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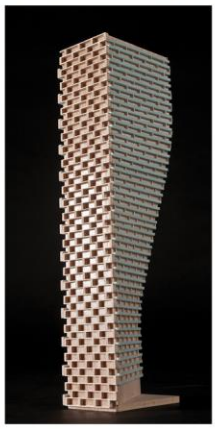
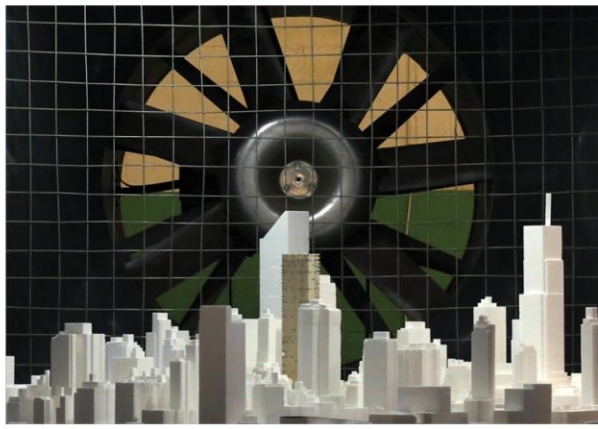
STATIONARY NOISE FEASIBILITY ASSESSMENT

3455 Hawthorne Road
Ottawa, Ontario

REPORT: 20-268– Stationary Noise





December 9, 2020

DRAFT

PREPARED FOR
Dymon Storage
2-1830 Walkley Road
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PREPARED BY
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EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment in support of Zoning By-law Amendment (ZBA) application for the proposed development located at 3455 Hawthorne Road in Ottawa, Ontario. The development consists of a four-storey storage building. Sources of stationary noise include rooftop air handling equipment, an emergency generator, and delivery trucks. Figure 1 illustrates a site plan with the surrounding context.

The focus of this study is the exterior noise levels generated by the stationary noise sources. 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 Nicholas Caragianis Architect Inc. and (iv) sound power data for the emergency generator, idling and moving trucks, and rooftop equipment which were based on Gradient Wind's past experience with similar projects.

Our stationary noise feasibility assessment for the proposed Dymon Storage development indicates that the noise levels at nearby points of reception are expected to fall below the ENCG noise criteria, provided our assumptions for noise control in Section 2.1 are adhered to in the detailed design process. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses and will satisfy all site plan conditions. Noise control measures are summarized below:

- The assumptions for noise control outlined in Section 2.1 should be followed.
- The sound power levels of the stationary equipment shall not exceed the levels stipulated in Section 4.3, Table 2.
- The emergency generator shall only be operated during the daytime period (07:00 – 19:00) for non-emergency situations, such as testing and maintenance.

If required, noise levels can be controlled with the diligent design of the mechanical equipment; placing the mechanical equipment such as the rooftop air handling units farther away from the noise-sensitive residential buildings or selecting quieter units. A detailed review of the equipment should be performed once the mechanical design is available and the location of the proposed equipment and specifications are known.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Dymon Storage to undertake a stationary noise feasibility assessment for the proposed Dymon Storage development located at 3455 Hawthorne Road in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise assessment.

The present scope of work involves assessing the impact of the stationary noise sources of the proposed development on the surrounding residential neighbourhood. 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 prepared by Nicholas Caragianis Architect Inc., mechanical equipment data for the emergency generator, idling and moving trucks, and rooftop equipment which is based on Gradient Wind's past experience with similar projects, and surrounding street layouts obtained from recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed Dymon Storage development located at 3455 Hawthorne Road in Ottawa, Ontario. The development consists of a four-storey storage building. Sources of stationary noise include rooftop air handling equipment, trucks serving the storage facility, idling trucks, and an emergency generator.

The site is surrounded by low-rise residential buildings located to the west of the development and commercial buildings surrounding the development clockwise from north to south. Hawthorne Road is located along the west side of the development and Hunt Club Road is located to the south. Figure 1 illustrates the site plan and the surrounding context.

[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 rooftop air handling units, idling truck, moving truck, and the generator are based on Gradient Wind's past experience with similar projects. A review of the equipment selections and locations that will form the requirements of the construction documents/contract should be made by a qualified acoustical engineer; final equipment selections shall be verified to meet or exceed the performance requirements prior to the installation of the equipment.

The following assumptions have been made in the analysis:

(i) The sound power levels of the rooftop air handling units, idling truck, moving truck, and the generator are based on Gradient Wind's past experience with similar projects.
(ii) The rooftop air handling units (RTU) are assumed to operate continuously at 100% over a 1-hour period during the daytime and nighttime periods.
(iii) Idling truck source is assumed to be running for 15 minutes per hour.
(iv) One truck is assumed to be visiting the proposed development per day.
(v) The generator is assumed to be running continuously at 100% over a 1-hour period during the daytime period.
(vi) The RTU noise sources are assumed to be 1.8 metres above the walking roof surface and the generator is assumed to be at 1.5 high above the grade level. The locations of the sources can be seen in Figure 3.
(i) The ground was assumed to be flat.
(ii) The ground region was modelled as absorptive due to the presence of grass and foliage (soft ground), and as reflective where pavement and concrete are present (hard ground).
(iii) A total of 12 receptors (6 POW and 6 OPOR) were strategically placed at the closest noise-sensitive buildings in the surrounding area. The location of the receptors can be seen in Figure 2.

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 of the proposed development 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. 12 receptor locations were selected for the study site, as illustrated in Figure 2.

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 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,

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

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. As the site is near two arterial roads, the area is considered as a Class 1 area as per the ENCG. The recommended maximum noise levels for a Class 1 area at a POR are outlined in Table 1 below.

TABLE 1: EXCLUSIONARY LIMITS FOR CLASS 1 AREA

Time of Day	Point of Reception (POR)	
	Outdoor Points of Reception (OPOR)	Plane of Window (POW)
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

Table 2 summarizes the sound power of each source used in the analysis. As per NPC-300, the generator was evaluated separately from other sources. The stationary noise source locations can be seen in Figure 3.

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

TABLE 2: EQUIPMENT SOUND POWER LEVELS (DBA)

Source ID	Description	Height Above Grade (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1 ,2, 3, 4, 5, 6	Lennox RTU 300	27.35	79	79	84	88	89	85	82	73	**94**
S7, 8, 9	Lennox RTU 156	27.35	71	71	78	81	81	76	71	63	**86**
S10	Generator	1.50	64	68	80	85	89	87	82	84	**93**
S11	Idling Truck	2.00	-	-	-	-	101	-	-	-	**101**
S12	Moving Truck	2.00	65	72	76	85	90	89	83	74	**94**

4.4 Stationary Source Noise Predictions

A total of 12 receptor locations were chosen at the surrounding noise-sensitive buildings to measure the noise impact at the outdoor point of reception (OPOR) and plane of window (POW) 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 4 and illustrated in Figure 2. Besides POW receptors, the noise levels were investigated at 6 different OPOR locations. All rooftop air handling equipment, emergency generator, and idling truck were represented as point sources in the Predictor model. Moving truck noise was modelled as a moving source. 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. A Predictor-Lima sample output 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 roadways and paved areas	0
Ground attenuation factor for grass and foliage areas	1
Temperature (K)	283.15
Pressure (kPa)	101.33
Air humidity (%)	70

TABLE 4: RECEPTOR LOCATIONS

Receptor Number	Receptor Type	Receptor Location	Height Above Grade (m)
R1	POW	69 Forestglade Crescent – East Façade	6
R2	POW	81 Forestglade Crescent – East Façade	6
R3	POW	93 Forestglade Crescent – East Façade	6
R4	POW	103 Forestglade Crescent – East Façade	6
R5	POW	111 Forestglade Crescent – East Façade	6
R6	POW	119 Forestglade Crescent – East Façade	6
R7	OPOR	69 Forestglade Crescent – Backyard (East)	1.5
R8	OPOR	81 Forestglade Crescent – Backyard (East)	1.5
R9	OPOR	93 Forestglade Crescent – Backyard (East)	1.5
R10	OPOR	103 Forestglade Crescent – Backyard (East)	1.5
R11	OPOR	111 Forestglade Crescent – Backyard (East)	1.5
R12	OPOR	119 Forestglade Crescent – Backyard (East)	1.5

5. RESULTS AND DISCUSSION

The preliminary calculations showed that the impact of the proposed equipment on the closest residential buildings will remain within the ENCG criteria provided that the assumptions outlined in Section 2.1 are followed and the noise source levels do not exceed the sound power levels listed in Table 2. The results of the calculations can be seen in Table 5.

TABLE 5: NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day*	Night	Day*	Night	Day*	Night
R1	POW	6	47	44	50	45	Yes	Yes
R2	POW	6	49	45	50	45	Yes	Yes
R3	POW	6	50	45	50	45	Yes	Yes
R4	POW	6	50	45	50	45	Yes	Yes
R5	POW	6	49	44	50	45	Yes	Yes
R6	POW	6	47	42	50	45	Yes	Yes
R7	OPOR	1.5	42	N/A**	50	45	Yes	N/A**
R8	OPOR	1.5	48	N/A**	50	45	Yes	N/A**
R9	OPOR	1.5	48	N/A**	50	45	Yes	N/A**
R10	OPOR	1.5	48	N/A**	50	45	Yes	N/A**
R11	OPOR	1.5	48	N/A**	50	45	Yes	N/A**
R12	OPOR	1.5	45	N/A**	50	45	Yes	N/A**

* Day values include both day and evening results.
** Outdoor Points of Reception (OPOR) during the nighttime are not considered as per the ENCG

Generator noise levels at all receptors will remain within the ENCG criteria as can be seen in Table 6, provided that the generator noise levels do not exceed the levels listed in Table 2.

TABLE 6: GENERATOR NOISE LEVELS

Receptor Number	Receptor Type	Height Above Grade (m)	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
			Day	Night	Day	Night	Day	Night
R1	POW	6	13	N/A*	55	N/A*	Yes	N/A*
R2	POW	6	19	N/A*	55	N/A*	Yes	N/A*
R3	POW	6	19	N/A*	55	N/A*	Yes	N/A*
R4	POW	6	45	N/A*	55	N/A*	Yes	N/A*
R5	POW	6	47	N/A*	55	N/A*	Yes	N/A*
R6	POW	6	46	N/A*	55	N/A*	Yes	N/A*
R7	OPOR	1.5	13	N/A*	55	N/A*	Yes	N/A*
R8	OPOR	1.5	20	N/A*	55	N/A*	Yes	N/A*
R9	OPOR	1.5	20	N/A*	55	N/A*	Yes	N/A*
R10	OPOR	1.5	46	N/A*	55	N/A*	Yes	N/A*
R11	OPOR	1.5	48	N/A*	55	N/A*	Yes	N/A*
R12	OPOR	1.5	46	N/A*	55	N/A*	Yes	N/A*

* Emergency generator noise levels during the nighttime are not considered as per the NPC-300

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 stationary noise sources don't exceed the levels shown in Table 2.

Noise control measures are summarized below:

- The assumptions for noise control outlined in Section 2.1 should be followed.
- The sound power levels of the stationary equipment shall not exceed the levels stipulated in Section 4.3, Table 2.
- The emergency generator shall only be operated during the daytime period (07:00 – 19:00) for non-emergency situations, such as testing and maintenance.

As such, the proposed development is expected to be compatible with the existing and future noise-sensitive land uses. A detailed review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to the installation of the equipment to verify that the equipment will meet or exceed the acoustical performance requirements.

This concludes our stationary noise feasibility 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.

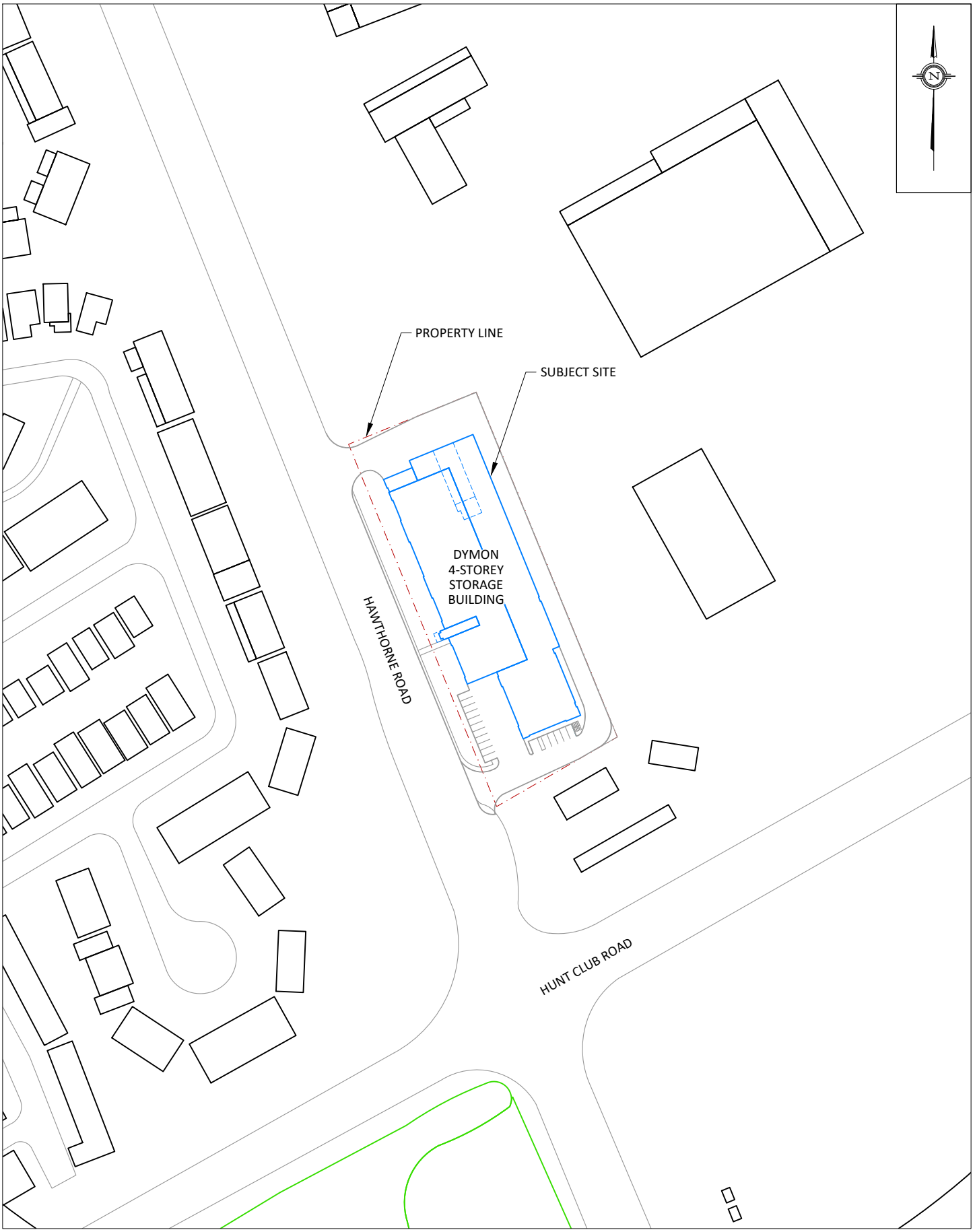
Sincerely,

Gradient Wind Engineering Inc.

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File 20-268 – Stationary Noise



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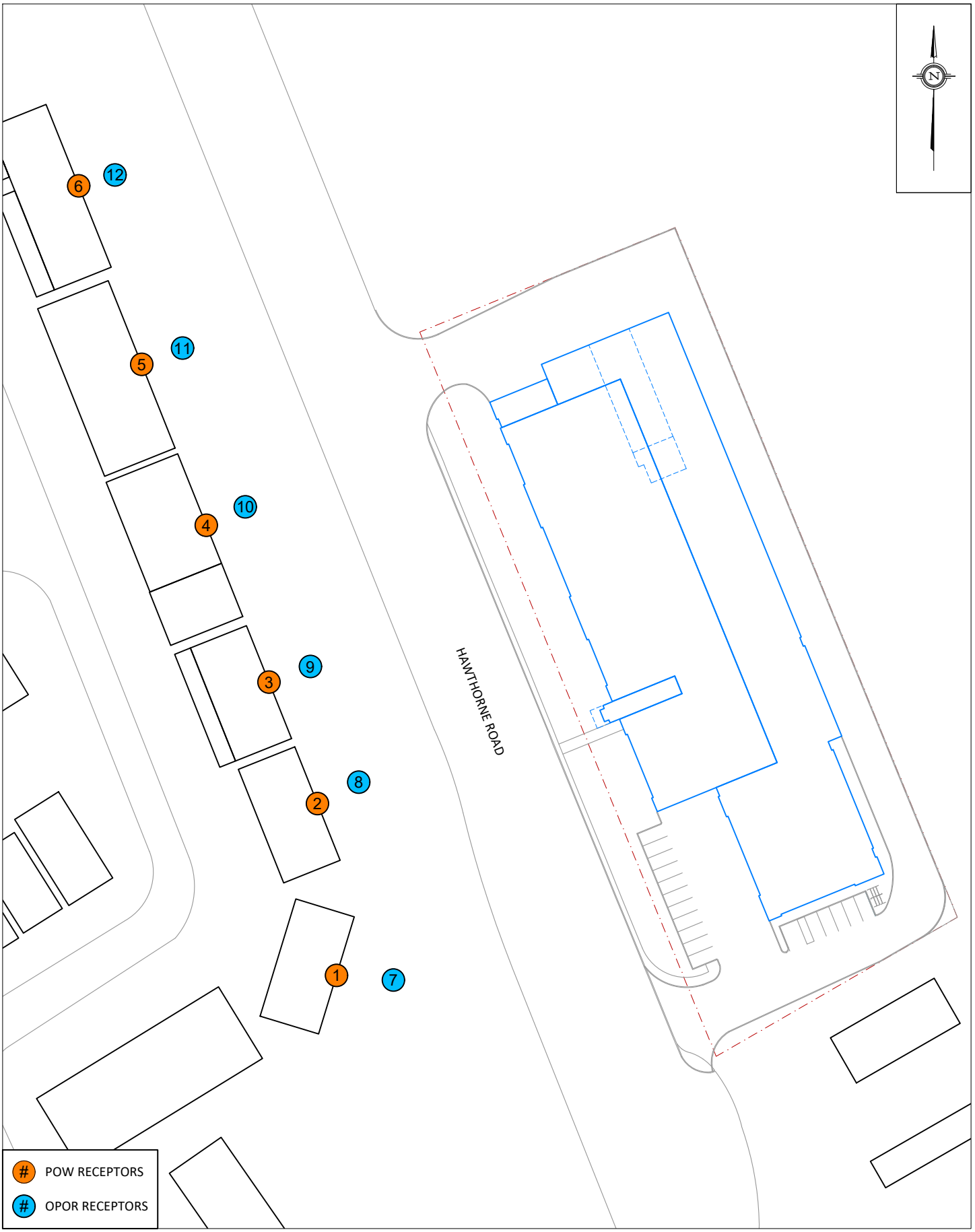
PROJECT	3455 HAWTHORNE ROAD, OTTAWA STATIONARY NOISE ASSESSMENT		
SCALE	1:2000 (APPROX.)	DRAWING NO.	GW20-268-1
DATE	NOVEMBER 30, 2020	DRAWN BY	E.K.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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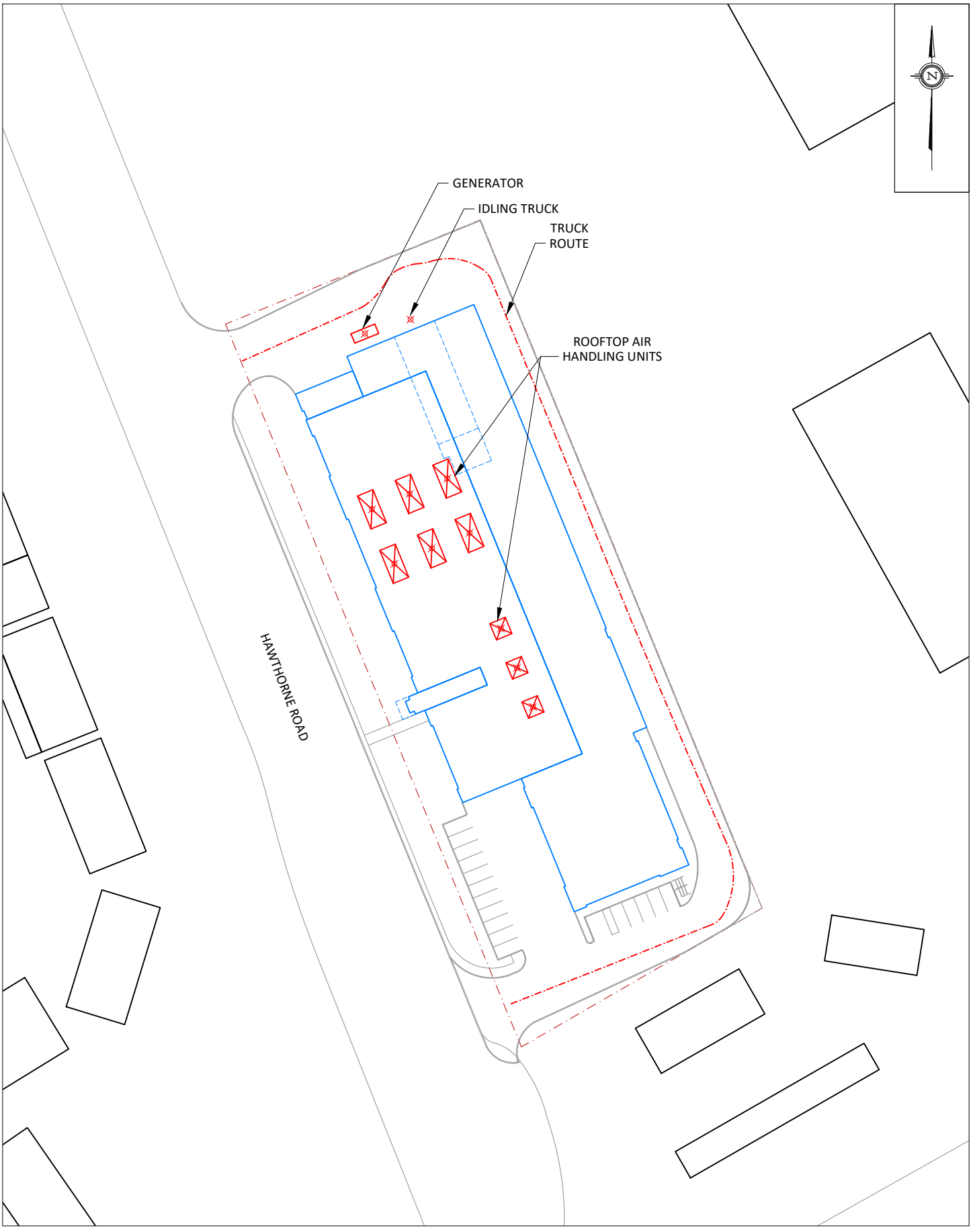
DATE	NOVEMBER 30, 2020	DRAWN BY E.K.	



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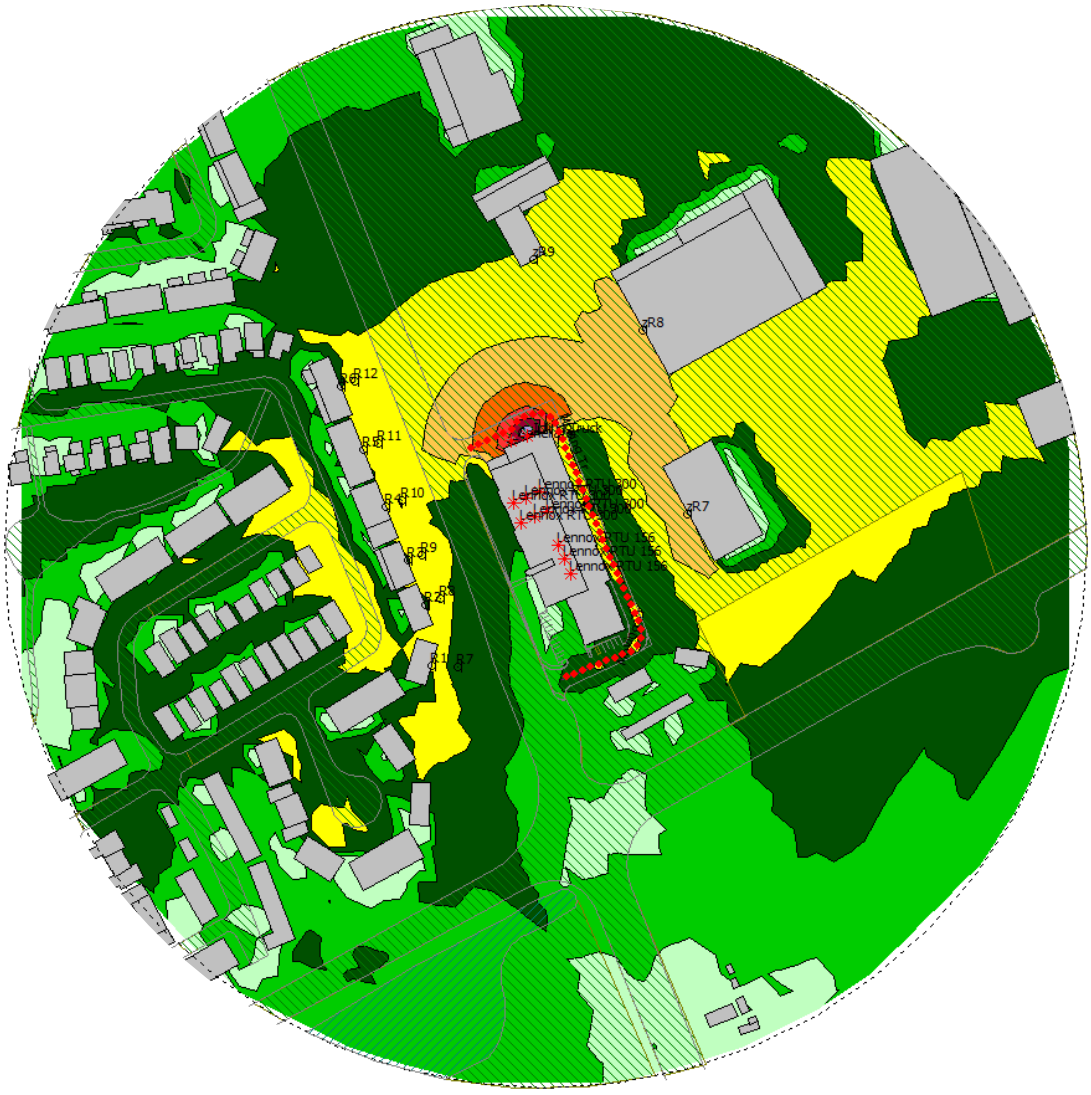

FIGURE 4: DAYTIME NOISE CONTOURS (4 M ABOVE GRADE)

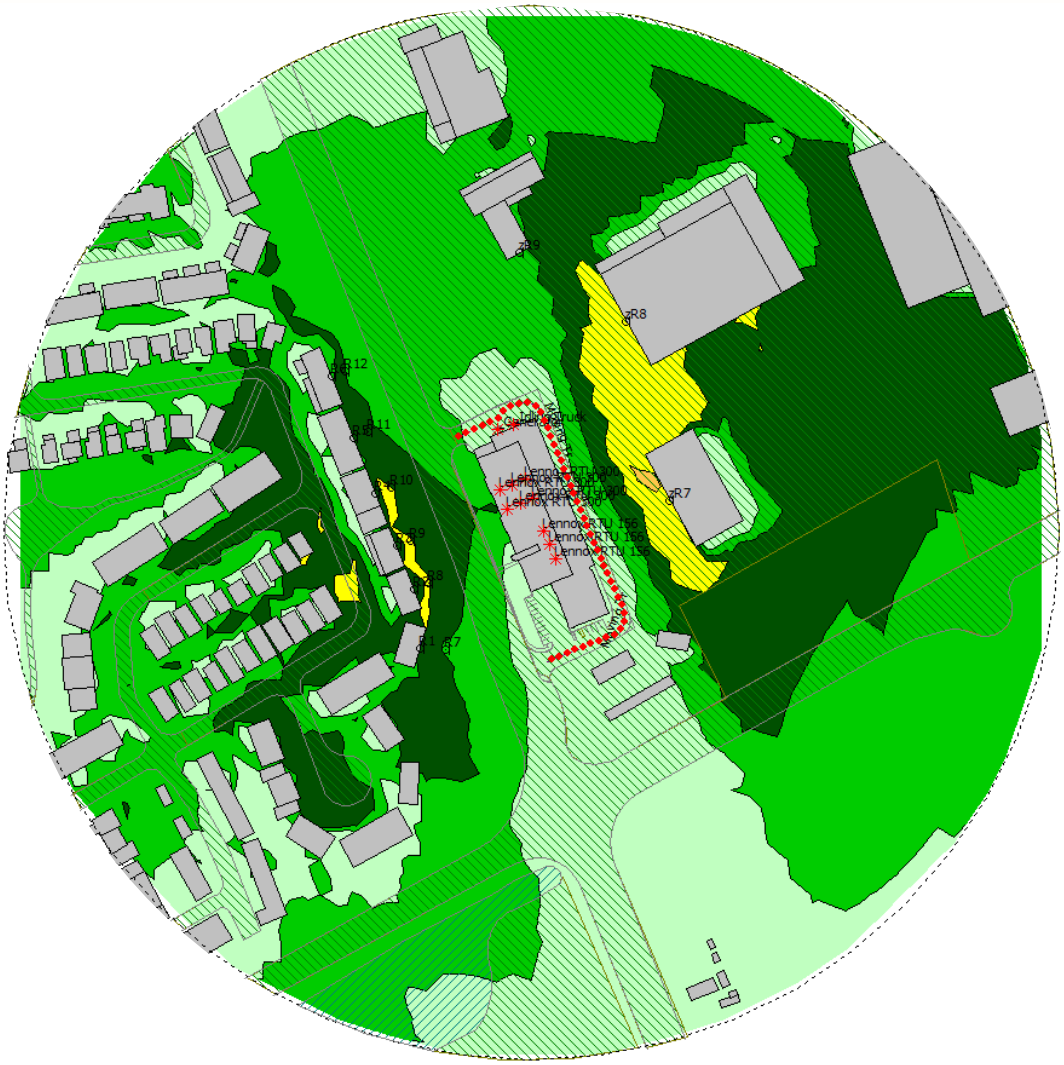

FIGURE 5: NIGHTTIME NOISE CONTOURS (4 M ABOVE GRADE)

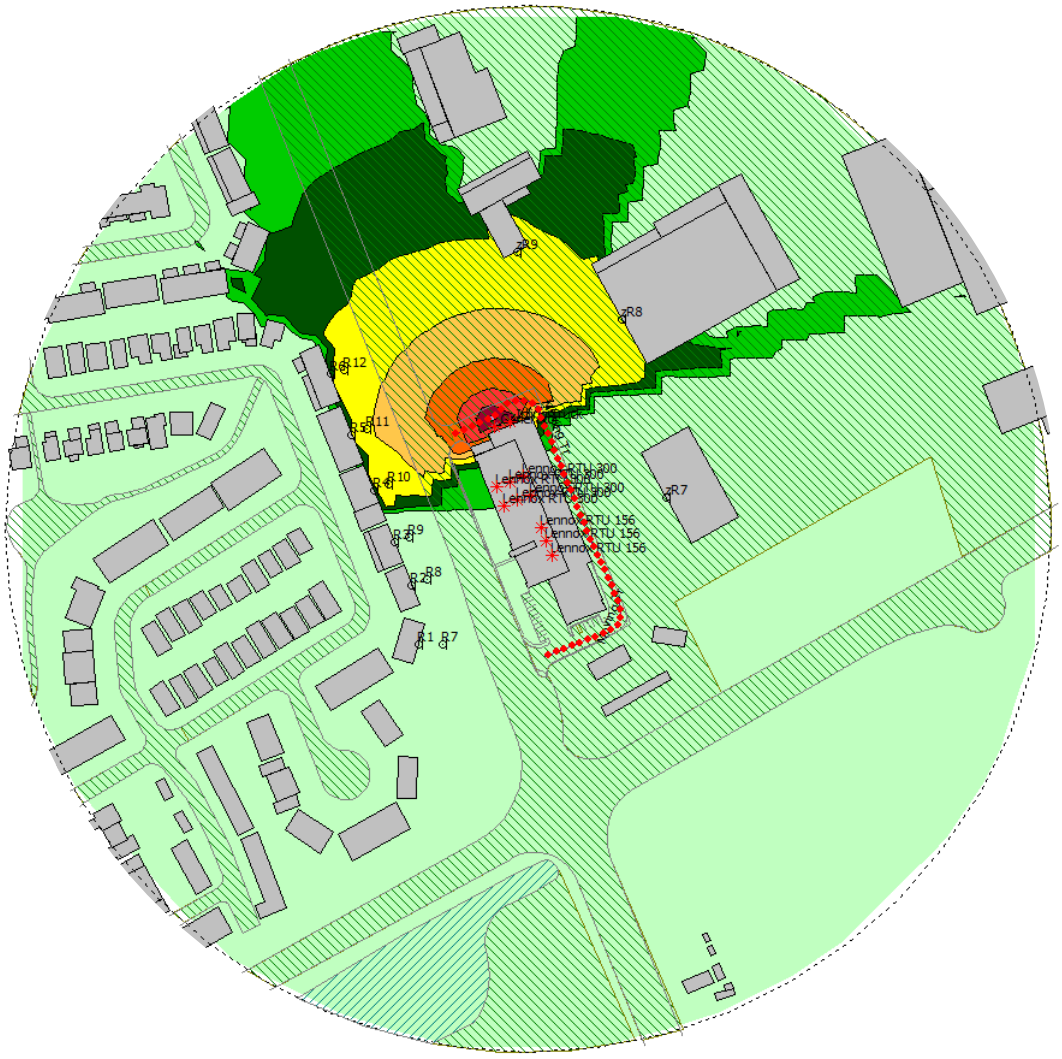

FIGURE 6: GENERATOR NOISE CONTOURS (4 M ABOVE GRADE)

- *80 – 85 dB*
- *75 – 80 dB*
- *70 – 75 dB*
- *65 – 70 dB*
- *60 – 65 dB*
- *55 – 60 dB*
- *50 – 55 dB*
- *45 – 50 dB*
- *40 – 45 dB*
- *35 – 40 dB*
- *0 – 35 dB*