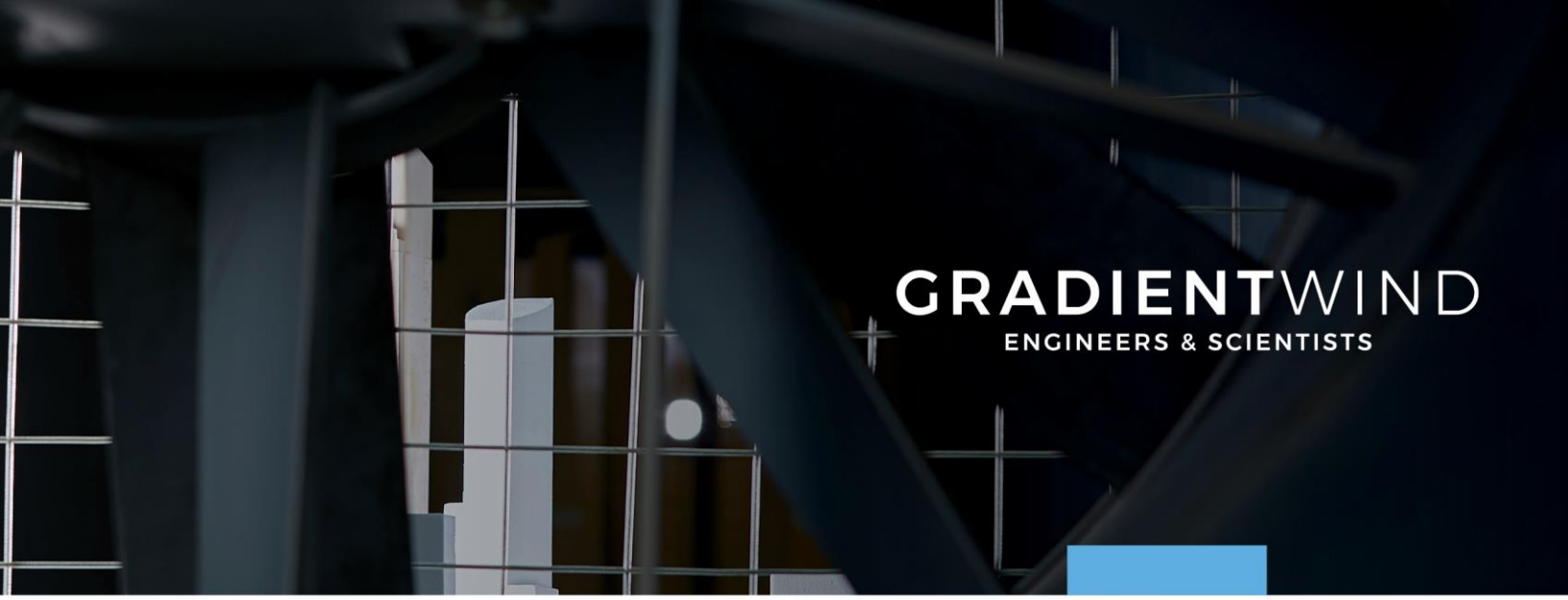
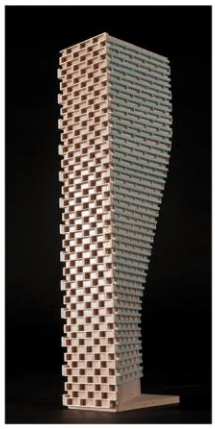


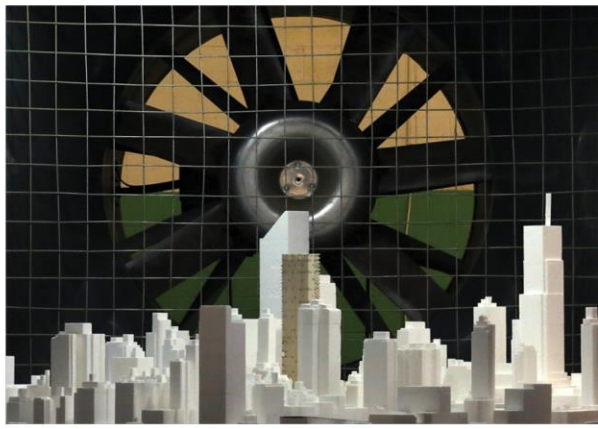
GRADIENTWIND
ENGINEERS & SCIENTISTS

STATIONARY NOISE ASSESSMENT

2983 Navan Road
Ottawa, Ontario

REPORT: 23-204– Stationary Noise





December 12, 2023

PREPARED FOR

H&H Orleans Gas Inc.
190 Lisgar St
Ottawa, ON K2P 0C4

PREPARED BY

Efser Kara, MSc, LEED GA, Acoustic Scientist
Joshua Foster, P.Eng., Lead Engineer

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

EXECUTIVE SUMMARY

This report describes a stationary noise assessment performed for the proposed gas station and car wash development located at 2983 Navan Road in Orleans Ottawa, Ontario. The development site is bounded by Brian Coburn Boulevard to the northwest and Navan Road to the southwest. The development's property line facing Brian Coburn Boulevard is referred to as North throughout this study. The proposed development is a triangular site, comprising a gas station and carwash, at the west corner of a planned subdivision consisting of 4-storey buildings and townhouses. The residential subdivision is under a separate application but was included in the study as context. Existing residential buildings are located to the west, across Navan Road, and to the immediate south of the study site. Figure 1 illustrates the site plan and 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) site plan drawings prepared by PMA Architects; and (iv) stationary noise source data extracted from Gradient Wind's past experience with similar projects.

Our stationary noise assessment indicates 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 do not exceed the levels shown in Table 2. As such, the proposed development is expected to be compatible with the existing and future noise-sensitive land uses. A review of final equipment selection and locations by a qualified acoustical engineer will be required prior to the installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by H&H Orleans Inc. to undertake a stationary noise assessment in support of a Site Plan Control (SPC) application for the proposed gas station and car wash development located at 2983 Navan Road in Orleans Ottawa, Ontario, hereinafter referred to as the "proposed development", "study site", or "subject site". 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, site plan drawings prepared by PMA Architects, surrounding street layouts obtained from the City of Ottawa and recent site imagery, and stationary noise source data extracted from Gradient Wind's past experience with similar projects.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is a proposed commercial development consisting of a gas station, car wash and drive-thru (subject site) located at 2983 Navan Road in Orleans Ottawa, Ontario.

The development site is bounded by Brian Coburn Boulevard to the northwest and Navan Road to the southwest. The development's property line facing Brian Coburn Boulevard is referred to as North throughout this study. The proposed development is a triangular site, comprising a gas station and carwash, at the west corner of a planned subdivision consisting of 4-storey buildings and townhouses. The proposed development is part of a planned subdivision comprising 4 storey condominium buildings and townhomes. The study site is a triangular-shaped parcel located at the west corner of the planned subdivision and consists of a gas station and carwash. The residential subdivision is under a separate application but was included in the study as context. Existing residential buildings are located to the west,

[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

across Navan Road, and to the immediate south of the study site. Figure 1 illustrates the site plan and the surrounding context.

The primary stationary noise sources are the car wash, rooftop units (RTU), idling cars in queue at the drive-thru and carwash.

2.1 Assumptions

Sound power data of the stationary noise sources (car wash, idling cars, RTUs) is based on Gradient Wind's experience. A review of the equipment selections and locations that will form the requirements of the construction documents/contract will need to be made by a qualified acoustical engineer; final equipment selections will 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 rooftop air handling units are assumed to operate continuously over a 1-hour period during the daytime and at 50% during the nighttime.

(ii) The car wash is assumed to operate 50% of the time over a 1-hour period during the daytime and 10% during the nighttime.

(iii) Cars are assumed to be idling continuously over a 1-hour period during the daytime and at 50% during the nighttime.

(iv) The ground was assumed to be flat and the ground region was modelled as absorptive except for the roads and paved areas which were modelled as reflective.

(v) A 0.5-metre high parapet wall is assumed to surround the rooftop of the drive-through restaurant and gas station/retail building.

(vi) A 2.5-metre high noise barrier is assumed to separate the car wash from the surrounding residential buildings (see Figure 4).

(vii) The car wash doors are expected to be closed so sound power levels at the entrance and exit of the car wash do not exceed the levels stated in Tabel 2.

(viii) A total of 25 receptors were strategically placed on existing and proposed noise-sensitive buildings surrounding the site. 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. 25 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].

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

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. As the site is located in a rapidly growing area and bordered by a new 4-lane road (Brian Coburn Boulevard) and an arterial road (Navan Road), the area is considered 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] City of Ottawa Environmental Noise Guidelines, page 9

4.3 Determination of Noise Source Power Levels

Table 2 summarizes the maximum permissible sound power level for each source used in the analysis. The stationary noise source locations can be seen in Figure 3.

TABLE 2: MAXIMUM PERMISSIBLE SOUND POWER LEVELS (DBA)

Source ID	Description	Height Above Grade (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1	RTU-01 – Drive-Trough Restaurant	6.5	67	72	75	80	79	76	73	70	**85**
S2	RTU-02 – Gas Station/Retail	6.5	67	72	75	80	79	76	73	70	**85**
S3	Idling Cars	0.75	55	65	57	65	66	63	62	54	**72**
S4	Car Wash Entrance	4x3*	49	57	62	78	79	79	77	74	**85**
S5	Car Wash Exit	3x3*	53	65	69	84	85	84	79	70	**90**

* Emitting façade (Length x Height)

4.4 Stationary Source Noise Predictions

A total of 25 receptor locations were chosen on 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. The noise levels were assessed at 15 discrete POW receptor locations at different heights. Besides POW receptors, the noise levels were investigated at 10 different OPOR locations. RTUs and idling cars were represented as point sources in the Predictor model while the car wash entrance and exit were represented as emitting façades. 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 lawn	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)
R01	POW	Building D - West	10.5
R02	POW	Building D - South	10.5
R03	POW	B11-7 - West	4.5
R04	POW	B11-5 - West	4.5
R05	POW	B11-2 - West	4.5
R06	POW	B10-6 - West	4.5
R07	POW	3007 Navan Road - West	4.5
R08	POW	3007 Navan Road - North	4.5
R09	POW	2997 Navan Road - North	4.5
R10	POW	2993 Navan Road - West	4.5
R11	POW	2993 Navan Road - North	4.5
R12	POW	3000 Navan Road - North	4.5
R13	POW	712 Percifor Way - East	4.5
R14	POW	714 Percifor Way - North	4.5
R15	POW	718 Percifor Way - Northwest	4.5
R16	OPOR	Building D - Outdoor Area	1.5
R17	OPOR	B11-6 - Backyard	1.5
R18	OPOR	B11-4 - Backyard	1.5
R19	OPOR	B11-1 - Backyard	1.5
R20	OPOR	2993 Navan Road - Backyard	1.5
R21	OPOR	2993 Navan Road - Backyard	1.5
R22	OPOR	2997 Navan Road - Backyard	1.5
R23	OPOR	3007 Navan Road - Backyard	1.5
R24	OPOR	712 Percifor Way - Backyard	1.5
R25	OPOR	718 Percifor Way - Backyard	1.5

5. RESULTS AND MITIGATION MEASURES

Noise levels at nearby sensitive receptors are below ENCG and NPC-300 criteria for stationary noise, as summarized in Table 5 below. The sound levels listed are based on the assumptions outlined in Section 2.1.

TABLE 5: STATIONARY NOISE SOURCES IMPACT ON RECEPTORS

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	10.5	49	44	50	45	Yes	Yes
R2	POW	10.5	50	44	50	45	Yes	Yes
R3	POW	4.5	50	44	50	45	Yes	Yes
R4	POW	4.5	45	41	50	45	Yes	Yes
R5	POW	4.5	45	40	50	45	Yes	Yes
R6	POW	4.5	40	36	50	45	Yes	Yes
R7	POW	4.5	43	39	50	45	Yes	Yes
R8	POW	4.5	43	39	50	45	Yes	Yes
R9	POW	4.5	45	40	50	45	Yes	Yes
R10	POW	4.5	45	40	50	45	Yes	Yes
R11	POW	4.5	42	39	50	45	Yes	Yes
R12	POW	4.5	33	28	50	45	Yes	Yes
R13	POW	4.5	33	30	50	45	Yes	Yes
R14	POW	4.5	33	30	50	45	Yes	Yes
R15	POW	4.5	33	30	50	45	Yes	Yes
R16	OPOR	1.5	49	N/A*	50	N/A*	Yes	N/A*
R17	OPOR	1.5	42	N/A*	50	N/A*	Yes	N/A*
R18	OPOR	1.5	43	N/A*	50	N/A*	Yes	N/A*
R19	OPOR	1.5	42	N/A*	50	N/A*	Yes	N/A*
R20	OPOR	1.5	38	N/A*	50	N/A*	Yes	N/A*

TABLE 5: STATIONARY NOISE SOURCES IMPACT ON RECEPTORS (CONT.)

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
R21	OPOR	1.5	39	N/A*	50	N/A*	Yes	N/A*
R22	OPOR	1.5	38	N/A*	50	N/A*	Yes	N/A*
R23	OPOR	1.5	42	N/A*	50	N/A*	Yes	N/A*
R24	OPOR	1.5	32	N/A*	50	N/A*	Yes	N/A*
R25	OPOR	1.5	31	N/A*	50	N/A*	Yes	N/A*

* Day values include both day and evening results.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels at nearby points of reception are expected to comply with ENCG and NPC-300 noise criteria provided that the assumptions outlined in Section 2.1 are followed and the sound power levels of the stationary noise sources do not exceed the levels shown in Table 2. As such, the proposed development is expected to be compatible with the existing noise-sensitive land uses.

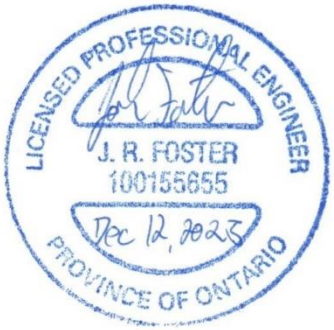
To ensure compliance with the ENCG and NPC-300 outdoor sound level limits, the following noise control measures are recommended:

- The sound power levels of the RTUs and Car Wash Exit and Entrance should not exceed the levels shown in Table 2. In order to reduce the Car Wash noise levels, the doors will be closed during the cleaning and drying of the cars to reduce the noise levels.
- A 0.5-metre-high parapet wall is assumed to surround the rooftop of the drive-through restaurant and gas station/retail (see Figure 4).
- A 2.5-metre-high noise barrier is assumed to separate the carwash from the surrounding residential buildings (see Figure 4). The noise barrier/parapet wall should have no gaps and should have a minimum surface mass of 20 kg/m².

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,

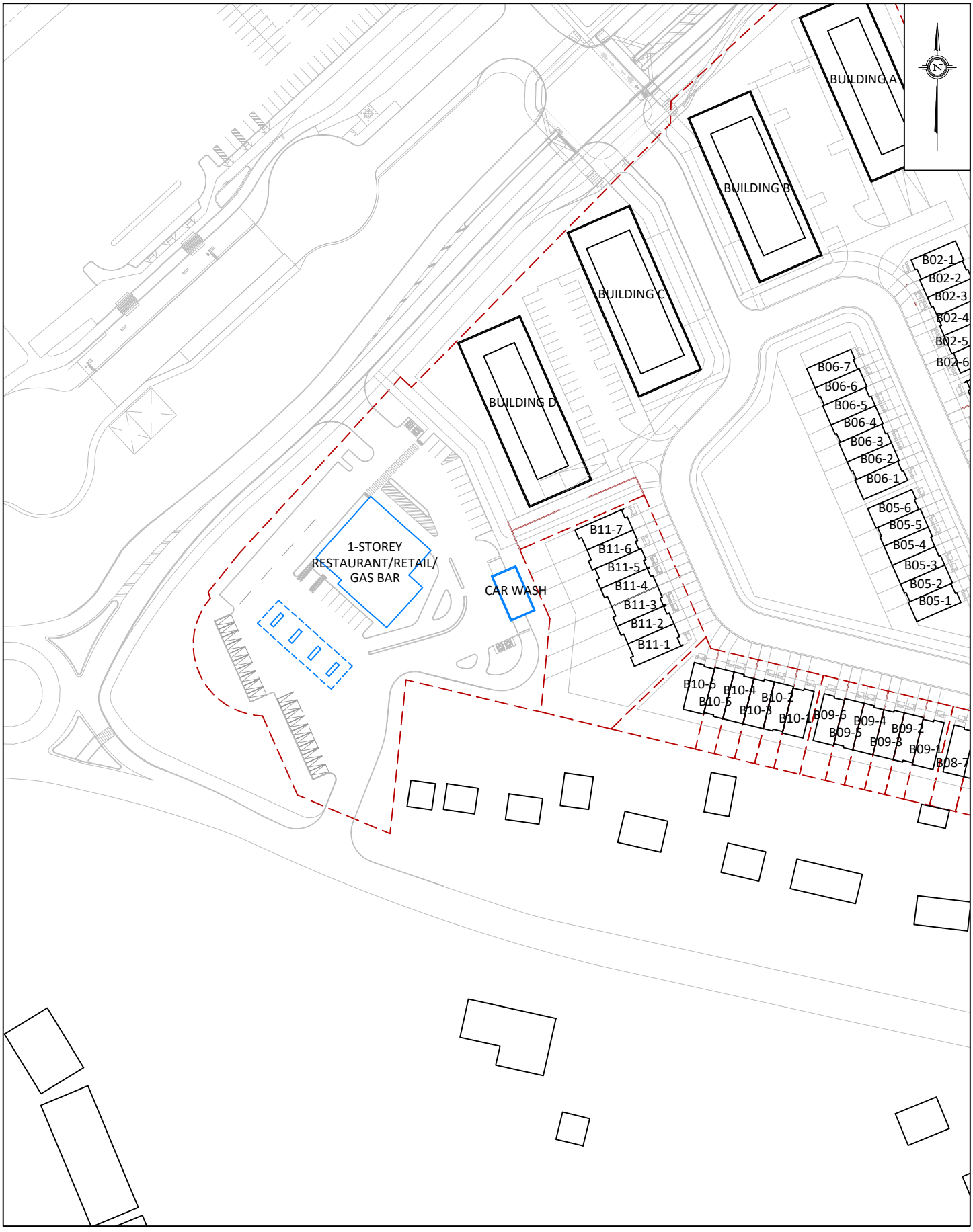
Gradient Wind Engineering Inc.



Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File #23-204 – Stationary Noise

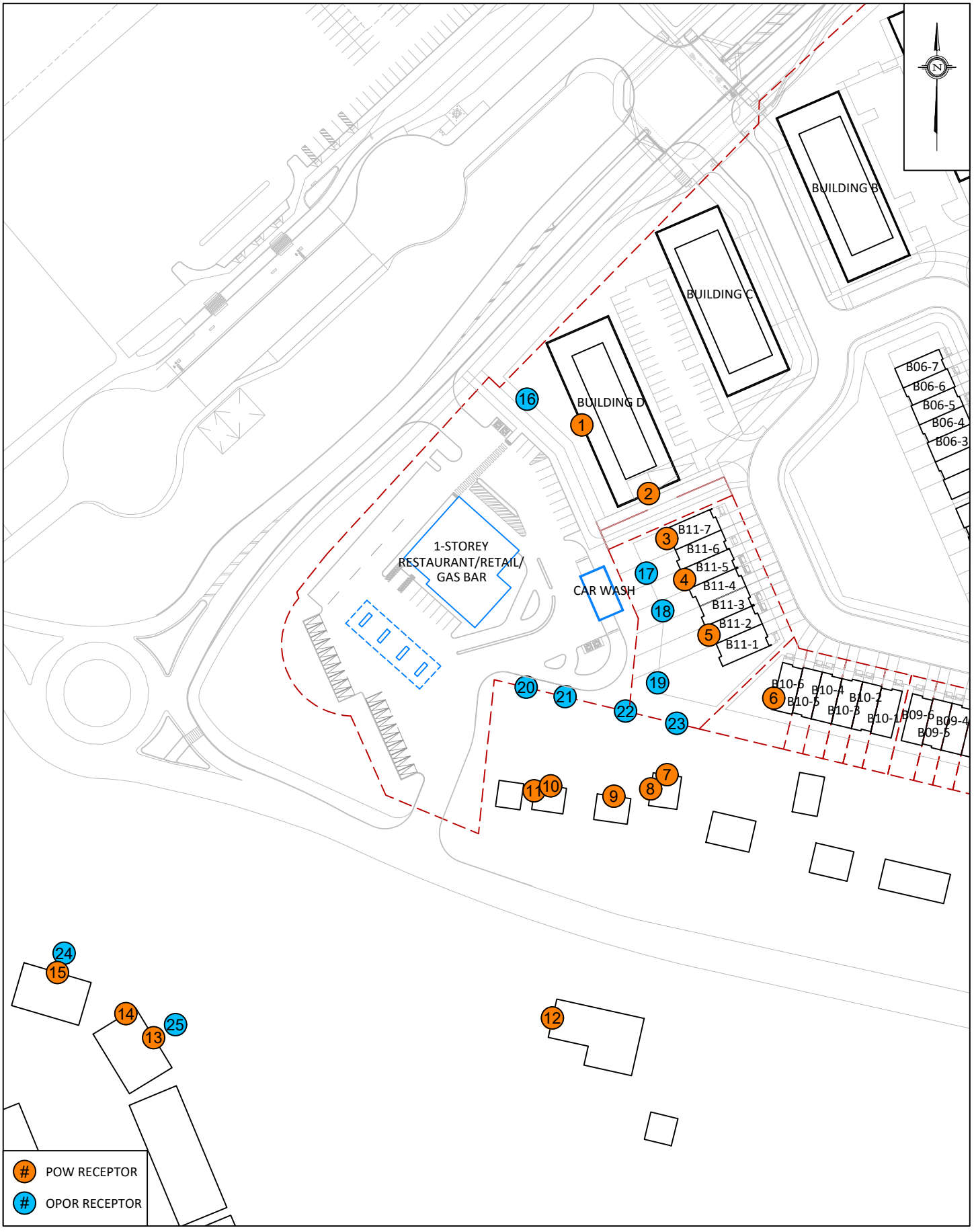


GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	2983 NAVAN ROAD, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1500 (APPROX.)	DRAWING NO.	GW23-204 - 1
DATE	DECEMBER 11, 2023	DRAWN BY	E.K.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



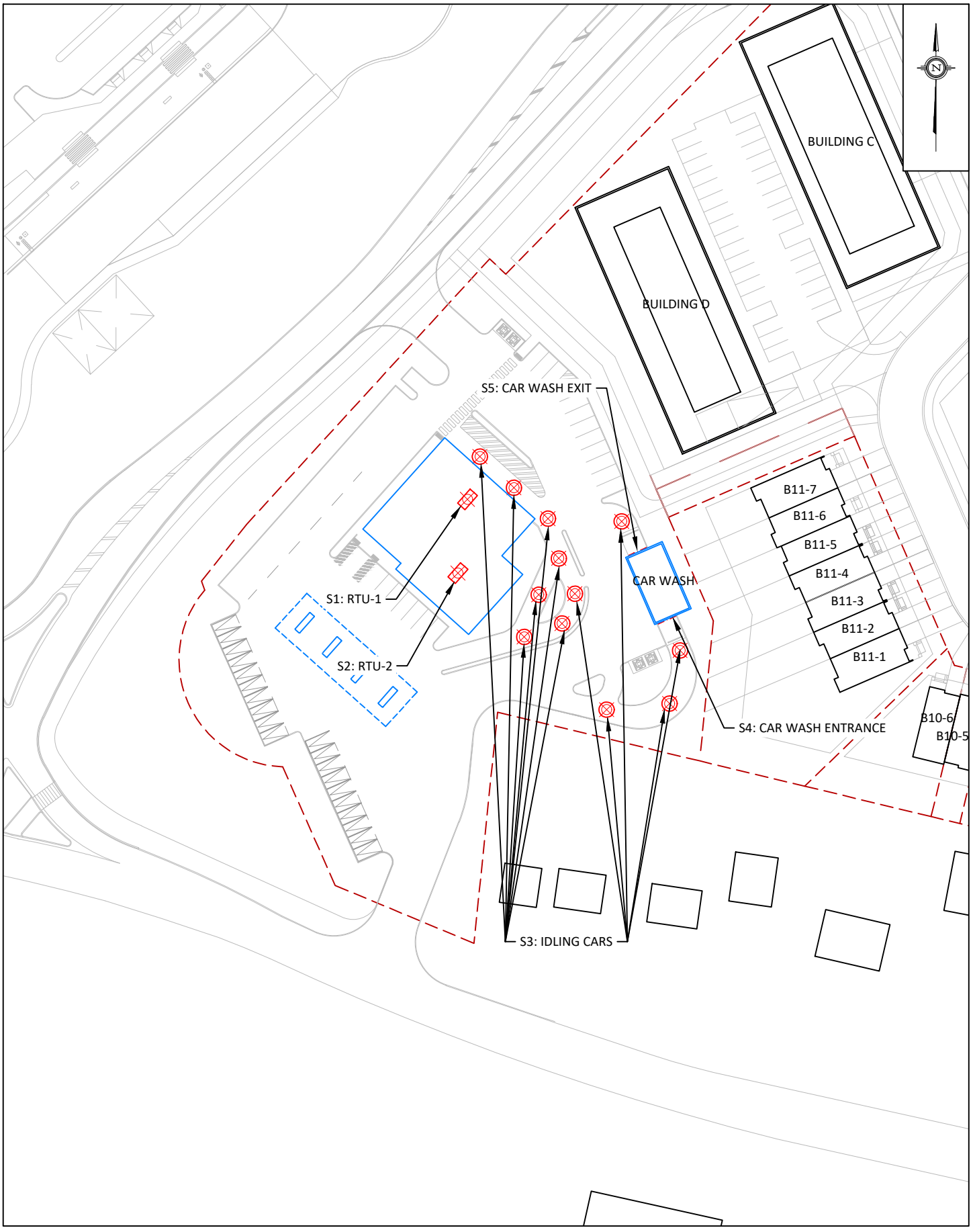
GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	2983 NAVAN ROAD, OTTAWA STATIONARY NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW23-204 - 2
DATE	DECEMBER 11, 2023
DRAWN BY	E.K.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS

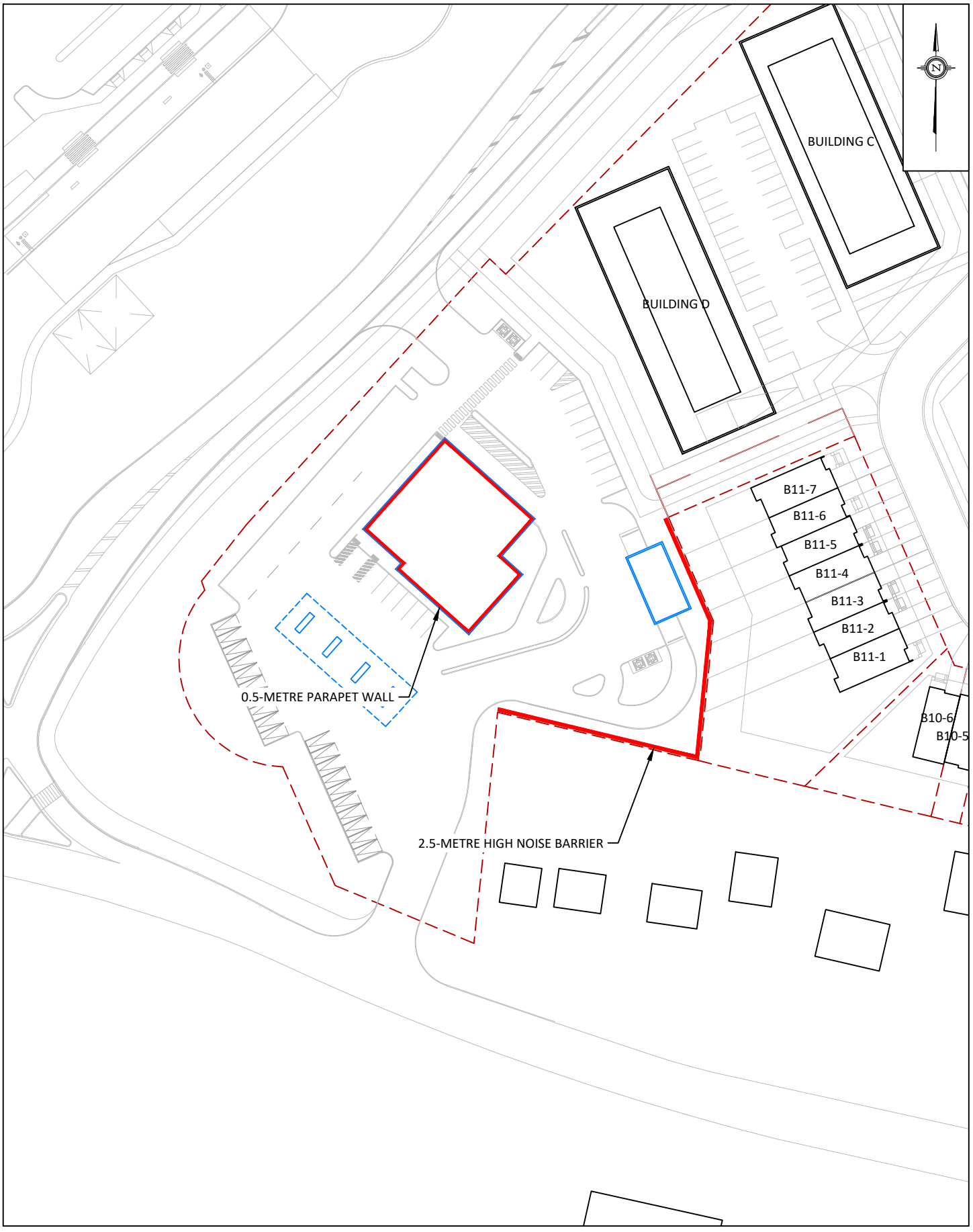


GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	2983 NAVAN ROAD, OTTAWA STATIONARY NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW23-204 - 3
DATE	DECEMBER 11, 2023	DRAWN BY	E.K.

FIGURE 3:
NOISE SOURCE LOCATIONS



GRADIENTWIND
ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	2983 NAVAN ROAD, OTTAWA STATIONARY NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW23-204 - 4
DATE	DECEMBER 11, 2023
DRAWN BY	E.K.
DESCRIPTION	FIGURE 4: NOISE BARRIER LOCATIONS

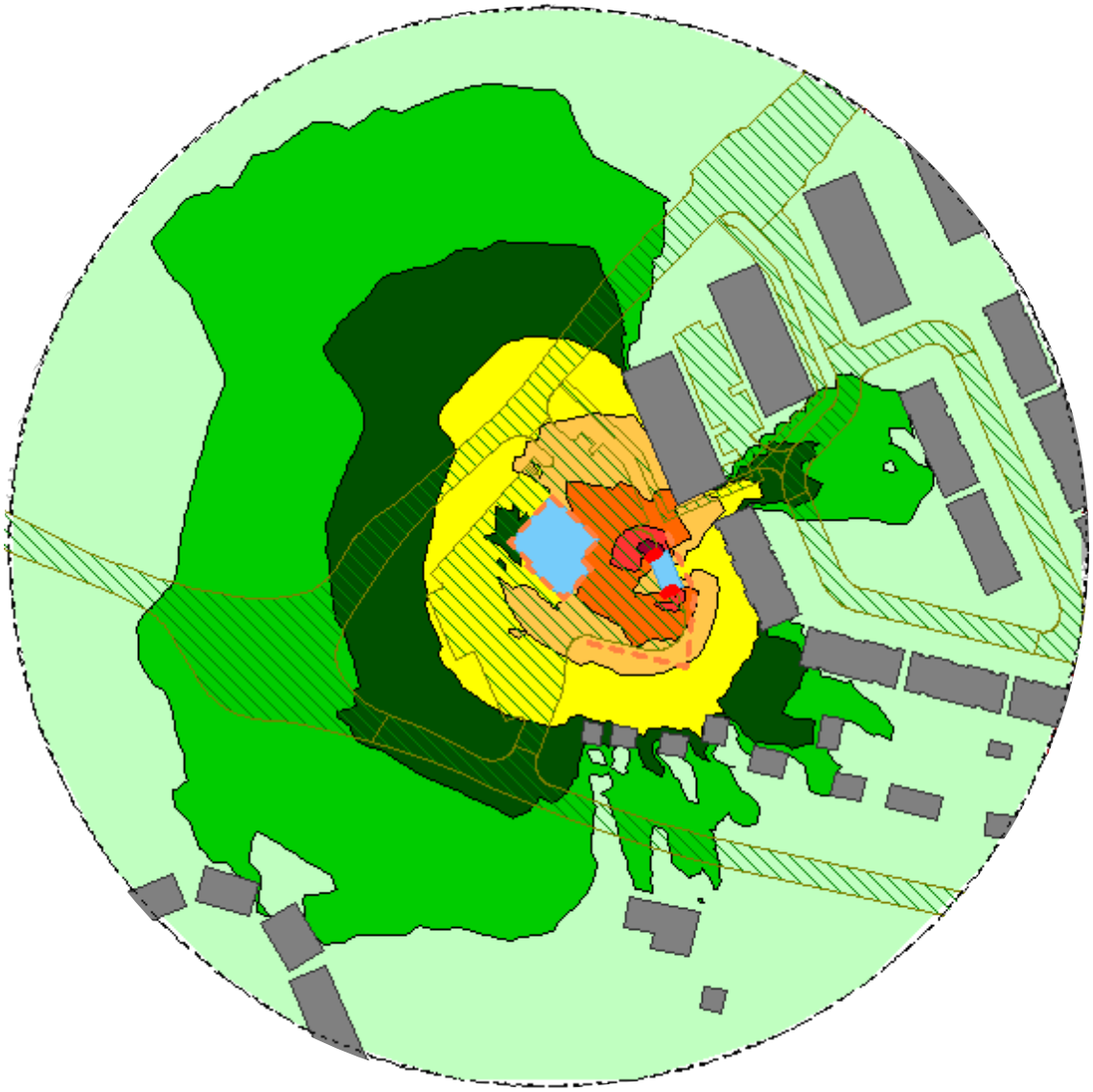


FIGURE 5: DAYTIME NOISE CONTOURS (4.5 M ABOVE GRADE)

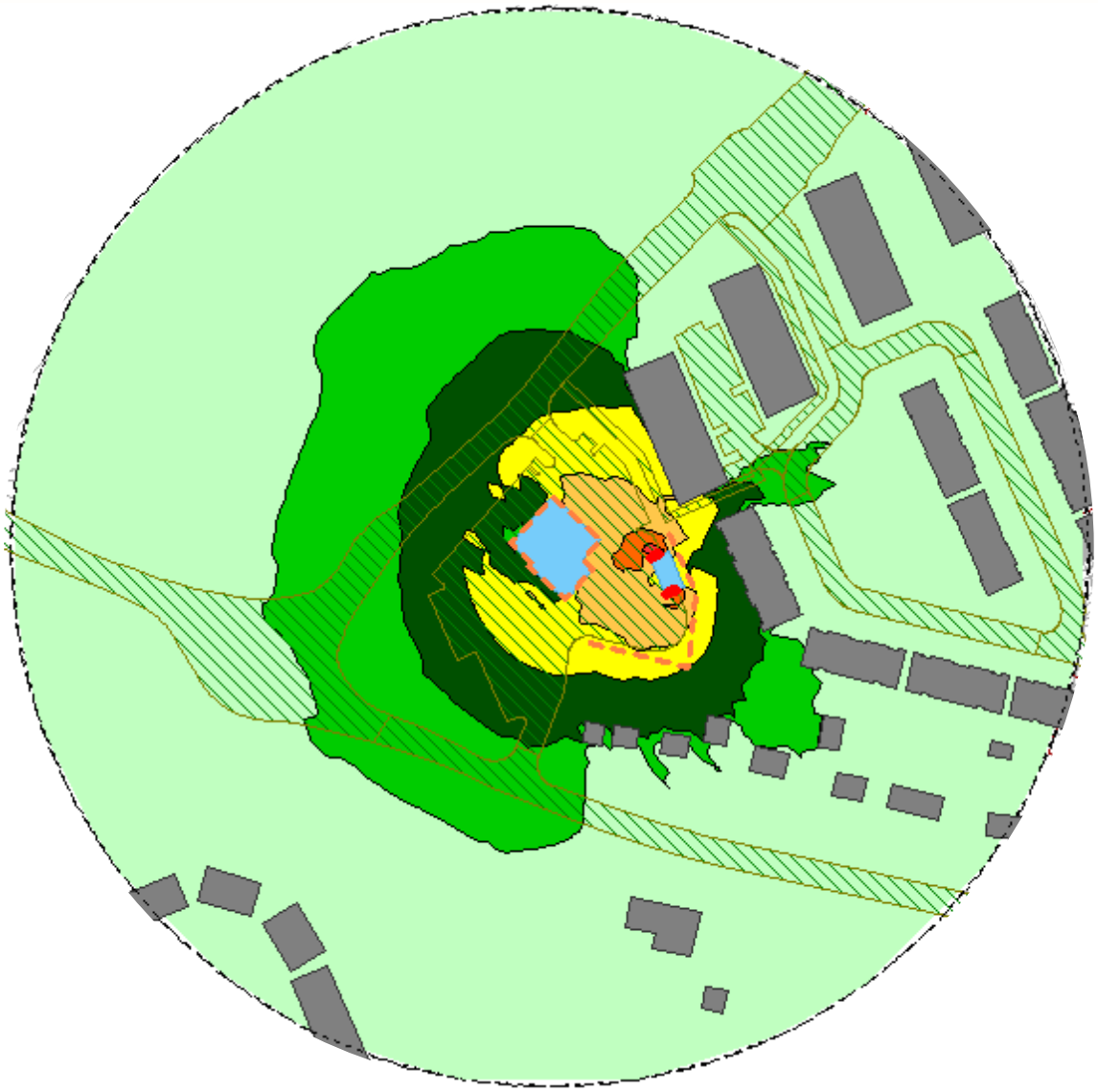


FIGURE 6: NIGHTTIME NOISE CONTOURS (4.5 M ABOVE GRADE)