill Avenue North
Ottawa, ON K1Z 5G2


PREPARED BY

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# EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for a proposed mixed-used condominium development located at 398, 402, and 406 Roosevelt Avenue in Ottawa, Ontario. The development will be 6-storieys high, with commercial space on the first floor and part of the second floor, and residential use from the second to the sixth floor. The major sources of stationary noise are a rooftop unit (RTU), six condensing units, and a generator. Figure 1 illustrates a site plan with the surrounding context.

The focus of this study is the exterior noise levels generated by the major mechanical equipment, which consists of a rooftop unit, a generator, and six condensing units. 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 prepared by RLA Architecture, dated April 7th 2022; and (iv) mechanical drawings and data provided by Goodkey, Weedmark & Associates Ltd.

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria provided that the assumptions outlined in Section 2.1 and the notes in Section 6 are followed. Additionally, the sound power levels of the condensers, rooftop unit, and generator should not exceed the levels shown in Table 3. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

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# 1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by ML Westboro Inc. to undertake a stationary noise assessment for the proposed mixed-used condominium development located at 398, 402, and 406 Roosevelt Avenue 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 the rooftop unit, condenser units, and generator. 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 (RLA Architecture, dated April 7th, 2022), and mechanical drawings and information provided by Goodkey, Weedmark & Associates Ltd.

# 2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed mixed-use condominium building on the property encompassing 398, 402 and 406 Roosevelt Avenue in Ottawa, Ontario. The proposed development is a six-storey building, with commercial space on the first floor and part of the second floor, and residential use from the second to the sixth floor. There is a basement level dedicated to storage spaces, parking spaces, mechanical and electrical rooms. Parking spaces are also available at grade on the west side of the building. The building rises with a uniform floor plan from Level 2 to Level 4, at which point the floor plan steps back on the north and east elevations to create space for private balconies. At Level six, the floor plan steps back on the north, west and south elevations to create space for private balconies. Figure 1 illustrates the site plan and surrounding context.

The major sources of stationary noise are the rooftop unit, condensing units, and generator that are in the mechanical penthouse and the outdoor mechanical area. Figure 2 illustrates the location of noise sources included in this study.

[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

## 2.1 Assumptions

The sound power levels of the condensing units, generator, and rooftop unit manufacturer data are provided by Goodkey, Weedmark & Associates Ltd. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

The following assumptions have been made in the analysis:

(i) The sound power levels of the condensing units, generator, and rooftop unit are based on manufacturer data provided by Goodkey, Weedmark & Associates Ltd.

(ii) The rooftop unit (RTU-1) is assumed to operate continuously at 100% over a 1-hour period during the daytime and evening periods and at 50% over a 1-hour period during the nighttime period.

(iii) The condensing units are assumed to operate continuously at 100% over a 1-hour period during the daytime, evening, and nighttime periods, respectively.

(iv) The generator is assumed to be running continuously at 100% over a 1-hour period during the daytime period for testing and maintenance purposes. It is assumed to have a Level 3 sound attenuating enclosure which has a sound pressure rating of 70 dBA at 7 m.

(v) Where applicable, the sound attenuation from ductwork and end reflections from louvres are applied to the sound power levels of the rooftop and condensing units.

(vi) The rooftop unit and generator were represented as point sources while noise from the condensing units was represented as an emitting façade and an emitting roof in the analysis.

(vii) A total of eighteen (18) receptors were strategically placed on the closest buildings and outdoor points of reception around the study site. The location noise sources and receptors can be seen in Figure 2 and Figure 3, respectively.

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

(ix) The condenser air intake is assumed to have either an acoustical louver or silencer bank. The required insertion loss of the acoustic louvre/ silencer can be seen in Table 1 below.

**TABLE 1: ACOUSTIC LOUVRE TRANSMISSION LOSS**

| Louvre Depth (mm) | Open Area (%) | Octave Band Transmission Loss (dB) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| 200 | 28 | 6 | 7 | 8 | 10 | 17 | 18 | 17 | 17 |

## 3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the neighbouring noise-sensitive buildings 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 noise-sensitive 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 ($2\times10^{-5}$ 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 the ENCG as "all sources of sound and vibration, whether fixed or mobile, that exist or operate on a premises, property or facility, the combined sound and vibration levels of which are emitted beyond the property boundary of the premises, property or facility, unless the source(s) is (are) due to 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 points of reception (POR). A POR is defined under the ENCG 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 daycares. Because noise is dominated by manmade sources,

[3] City of Ottawa Environmental Noise Control Guidelines, page 10
[4] City of Ottawa Environmental Noise Guidelines, page 9

the site is considered to be in a Class 1 area. The recommended maximum noise levels at a POR for a Class 1 area in an urban environment adjacent to arterial roadways are outlined in Table 2.

Additionally, when analysing 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.

**TABLE 2: EXCLUSIONARY LIMITS FOR CLASS 1 AREA**

| Time of Day | Outdoor Points of Reception | Plane of Window |
|---|---|---|
| 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

The sound power levels of the condensing units, generator, and rooftop unit are based on manufacturer data provided by Goodkey, Weedmark & Associates Ltd. Table 3 summarizes the sound power levels of each source used in the analysis.

**TABLE 3: EQUIPMENT SOUND POWER LEVELS (DBA)**

| Source | Description | Height Above Roof (m) | Correction Applied | Frequency (Hz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | Total |
| S1 | CU-Intaker | 1* | Unmitigated | - | - | - | - | 90 | - | - | - | **90** |
| | | | Maximum Permissible | - | - | - | - | 85 | - | - | - | **85** |
| S2 | CU-Discharge | 1x1 | Unmitigated | - | - | - | - | 86 | - | - | - | **86** |
| S3 | Generator | 1.8 | Level 3 Enclosure | - | - | - | - | 95 | - | - | - | **95** |
| S4 | RTU-1 | 1.5 | Unmitigated | 54 | 68 | 69 | 76 | 80 | 74 | 68 | 62 | **83** |

*Height above the roof of the center point of the louver. CU-Louver dimensions are 5500x1920.

## 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 18 receptor locations were chosen on the surrounding buildings to measure the noise impact at plane of window (POW) and OPOR receptors during the daytime/evening period (07:00 – 23:00), as well as during the nighttime period (23:00 – 07:00). Receptor locations are described in

Table 5 and illustrated in Figure 3. The rooftop unit and generator unit were represented as point sources while noise from the condensing units were modelled as emitting façades and an emitting roof in the analysis. The source locations can be seen in Figure 2. Table 4 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. A Predictor-Lima sample output is available upon request.

**TABLE 4: CALCULATION SETTINGS**

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

### TABLE 5: RECEPTOR LOCATIONS

| Receptor Number | Receptor Location | Height Above Grade (m) |
|---|---|---|
| R1 | Study Site- Level 5 Roof | 19.5 |
| R2 | 395 Berkley Ave | 1.5/4.5 |
| R3 | 397 Berkley Ave | 1.5/4.5 |
| R4 | 403 Berkley Ave | 1.5/4.5 |
| R5 | 420 Berkley Ave | 29.5 |
| R6 | 398-410 Berkley Ave | 1.5/4.5 |
| R7 | 398-410 Berkley Ave | 1.5/4.5 |
| R8 | 410 Richmond Road | 26.5 |
| R9 | 410 Richmond Road | 26.5 |
| R10 | 403 Richmond Road | 1.5/4.5 |
| R11 | 403 Richmond Road | 1.5/4.5 |
| R12 | 396 Winston Ave | 1.5/4.5 |
| R13 | 375 Roosevelt Ave | 1.5/4.5 |
| R14 | 386 Roosevelt Ave | 1.5/4.5 |
| R15 | 390 Roosevelt Ave | 1.5/4.5 |
| R16 | 396 Roosevelt Ave | 1.5/4.5 |
| R17 | 381-385 Berkley Ave | 1.5/4.5 |
| R18 | 391 Berkley Ave | 1.5/4.5 |

## 5. RESULTS AND DISCUSSION

Noise levels at nearby sensitive receptors are below ENCG criteria for stationary noise, as summarized in Table 6 below. The sound levels listed in Table 6 and Table 7 are based on the assumptions outlined in Section 2.1. With consideration of Gradient Wind's recommendations and assumptions, the proposed development is expected to be compatible with the existing land uses.

## TABLE 6: HVAC NOISE LEVELS

| Receptor Number / Type | Location | Height Above Grade (m) | Noise Level (dBA) | | Sound Level Limits | | Meets ENCG Class 1 Criteria | |
|---|---|---|---|---|---|---|---|---|
| | | | Day | Night | Day | Night | Day | Night |
| R1 | Study Site – Level 5 Roof | 19.5 | 38 | N/A* | 50 | N/A* | Yes | N/A* |
| R2 | 395 Berkley Ave – East Façade | 1.5 | 39 | 39 | 50 | 45 | Yes | Yes |
| | | 4.5 | 40 | 40 | 50 | 45 | Yes | Yes |
| R3 | 397 Berkley Ave– East Façade | 1.5 | 38 | 37 | 50 | 45 | Yes | Yes |
| | | 4.5 | 39 | 39 | 50 | 45 | Yes | Yes |
| R4 | 403 Berkley Ave – East Façade | 1.5 | 40 | 39 | 50 | 45 | Yes | Yes |
| | | 4.5 | 42 | 42 | 50 | 45 | Yes | Yes |
| R5 | 420 Berkley Ave – East Façade | 29.5 | 46 | 45 | 50 | 45 | Yes | Yes |
| R6 | 398-410 Berkley Ave – East Façade | 1.5 | 44 | 44 | 50 | 45 | Yes | Yes |
| | | 4.5 | 45 | 45 | 50 | 45 | Yes | Yes |
| R7 | 398-410 Berkley Ave – East Façade | 1.5 | 45 | 45 | 50 | 45 | Yes | Yes |
| | | 4.5 | 45 | 45 | 50 | 45 | Yes | Yes |
| R8 | 410 Richmond Road – North Façade | 26.5 | 45 | 43 | 50 | 45 | Yes | Yes |
| R9 | 410 Richmond Road – East Façade | 26.5 | 36 | 34 | 50 | 45 | Yes | Yes |

*OPOR noise levels during the nighttime are not considered as per the ENCG.

## TABLE 6 (CONTINUED): HVAC NOISE LEVELS

| Receptor Number / Type | Location | Height Above Grade (m) | Noise Level (dBA) | | Sound Level Limits | | Meets ENCG Class 1 Criteria | |
|---|---|---|---|---|---|---|---|---|
| | | | Day | Night | Day | Night | Day | Night |
| R10 | 403 Richmond Road – West Façade | 1.5 | 30 | 28 | 50 | 45 | Yes | Yes |
| | | 4.5 | 31 | 30 | 50 | 45 | Yes | Yes |
| R11 | 403 Richmond Road– West Façade | 1.5 | 27 | 26 | 50 | 45 | Yes | Yes |
| | | 4.5 | 28 | 27 | 50 | 45 | Yes | Yes |
| R12 | 396 Winston Ave – West Façade | 1.5 | 31 | 30 | 50 | 45 | Yes | Yes |
| | | 4.5 | 33 | 32 | 50 | 45 | Yes | Yes |
| R13 | 375 Roosevelt Ave– West Façade | 1.5 | 28 | 28 | 50 | 45 | Yes | Yes |
| | | 4.5 | 30 | 29 | 50 | 45 | Yes | Yes |
| R14 | 386 Roosevelt Ave – South Façade | 1.5 | 23 | 23 | 50 | 45 | Yes | Yes |
| | | 4.5 | 24 | 23 | 50 | 45 | Yes | Yes |
| R15 | 390 Roosevelt Ave Ave – South Façade | 1.5 | 28 | 27 | 50 | 45 | Yes | Yes |
| | | 4.5 | 30 | 30 | 50 | 45 | Yes | Yes |
| R16 | 396 Roosevelt Ave Ave – South Façade | 1.5 | 28 | 28 | 50 | 45 | Yes | Yes |
| | | 4.5 | 28 | 27 | 50 | 45 | Yes | Yes |
| R17 | 381-385 Berkley Ave – South Façade | 1.5 | 39 | 39 | 50 | 45 | Yes | Yes |
| | | 4.5 | 37 | 37 | 50 | 45 | Yes | Yes |
| R18 | 391 Berkley– East Façade | 1.5 | 37 | 37 | 50 | 45 | Yes | Yes |
| | | 4.5 | 39 | 39 | 50 | 45 | Yes | Yes |

## TABLE 7: GENERATOR NOISE LEVELS

| Receptor Number / Type | Location | Height Above Grade (m) | Noise Level (dBA) | Sound Level Limits | Meets ENCG Class 1 Criteria |
|---|---|---|---|---|---|
| | | | Day | Day | Day |
| R1 | Study Site - Level 5 Roof | 19.5 | 55 | 55 | Yes |
| R2 | 395 Berkley Ave– East Façade | 1.5 | 41 | 55 | Yes |
| | | 4.5 | 42 | 55 | Yes |
| R3 | 397 Berkley Ave– East Façade | 1.5 | 39 | 55 | Yes |
| | | 4.5 | 40 | 55 | Yes |
| R4 | 403 Berkley Ave– East Façade | 1.5 | 39 | 55 | Yes |
| | | 4.5 | 41 | 55 | Yes |
| R5 | 420 Berkley Ave– East Façade | 29.5 | 49 | 55 | Yes |
| R6 | 398-410 Berkley Ave– East Façade | 1.5 | 44 | 55 | Yes |
| | | 4.5 | 45 | 55 | Yes |
| R7 | 398-410 Berkley Ave– East Façade | 1.5 | 44 | 55 | Yes |
| | | 4.5 | 45 | 55 | Yes |
| R8 | 410 Richmond Road | 26.5 | 40 | 55 | Yes |
| R9 | 410 Richmond Road– East Façade | 26.5 | 33 | 55 | Yes |

**TABLE 7 (CONTINUED): GENERATOR NOISE LEVELS**

| Receptor Number / Type | Location | Height Above Grade (m) | Sound Level Limits | Sound Level Limits | Meets ENCG Class 1 Criteria |
|---|---|---|---|---|---|
| | | | Day | Day | Day |
| R10 | 403 Richmond Road | 1.5 | 28 | 55 | Yes |
| | | 4.5 | 29 | 55 | Yes |
| R11 | 403 Richmond Road | 1.5 | 35 | 55 | Yes |
| | | 4.5 | 35 | 55 | Yes |
| R12 | 396 Winston Ave | 1.5 | 40 | 55 | Yes |
| | | 4.5 | 41 | 55 | Yes |
| R13 | 375 Roosevelt Ave | 1.5 | 46 | 55 | Yes |
| | | 4.5 | 48 | 55 | Yes |
| R14 | 386 Roosevelt Ave | 1.5 | 38 | 55 | Yes |
| | | 4.5 | 39 | 55 | Yes |
| R15 | 390 Roosevelt Ave | 1.5 | 38 | 55 | Yes |
| | | 4.5 | 47 | 55 | Yes |
| R16 | 396 Roosevelt Ave | 1.5 | 37 | 55 | Yes |
| | | 4.5 | 38 | 55 | Yes |
| R17 | 381-385 Berkley | 1.5 | 48 | 55 | Yes |
| | | 4.5 | 48 | 55 | Yes |
| R18 | 391 Berkley – East Façade | 1.5 | 42 | 55 | Yes |
| | | 4.5 | 44 | 55 | Yes |

## 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 ENCG noise criteria provided that the assumptions outlined in Section 2.1 are followed, and the sound power levels of the condenser units, rooftop unit, and generator do not exceed the levels shown in Table 3. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

To ensure compliance with the ENCG, the following noise control measures are recorded:

- The sound power levels of the condenser units, rooftop unit, and generator, should not exceed the levels shown in Table 3.
- An acoustic louver or silencer bank will be provided for the condenser air intake. The acoustic louvre or silencer will have minimum insertion losses as presented in Table 1.
- The emergency generator will have a sound rated enclosure with a sound pressure rating of 70 dBA at 7 m.

This concludes our assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

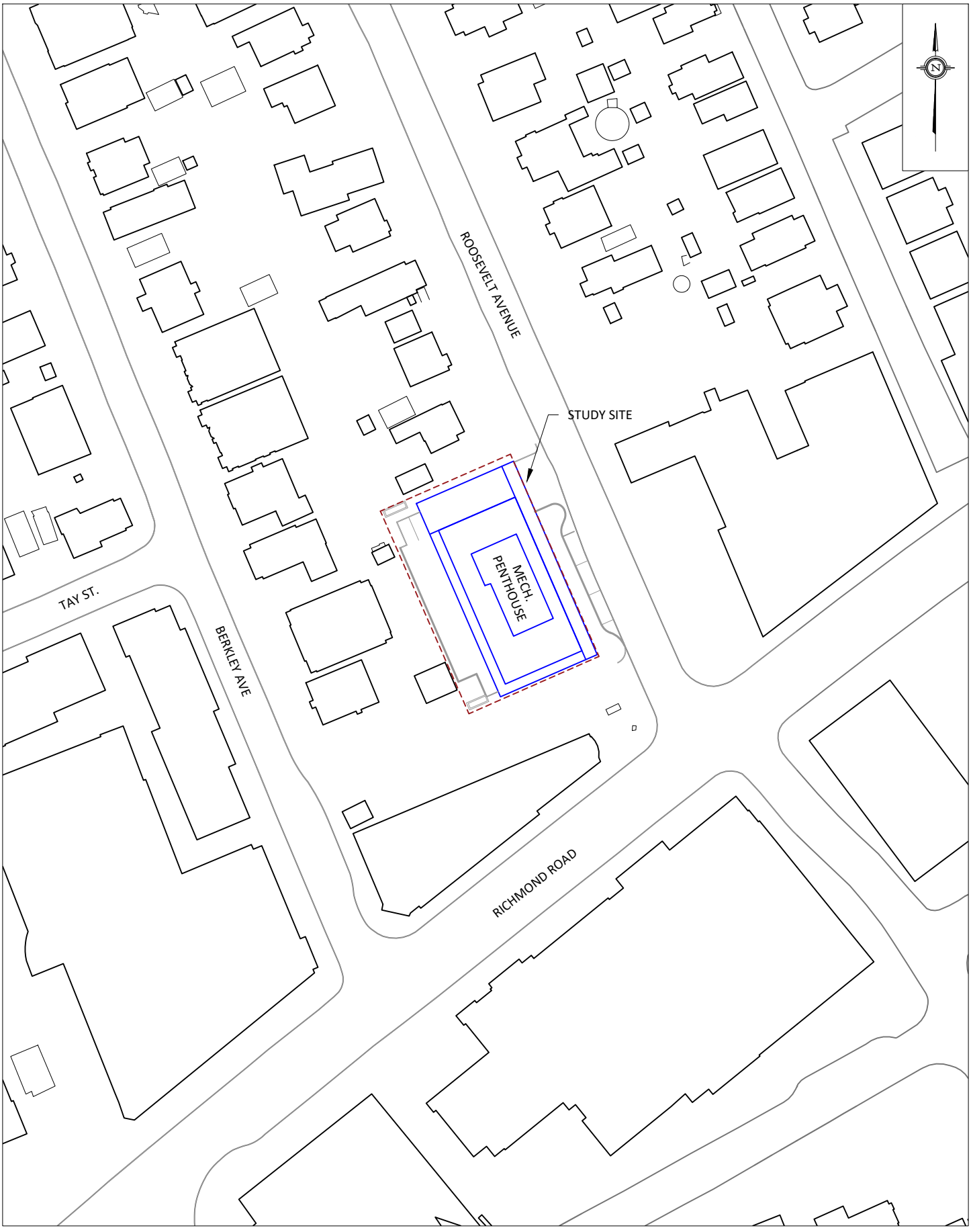
Sincerely,

***Gradient Wind Engineering Inc.***


Essraa Alqassab, BASc
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

*Gradient Wind File #17-179 – Stationary Noise*

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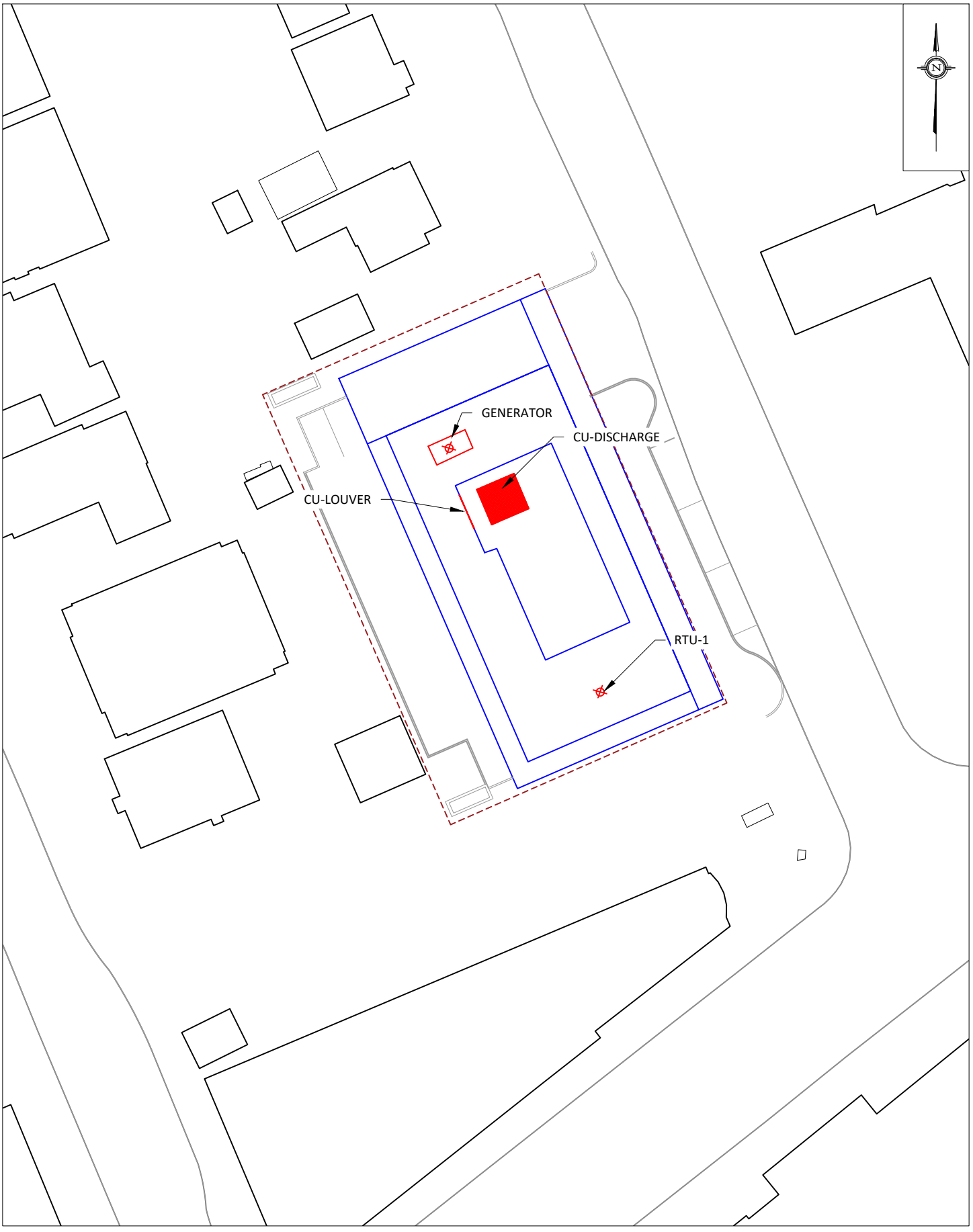
| PROJECT | 398, 402, 406 ROOSEVELT AVENUE, OTTAWA<br>STATIONARY NOISE ASSESSMENT | | DESCRIPTION |
| SCALE | 1:1000 (APPROX.) | DRAWING NO. | GW17-179-1 |
| DATE | JULY 29, 2022 | DRAWN BY | E.A. |

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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| SCALE | 1:200 (APPROX.) | DRAWING NO. GW17-179-2 | FIGURE 2:<br>SOURCE LOCATIONS |
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| SCALE | 1:1000 (APPROX.) | DRAWING NO. GW17-179-3 | FIGURE 3:<br>RECEPTOR LOCATIONS |
| DATE | JULY 29, 2022 | DRAWN BY E.A. | |

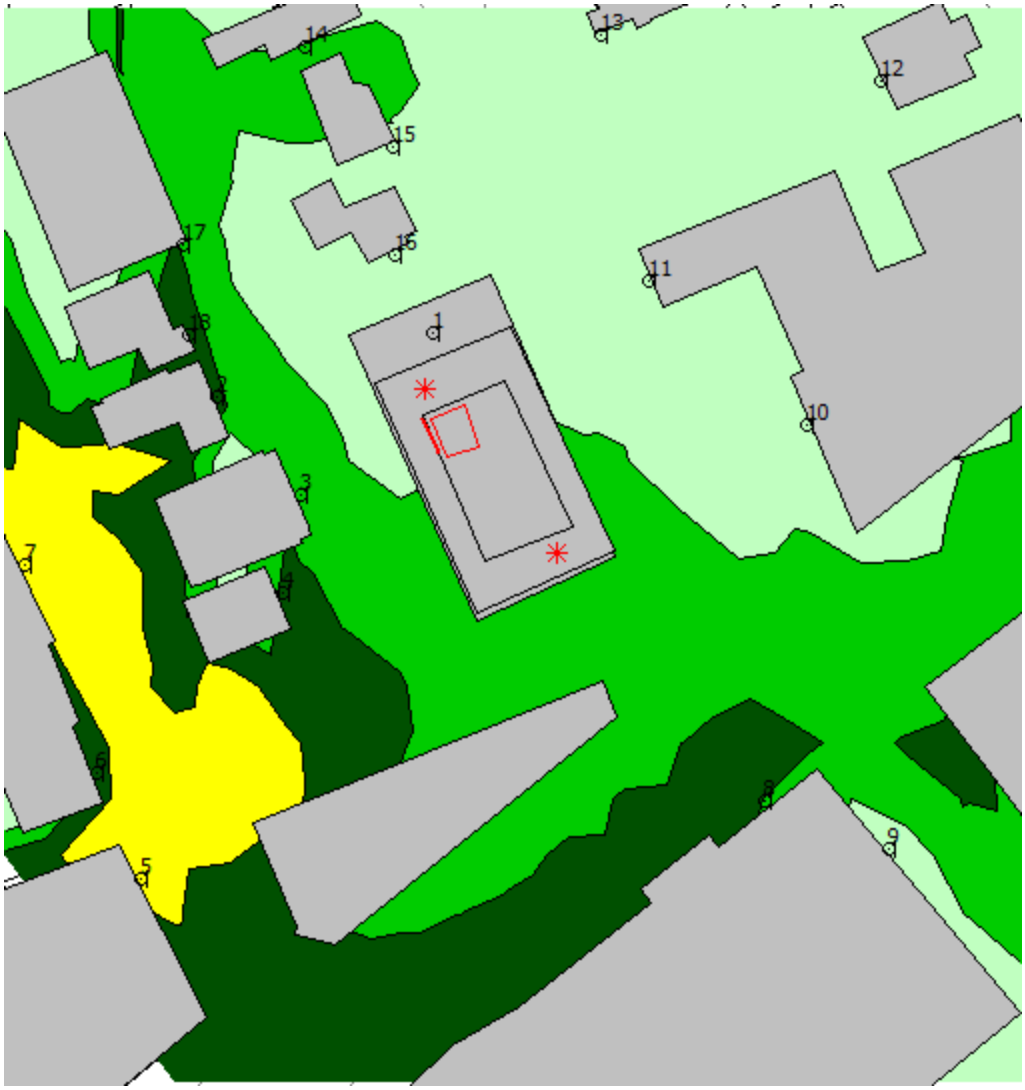


**FIGURE 5: HVAC DAYTIME NOISE CONTOURS**
**(4 M ABOVE GRADE, WITH 3.5 M NOISE SCREEN)**

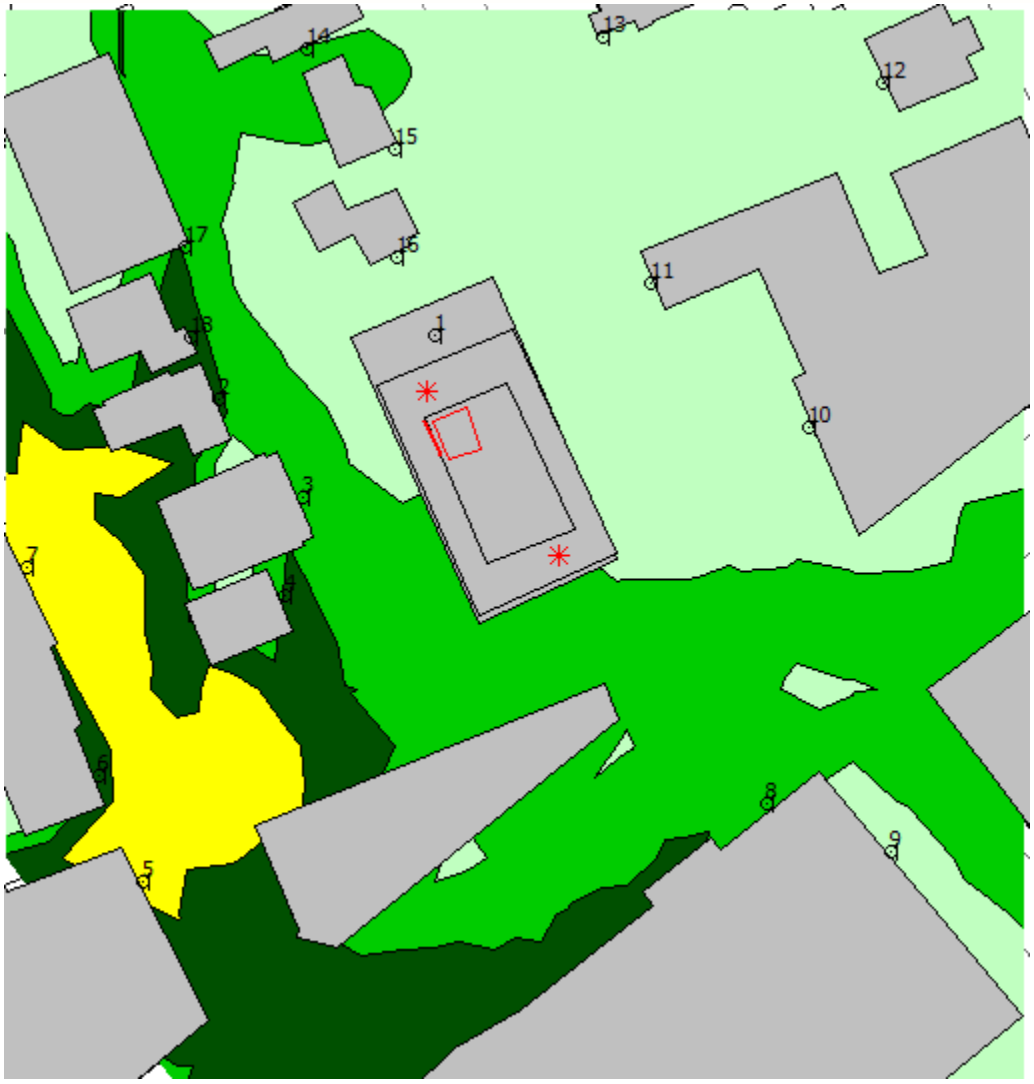


**FIGURE 6: HVAC NIGHTTIME NOISE CONTOURS**
**(4 M ABOVE GRADE, WITH 3.5 M NOISE SCREEN)**


**FIGURE 7: GENERATOR NOISE CONTOURS (4 M ABOVE GRADE)**