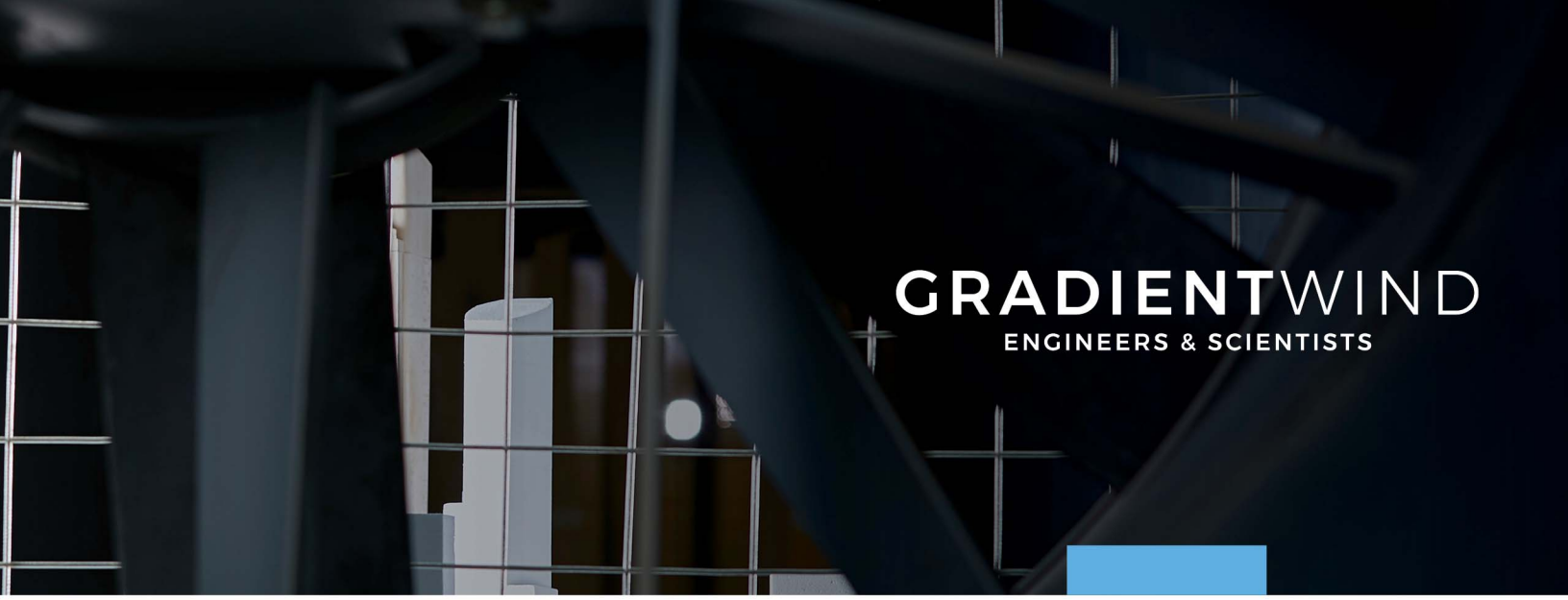

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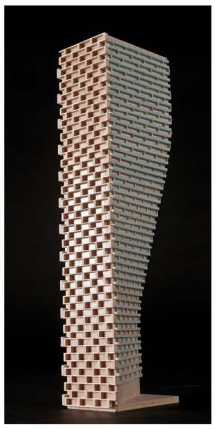
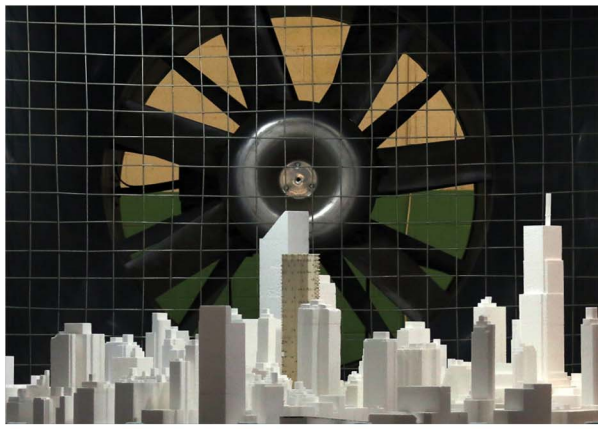
STATIONARY NOISE FEASIBILITY ASSESSMENT

2525 Carling Avenue (Lincoln Fields Redevelopment)
Ottawa, Ontario

REPORT: GWE18-178-Stationary Noise Feasibility





December 13, 2018

PREPARED FOR

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EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment performed for a proposed redevelopment of Lincoln Fields Shopping Centre located at 2525 Carling Avenue in Ottawa, Ontario. The redevelopment comprises relocation of the Rexall store and the Metro grocery store, and the demolition of the existing mall. The Rexall is proposed to relocate to a new two-story building situated midway along the south property line, adjacent to Carling Avenue. Partial demolition of the existing mall will take place to accommodate parking spaces and the Metro grocery store relocated at the northeast corner of the site. Sources of stationary noise include rooftop mechanical equipment, idling reefer trucks, and an emergency generator. Figure 1 illustrates a site plan with 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) conceptual site plan drawings prepared by RLA Architecture dated November 15, 2018; and (iv) mechanical information provided by McGregor Allsop Consulting Engineers.

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 for noise control as outlined in Section 2.1 are adhered to during the detailed design process. The proposed grocery store loading dock enclosure was conservatively omitted in the analysis and assumed the loading docks were outside. Therefore, the enclosure would not be required due to the noise, however it would be beneficial. As such, the proposed development is expected to be compatible with the existing noise sensitive land uses and will satisfy all site plan conditions. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by RioCan Management Incorporated to undertake a stationary noise feasibility assessment for the proposed redevelopment of Lincoln Fields Shopping Centre located at 2525 Carling Avenue in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to a stationary noise feasibility assessment.

The present scope of work involves assessing exterior noise levels generated by rooftop mechanical equipment, idling reefer trucks, and an emergency 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, conceptual site plan drawings prepared by RLA Architecture dated November 15, 2018, mechanical information provided by McGregor Allsop Consulting Engineers, surrounding street layouts obtained from the City of Ottawa, and recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise feasibility assessment is the proposed redevelopment at 2525 Carling Avenue in Ottawa, Ontario. The development is located on a parcel of land bound by Richmond Road to the North, Croydon Avenue to the West, Carling Avenue to the South. The site is surrounded by mixed-use land, comprising residential, commercial, and business zones. The nearest points of reception are the adjacent residential buildings toward the East and West.

The redevelopment comprises relocation of the Rexall store and the Metro grocery store, and the demolition of the existing mall. The Rexall is proposed to relocate to a new two-storey building situated midway along the south property line adjacent to Carling Avenue. Partial demolition of the existing mall will take place to accommodate new parking spaces and the Metro grocery store relocated at the northeast corner of the site. The current plans for the grocery store show an enclosure for the loading area, Figure 1 illustrates the site plan and surrounding context.

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

The facilities are expected to operate 24 hours a day. However, certain sources are likely to have reduced operation during the nighttime period between 23:00 and 07:00. Sources of stationary noise include rooftop mechanical equipment, idling reefer trucks, and an emergency generator. Figure 2 illustrates the location of all noise sources included in this study.

2.1 Assumptions

Preliminary mechanical information for the development has been based on information provided by McGregor Allsop Consulting Engineers, as well as Gradient Wind's experience with similar developments where mechanical equipment information was not available. Once mechanical equipment has been selected, these should be forwarded to Gradient Wind for review. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment. The following assumptions have been made in the analysis:

(i) A refrigerated trailers' air conditioning unit (reefer) is assumed to operate at the loading dock for thirty minutes per hour during the daytime period (07:00 – 23:00). No idling trucks are at the loading dock during the nighttime period (23:00 – 07:00). The City of Ottawa Noise By-law No.2017-255 prohibits deliveries during the nighttime period.

(ii) Three truck movements occur per hour during the daytime period (07:00 – 23:00). Two truck movement paths were investigated as trucks could enter the site via Richmond Road or Carling Avenue.

(iii) The garbage compactor operates for six minutes per hour during the daytime period (07:00 – 23:00). No garbage compactor operation occurs during the nighttime period (23:00 – 07:00).

(iv) The locations, quantity and tonnage of rooftop units has been assumed based on information provided by McGregor Allsop Consulting Engineers, as well as Gradient Wind's experience with similar developments.

(v) Sound data for rooftop units are based on manufacturer's data.

(vi) Sound power data for rooftop air handling units would note exceed a sound power level of 89 dBA (re picowatt).

(vii) Sound data for reefer units, truck movements, and garbage compactor are based on Gradient Wind's past experience.

(viii) The rooftop mechanical units are assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.

(ix) The emergency generator shall only be operated during the daytime period (07:00-23:00) for non-emergency situations such as testing and maintenance.

(x) The generator is situated on the rooftop within a Level 2 sound attenuating enclosure.

(xi) Screening effects of buildings have been considered in the modelling.

(xii) Screening effects of the parapets on the Rexall building have been included in the modelling (refer to Figure 4).

(xiii) The Rexall RTU was determined based on a "worst-case scenario" as sound data for the Rexall mechanical units was not available. Sound data for the loudest RTU atop the Rexall was chosen as a performance limit to meet ENCG guidelines. The number of RTUs operational (4) was chosen based on previous experience with similar developments.

(xiv) Sound power levels from exhaust fans were examined to be well below sound power levels of the nearby RTU's and condenser units. Noise from the fans were considered negligible.

(xv) The proposed grocery store loading dock enclosure was conservatively omitted from the analysis and assumed all loading docks were outside.

The equipment considered in the model consisted of:

(i) Truck Route (S1, S2)

(ii) Garbage Compactor (S3)

(iii) Truck Reefer Unit (S4)

(iv) Condenser: RefPlus Gas Cooler 2x5 (S5)

(v) Lennox LGH Energence: RTU-1, RTU-2 (S6, S8)

(vi) CES-MPU-050: RTU-3 (S7, S10-S13)

(vii) CES-SPU-0060-00: RTU-4 (S9)

(viii) Cummins C60D6C QSB5-G13 Emergency Generator (S14, S15)

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the surrounding dwellings 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. Eighteen receptor locations were selected for the study site, as illustrated in Figure 3.

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].

[3] NPC – 300, page 16

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, camp grounds, and noise sensitive buildings such as schools and places of worship. The recommended maximum noise levels for a Class 1 area in a suburban environment adjacent to arterial roadways at a POR are outlined in Table 1 below. The study site is considered to be in a Class 1 area because it is bound by two arterial roadways. These conditions indicate that the sound field is dominated by manmade sources.

TABLE 1: 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

Preliminary mechanical information for the development has been based on information provided by McGregor Allsop Consulting Engineers, as well as Gradient Wind's experience with similar developments. Table 2 summarizes the sound power of each source used in the analysis.

[4] NPC – 300, page 14

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	Truck Route	2.7	80	90	97	101	102	97	91	82	106
S3	Garbage Compactor	0.5	-	-	-	-	95	-	-	-	95
S4	Reefer Unit	2.7	-	-	-	-	98	-	-	-	98
S5	Condenser	2	-	-	-	-	91	-	-	-	91
S6	RTU-1	1.7	47	47	57	67	71	69	63	52	75
S7, S10-S13	RTU-3	1.7	71	76	79	84	82	80	77	74	89*
S8	RTU-2	1.7	47	47	57	67	71	69	63	52	75
S9	RTU-4	1.7	75	78	83	82	79	76	73	81	88
S14	Generator Exhaust	2.3	82	85	89	89	90	88	92	97	100
S15	Generator	2	85	88	88	93	92	90	87	83	98

* Maximum Sound power level permissible given the equipment's current location in order to maintaining compliance with ENCG criteria.

4.4 Stationary Source Noise Predictions

The impact of stationary noise sources on nearby residential 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 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 3 and illustrated in Figure 3. All units were represented as point sources in the Predictor model. 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 in Appendix A. Further modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	POW – 1330 Richmond Road	31
R2	POW – 1330 Richmond Road	31
R3	POW – 1320 Richmond Road	25
R4	POW – 2560 Starflower Lane	4
R5	POW – 2574 Starflower Lane	4
R6	POW – 360 Croydon Avenue	50
R7	POW – 2575 Bond Street	4
R8	POW – 2550 Carling Avenue	4
R9	POW – 811 Connaught Avenue	5
R10	POW – 811 Connaught Avenue	5
R11	OPOR – 1330 Richmond Road	1.5
R12	OPOR – 1330 Richmond Road	1.5
R13	OPOR – 1320 Richmond Road	1.5
R14	OPOR – 2560 Starflower Lane	1.5
R15	OPOR – 2574 Starflower Lane	1.5
R16	OPOR – 2576 Carling Avenue	1.5
R17	OPOR – 811 Connaught Avenue	1.5
R18	OPOR – 811 Connaught Avenue	1.5

TABLE 4: CALCULATION SETTINGS

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

5. RESULTS AND DISCUSSION

Noise levels at nearby sensitive receptors fall below ENCG criteria for stationary noise, as summarized in Table 5 below. The sound levels listed in Table 5 are based on the assumptions outlined in Section 2.1. Since the generator is for emergency situations, it has been assessed separately from the other mechanical equipment, as per ENCG guidelines.

TABLE 5: NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
R1	POW – 1330 Richmond Road	47	43	50	45	Yes	Yes
R2	POW – 1330 Richmond Road	47	44	50	45	Yes	Yes
R3	POW – 1320 Richmond Road	50	43	50	45	Yes	Yes
R4	POW – 2560 Starflower Lane	41	36	50	45	Yes	Yes
R5	POW – 2574 Starflower Lane	37	33	50	45	Yes	Yes
R6	POW – 360 Croydon Avenue	43	40	50	45	Yes	Yes
R7	POW – 2575 Bond Street	43	39	50	45	Yes	Yes
R8	POW – 2550 Carling Avenue	47	43	50	45	Yes	Yes
R9	POW – 811 Connaught Avenue	48	45	50	45	Yes	Yes

TABLE 5 (CONTINUED): NOISE LEVELS FROM STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
R10	POW – 811 Connaught Avenue	48	45	50	45	Yes	Yes
R11	OPOR – 1330 Richmond Road	31	28	50	N/A	Yes	Yes
R12	OPOR – 1330 Richmond Road	35	32	50	N/A	Yes	Yes
R13	OPOR – 1320 Richmond Road	32	28	50	N/A	Yes	Yes
R14	OPOR – 2560 Starflower Lane	38	33	50	N/A	Yes	Yes
R15	OPOR – 2574 Starflower Lane	38	35	50	N/A	Yes	Yes
R16	OPOR – 2576 Carling Avenue	41	37	50	N/A	Yes	Yes
R17	OPOR – 811 Connaught Avenue	45	42	50	N/A	Yes	Yes
R18	OPOR – 811 Connaught Avenue	42	39	50	N/A	Yes	Yes

As Table 5 summarizes, noise levels fall below ENCG criteria at all receptors. Noise contours at 1.5 m above grade can be seen in Figure 5 and 6 for daytime and nighttime conditions, respectively. The main contributor of noise at these locations is the reefer unit and RTU-3 on the Metro and Rexall buildings. The loudest rooftop equipment should be located toward the centre of the rooftop, avoiding direct line of sight with sensitive areas if possible.

TABLE 6: NOISE LEVELS FROM EMERGENCY EQUIPMENT

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	Sound Level Limits	Meets ENCG Class 1 Criteria	
		Day	Day	Day	Night
R1	POW – 1330 Richmond Road	53	55	Yes	Yes
R2	POW – 1330 Richmond Road	54	55	Yes	Yes
R3	POW – 1320 Richmond Road	53	55	Yes	Yes
R4	POW – 2560 Starflower Lane	44	55	Yes	Yes
R5	POW – 2574 Starflower Lane	31	55	Yes	Yes
R6	POW – 360 Croydon Avenue	45	55	Yes	Yes
R7	POW – 2575 Bond Street	43	55	Yes	Yes

TABLE 6 (CONTINUED): NOISE LEVELS FROM EMERGENCY EQUIPMENT

Receptor Number	Plane of Window Receptor Location	Noise Level (dBA)	Sound Level Limits	Meets ENCG Class 1 Criteria	
		Day	Day	Day	Night
R8	POW – 2550 Carling Avenue	43	55	Yes	Yes
R9	POW – 811 Connaught Avenue	38	55	Yes	Yes
R10	POW – 811 Connaught Avenue	43	55	Yes	Yes
R11	OPOR – 1330 Richmond Road	34	55	Yes	Yes
R12	OPOR – 1330 Richmond Road	36	55	Yes	Yes
R13	OPOR – 1320 Richmond Road	23	55	Yes	Yes
R14	OPOR – 2560 Starflower Lane	41	55	Yes	Yes
R15	OPOR – 2574 Starflower Lane	32	55	Yes	Yes
R16	OPOR – 2576 Carling Avenue	38	55	Yes	Yes
R17	OPOR – 811 Connaught Avenue	41	55	Yes	Yes
R18	OPOR – 811 Connaught Avenue	39	55	Yes	Yes

Assuming the standby power generator is equipped with a Level 2 enclosure, noise levels from the emergency generator are expected to fall below ENCG criteria during the daytime period, as shown in Table 6. Since the generator is an emergency unit, the noise criteria in Section 4.2 can be increased by 5 dBA as outlined in the ENCG. With consideration of Gradient Wind's recommendations, the proposed development is expected to be compatible with the existing land uses.

6. CONCLUSIONS AND RECOMMENDATIONS

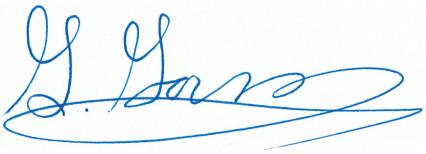
The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria, provided that the assumptions for noise control as outlined in Section 2.1 are adhered to during the detailed design process. It was noted in Section 2.1 the proposed grocery store loading dock enclosure was conservatively omitted in the analysis and assumed the loading docks were outside. Therefore, the enclosure would not be required due to the noise, however it would be beneficial. As such, the proposed development is expected to be compatible with the existing noise

sensitive land uses and will satisfy all site plan conditions. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment.

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.



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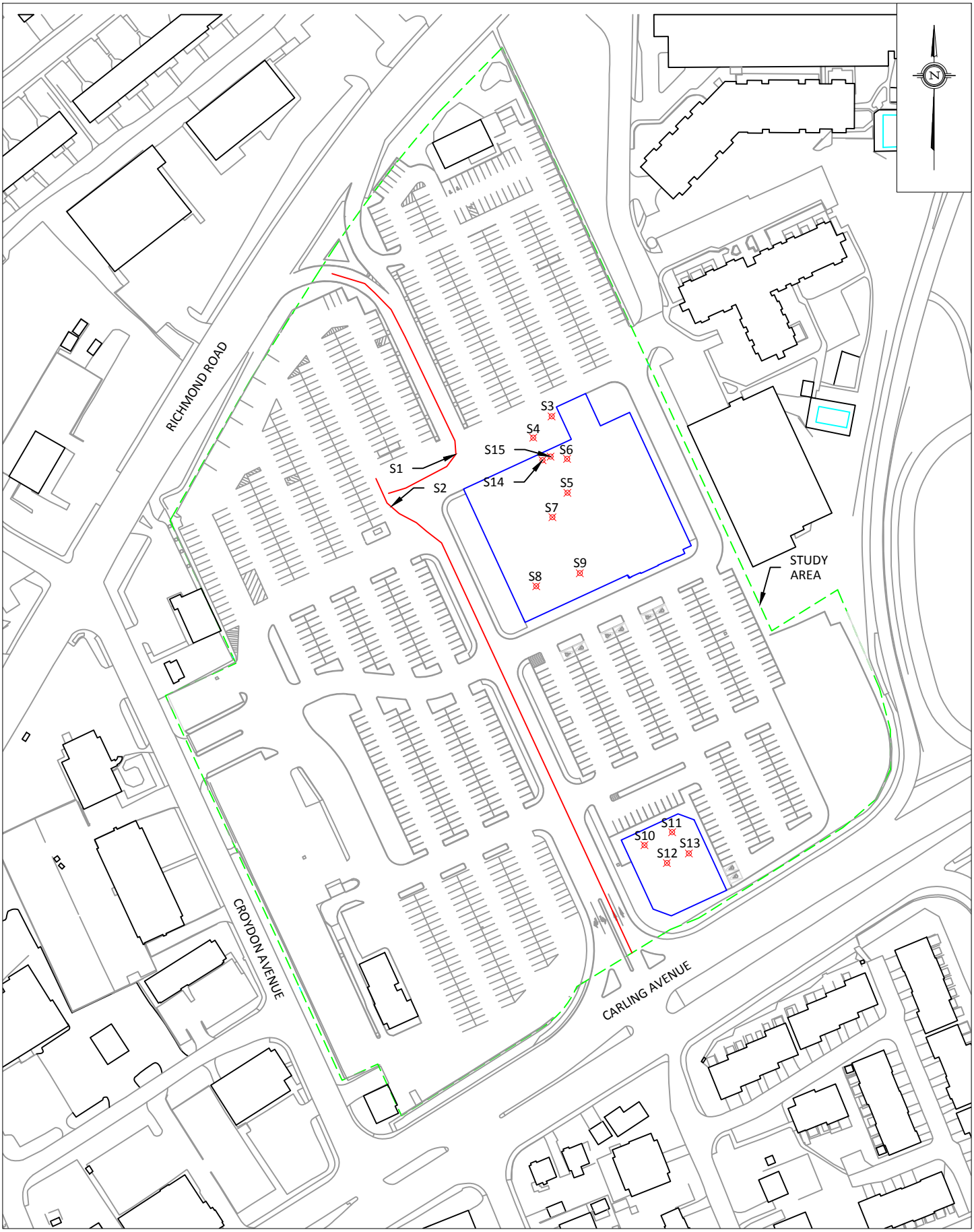
PROJECT	2525 CARLING AVENUE - STATIONARY NOISE STUDY		DESCRIPTION
SCALE	1:2000 (APPROX.)	DRAWING NO.	GWE18-178
DATE	DECEMBER 6, 2018	DRAWN BY	G.G.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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DESCRIPTION

FIGURE 2:
STATIONARY NOISE SOURCE LOCATIONS

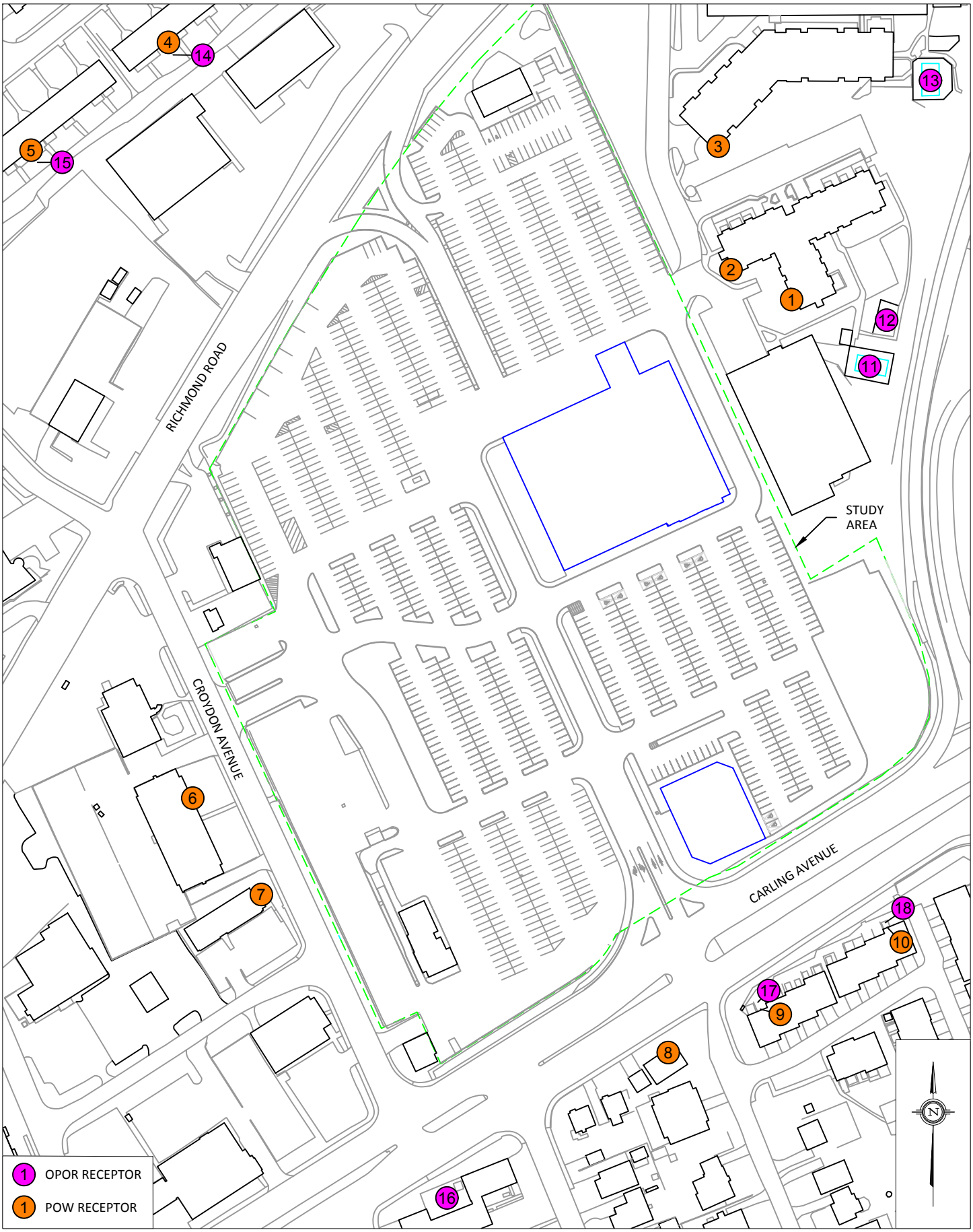

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FIGURE 3:
RECEPTOR LOCATIONS

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FIGURE 4:
PARAPET LOCATION

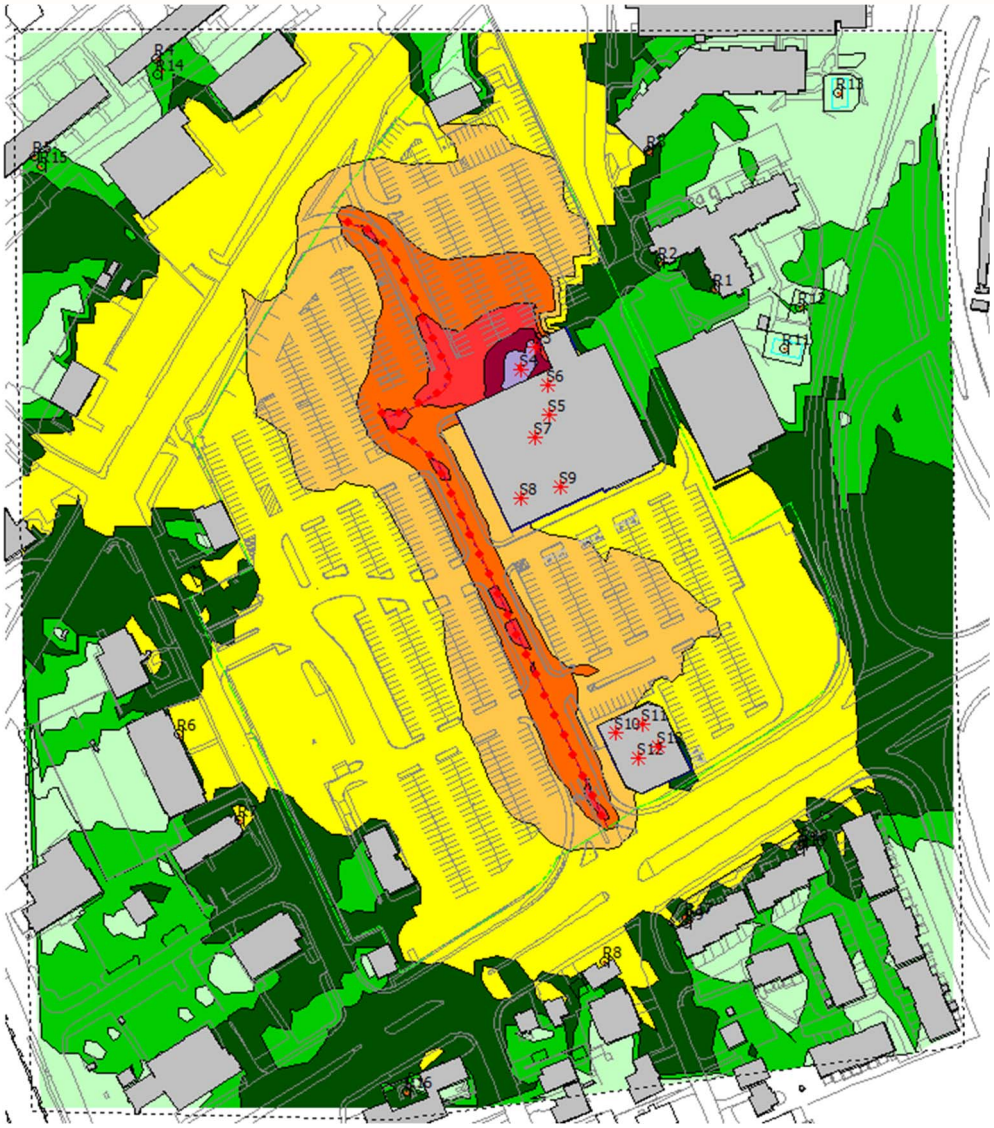

FIGURE 5: DAYTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)

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

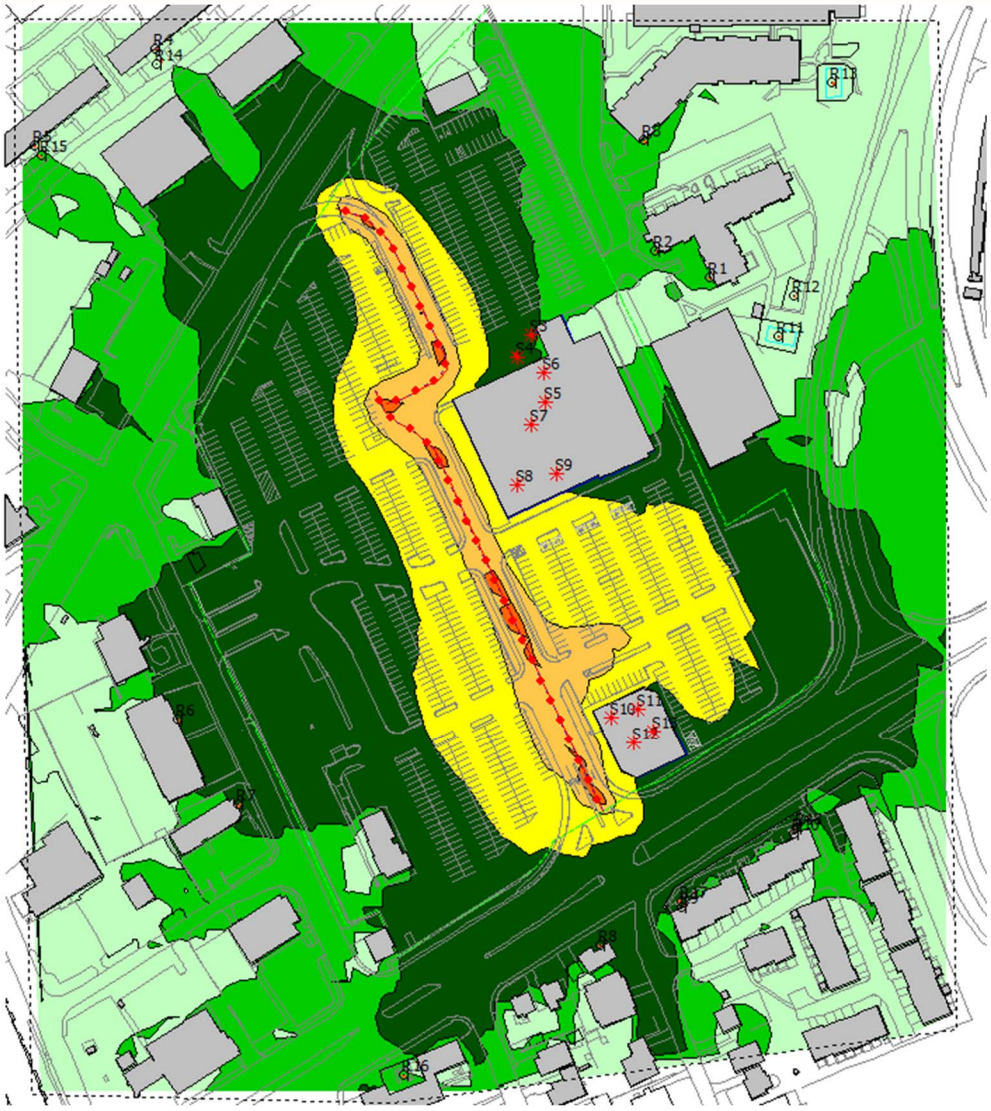

FIGURE 6: NIGHTTIME STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)