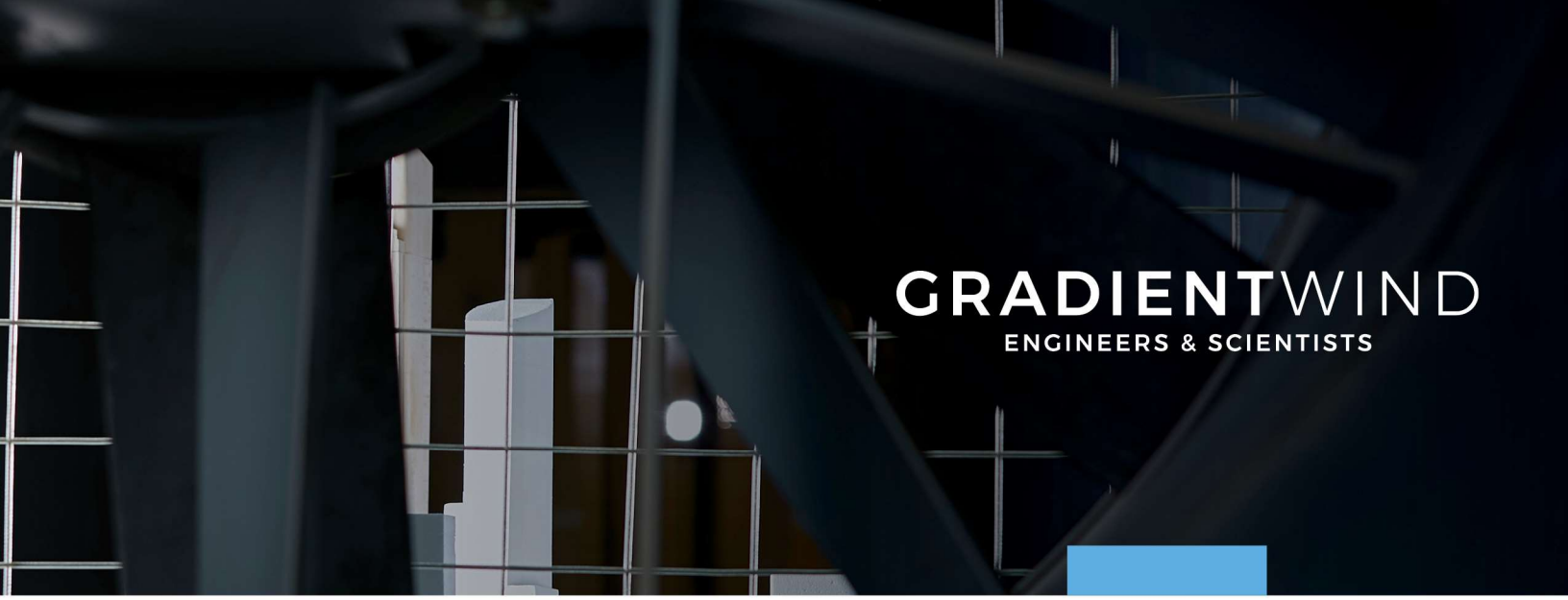

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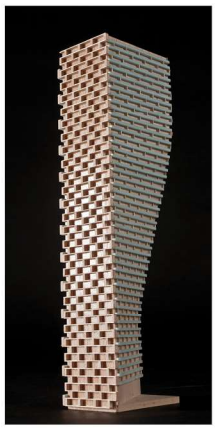
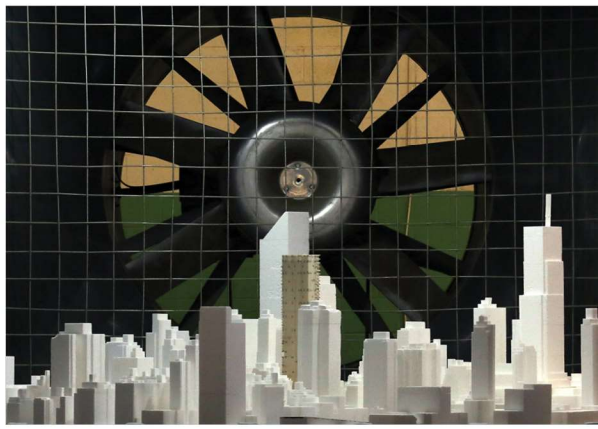
STATIONARY NOISE FEASIBILITY ASSESSMENT

Airport Rd. & Mayfield Rd.
Caledon, Ontario

REPORT: 21-234 - Stationary Noise





July 23, 2021

PREPARED FOR
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EXECUTIVE SUMMARY

This report describes a stationary noise feasibility assessment performed in support of concurrent Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBLA) applications for a proposed industrial development located at the intersection of Airport Rd. and Mayfield Rd. in Caledon, Ontario. For the purposes of this study, Mayfield Rd. will be referred to as project east.

The proposed development comprises 2 industrial buildings, separated by a centrally located region of loading docks for semi-trailer transport trucks. Industrial Building 1 on the west region of the site occupies 23,482 m^2 of land divided into 2 units, whereas Industrial Building 2 located on the east region of the site will occupy 21,053 m^2. Sources of stationary noise include roof top air-handling units (RTUs), a truck route, idling trucks, as well as impulsive noise associated with loading/unloading activities. 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) requirements; (ii) site plan drawings prepared by Ware Malcomb Inc. dated July 1, 2021; (iii) assumed mechanical information based on Gradient Wind's past experience with similar developments; (iv) truck movement information provided by WSP Global Inc. in July 2021; (v) surrounding street layouts and recent site imagery.

The results of the current assessment indicate that noise levels at nearby points of reception are expected to fall below the MECP noise criteria, provided that the assumptions and guidelines for noise control, as outlined in Section 2.1, are followed during the detailed design process. Mechanical information for the development was not yet available at the time of this study. As a result, Gradient Wind assumed the preliminary mechanical information for the development based on experience with similar industrial developments. Once the mechanical design progresses and equipment information becomes available, these should be forwarded to Gradient Wind for review.

The proposed development is expected to be compatible with the existing and proposed noise sensitive land uses. 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 Smart Centres to undertake a stationary noise feasibility assessment in support of concurrent Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBLA) applications for the proposed development located at the intersection of Airport Rd. and Mayfield Rd. in Caledon, 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 air handling equipment, a truck route, idling trucks, as well as impulsive noise associated with loading dock operations. The assessment was performed based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP) NPC-300[1] guidelines, site plan drawings provided by Ware Malcomb Inc. dated July 1, 2021, assumed mechanical information based on Gradient Wind's past experience with similar industrial developments, truck movement information provided by WSP Global Inc. in July 2021, surrounding street layouts, and recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise feasibility assessment is the proposed industrial development located at the intersection of Airport Rd. and Mayfield Rd. in Caledon, Ontario. The proposed development comprises 2 industrial buildings, separated by a centrally located region of loading docks for semi-trailer transport trucks. The site is accessed from entrances on Airport Rd. and Mayfield Rd., with 426 parking spaces for employees and 83 loading docks for semi-trailer transport trucks. Industrial Building 1 located on the west region of the site will occupy 23,482 m^2 of land divided into 2 units, whereas Industrial Building 2 located on the east region of the site will occupy 21,053 m^2 of land divided into 2 units. The site will be located amongst other industrial sites to northwest and southwest of the site, while the surrounding stretches are primarily open spaces. Noise-sensitive residential dwellings are located to the northeast of the proposed development on Royal Links Circle. Figure 1 illustrates a site plan with surrounding context.

[1] Ministry of the Environment, Conservation and Parks (MECP), Environmental Noise Guideline – Publication NPC-300, August 2013

The facility's mechanical equipment is expected to operate 24 hours a day with a majority of the operations taking place during the daytime period. However, certain sources are likely to have reduced operation during the nighttime period between 23:00 and 07:00. Sources of steady-state/varying stationary noise include rooftop air handling equipment, and a truck route. Regarding impulsive stationary noise (i.e., bangs), possible sources are expected at the central region of the site where the loading docks are located. Figure 2 illustrates the location of all noise sources included in this study.

2.1 Assumptions

At the time of this study, mechanical information for the development was not yet available. As a result, Gradient Wind assumed the preliminary mechanical information for the development based on previous experience with similar industrial developments. Once the mechanical design progresses and equipment information becomes available, 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) As a worst-case scenario, twenty (20) truck movements occur per hour during the daytime and evening periods (07:00 - 23:00), and ten (10) per hour during the nighttime period (23:00 - 07:00).

(ii) The vehicle type primarily used at the facility is semi-trailer transport trucks.

(iii) Truck movements were modelled as through-traffic, arriving to the facility by Mayfield Rd. and departing by Airport Rd.

(iv) The locations, quantity and tonnage of rooftop units have been assumed based on Gradient Wind's experience with similar industrial developments.

(v) Sound data for all noise sources for the development have been assumed based on Gradient Wind's experience with similar industrial developments.

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

(vii) A total of 5 impulsive noise sources were positioned at loading docks in the central region of the site, towards the north where their impact on noise-sensitive dwellings is the greatest.

(viii) Screening effects of rooftop parapets have been conservatively excluded in the modelling.

(ix) The ground region was modelled as reflective for hard ground (pavement), and absorptive for soft ground (landscaped).

3. OBJECTIVES

The main goals of this work are to (i) calculate the future noise levels on the surrounding noise-sensitive dwellings produced by stationary sources and (ii) ensure that exterior noise levels do not exceed the allowable limits specified by the MECP, 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. Five 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 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"[2].

[2] NPC – 300, page 16

4.2 Steady-State / Varying Stationary Noise

4.2.1 Criteria for Steady-State / Varying Stationary Noise

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 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"[3]. 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. Furthermore, Airport Rd. and Mayfield Rd. are both classified as major arterial roadways and are the main contributors to ambient noise in the area. 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 (dBA)	Plane of Window (dBA)
07:00 – 19:00	50	50
19:00 – 23:00	50	50
23:00 – 07:00	N/A	45

[3] NPC – 300, page 14

4.2.2 Determination of Steady-State / Varying Noise Source Power Levels

Mechanical information for the development was not yet available at the time of this study. As a result, Gradient Wind assumed the preliminary mechanical information for the development based on experience with similar industrial developments. Once the mechanical design progresses and equipment information becomes available, these should be forwarded to Gradient Wind for review. Table 2 summarizes the sound power of each source used in the analysis.

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source	Description	Height Above Grade/Roof (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1-S34	15 Ton RTU	1.5	66	77	80	84	85	81	77	68	**90**
S35	Truck Route	2	65	72	76	85	90	89	83	74	**94**
S36	Idling Truck	2	65	72	76	85	90	89	83	74	**94**

4.2.3 Steady-State / Varying 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. 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 five receptor locations were chosen at nearby noise-sensitive dwellings 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 2. All units were represented as point sources in the Predictor model, with the exception of the truck route (S35) which was modelled as a moving source. 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 modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
1	OPOR – 42 Royal Links Circle	1.5
2	POW – 42 Royal Links Circle – South Façade	4.5
3	POW – 42 Royal Links Circle – West Façade	4.5
4	POW – 25 Royal Links Circle – West Façade	4.5
5	POW – 56 Royal Links Circle – South Façade	4.5

TABLE 4: 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

4.3 Impulsive Stationary Noise

Frequent deliveries are expected to occur at the loading docks in the central region of the site. Loading and unloading activities of the semi-trailer transport trucks at the loading docks are potential sources of frequent impulsive noise. Based on Gradient Wind's experience with similar facilities, it is expected that the loading docks comprise of a concrete structure and metal loading ramps to allow pallet lift trucks to roll on and off the trailers. Impulsive noise is generated when the pallet truck moves over the metal ramp and is caused by the metal-on-metal or metal-on-concrete contact. Pallet lifts used to load and unload the transport trucks are expected to have standard hard plastic wheels.

4.3.1 Criteria for Impulsive Stationary Noise

Impulse noise, such as bangs and firearm discharges, are expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}). The L_{LM} is the average of the individual sound pressure levels generated by each impulse event. According to NPC-300, the exclusion limit values for impulsive sound levels for Plane of Window and Outdoor Points of Reception are shown in Table 5 below.

TABLE 5: EXCLUSION LIMIT FOR IMPULSIVE SOUND LEVELS - CLASS 1 AREA

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 1 L_{LM} (dBAI) Limit	
		POW Points of Reception	OPOR Points of Reception
07:00 – 23:00/ 23:00-07:00	9 or more	50/45	50/-
07:00 – 23:00/ 23:00-07:00	7 to 8	55/50	55/-
07:00 – 23:00/ 23:00-07:00	5 to 6	60/55	60/-
07:00 – 23:00/ 23:00-07:00	4	65/60	65/-
07:00 – 23:00/ 23:00-07:00	3	70/65	70/-
07:00 – 23:00/ 23:00-07:00	2	75/70	75/-
07:00 – 23:00/ 23:00-07:00	1	80/75	80/-

4.3.2 Determination of Impulsive Noise Sound Power

Sound power levels for the impulse noise due to the loading docks of the proposed development were based on Gradient Wind's previous experience with similar industrial developments. It was assumed that impulse events occur more than 9 times within an hour, during the loading process. The Logarithmic Mean Impulse Sound Level (L_{LM}) of the impulsive noise at loading docks used in the assessment was 104 dBAI. Where impulsive noise sources are in close proximity, the L_{LM} was prorated to 99 dBAI.

4.3.3 Impulsive Noise Source Prediction Assessment

The logarithmic impulsive noise levels were examined at the various noise sensitive points of reception in the *Predictor-Lima* model. It is assumed that impulsive noise is produced every time a truck loads/unloads at a loading dock in the central region of the site. Based on the estimated number of truck arrivals/departures to the facility, impulsive noise events are expected to occur twenty times during a peak hour of the daytime period and evening periods (07:00 - 23:00). During a peak hour of the nighttime period (23:00 - 07:00) the number of impulsive noise-producing events is reduced by 50%, consistent with assumptions outlined in section 2.1. Five impulsive noise sources were placed at the loading docks towards the north side of the central region, where their impact on nearby noise-sensitive properties is greatest. Each impulsive noise source is expected to produce 9 or more impulses in a one-hour period, and as a worst-case scenario, these impulses are modelled to occur at the same time. The impulsive noise sources were modeled as point sources at a height of 1.2 meters above grade for the deck-level of the trailer. For grade-level loading docks, a height of 0.2 meters above average grade was used.

5. RESULTS AND DISCUSSION

5.1 Steady State / Varying Stationary Noise Results

Noise levels on the surroundings produced by the mechanical equipment associated with the proposed industrial development are presented in Table 6. The sound levels are based on the assumptions outlined in Section 2.1.

TABLE 6: NOISE LEVELS FROM STEADY-STATE / VARYING STATIONARY SOURCES

Receptor Number	Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
1	OPOR – 42 Royal Links Circle	45	N/A*	50	N/A*	**YES**	N/A*
2	POW – 42 Royal Links Circle – South Façade	46	43	50	45	**YES**	**YES**
3	POW – 42 Royal Links Circle – West Façade	47	44	50	45	**YES**	**YES**
4	POW – 25 Royal Links Circle – West Façade	45	42	50	45	**YES**	**YES**
5	POW – 56 Royal Links Circle – South Façade	44	41	50	45	**YES**	**YES**

*Nighttime noise levels are not considered at OPOR receptors as per NPC-300

As Table 6 summarizes, noise levels fall below MECP criteria at all receptors. Noise contours at 1.5 metres above grade for all stationary noise sources can be seen in Figures 3 and 4 for daytime and nighttime conditions. The main contributor of steady-state stationary noise received by the noise-sensitive dwellings is expected to be the truck route which enters the facility in close proximity to the dwellings. As a general recommendation, semi-trailer transport truck traffic should prioritize use of the entrance on Airport Rd, to avoid frequent passes near the noise sensitive areas if possible.

5.2 Impulsive Noise Results

The impulse noise levels from loading/unloading activities at the central loading docks are summarized in Table 7. The results of the analysis indicate the resultant highest mean logarithmic impulsive sound level predicted at the noise-sensitive dwellings on Royal Links Circle is 42 dBAI during the daytime period. Impulsive noise contours at 1.5 metres above grade can be seen in Figures 5 & 6 for daytime and nighttime conditions, respectively.

TABLE 7: NOISE LEVELS FROM IMPULSIVE STATIONARY SOURCES

Receptor Number	Plane of Window Receptor Location	Noise Level (dBAI)		Meets Class 1 Criteria	
		Day	Night	Day (50 dBAI)	Night (45 dBAI)
1	OPOR – 42 Royal Links Circle	38	N/A*	**YES**	N/A*
2	POW – 42 Royal Links Circle – South Façade	37	34	**YES**	**YES**
3	POW – 42 Royal Links Circle – West Façade	42	39	**YES**	**YES**
4	POW – 25 Royal Links Circle – West Façade	42	39	**YES**	**YES**
5	POW – 56 Royal Links Circle – South Façade	42	39	**YES**	**YES**

*Nighttime noise levels are not considered at OPOR receptors as per 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 MECP noise criteria, provided that the assumptions and guidelines for noise control, as outlined in Section 2.1, are followed during the detailed design process. As previously mentioned, mechanical information for the development was not yet available at the time of writing. As a result, Gradient Wind assumed the preliminary mechanical information for the development based on experience with similar industrial developments. Once the mechanical design progresses and equipment information becomes available, these should be forwarded to Gradient Wind for review.

The proposed development is expected to be compatible with the existing and proposed 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 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.

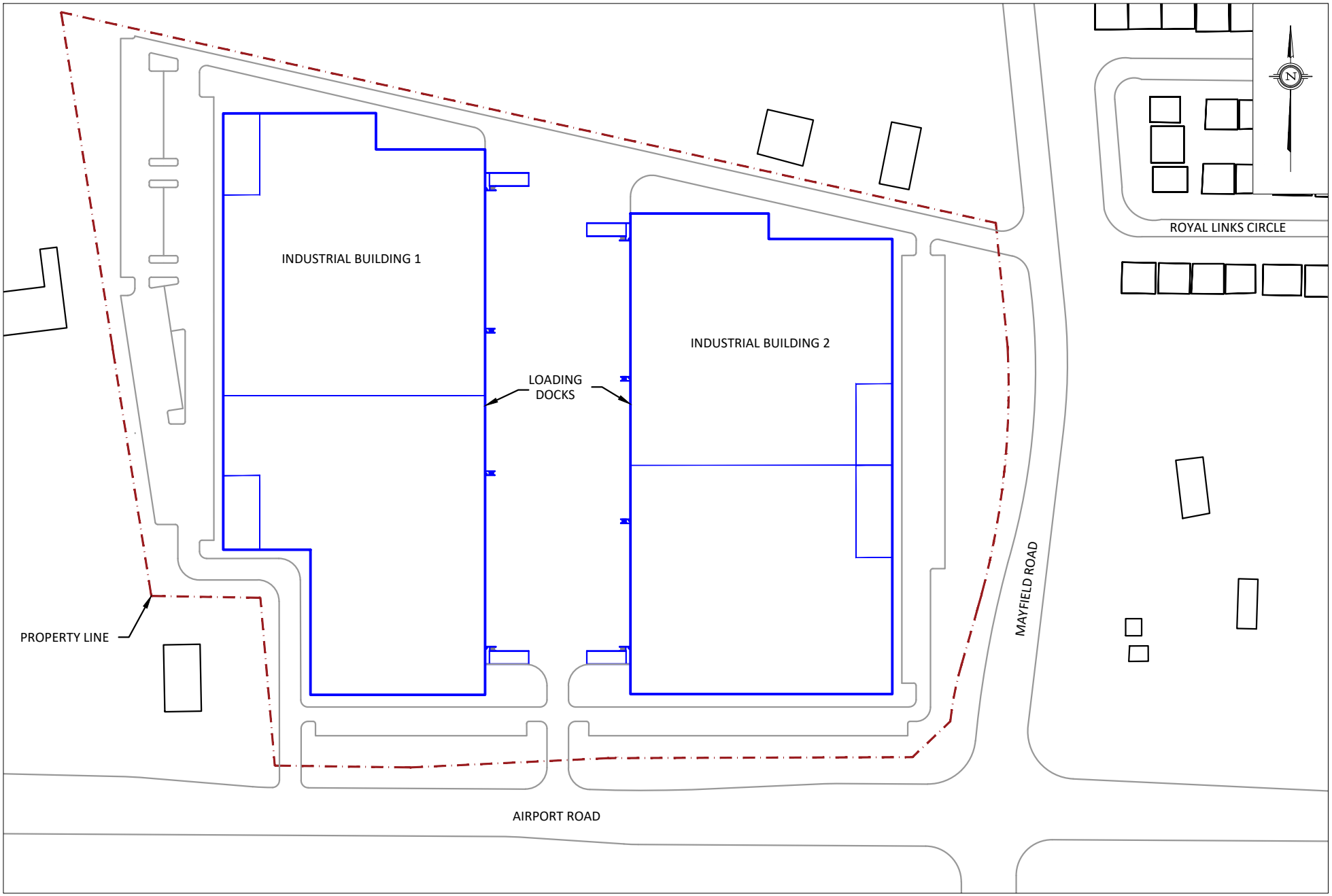
Sincerely,

Gradient Wind Engineering Inc.

Tanyon Matheson-Fitchett, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #21-234 – Stationary Noise



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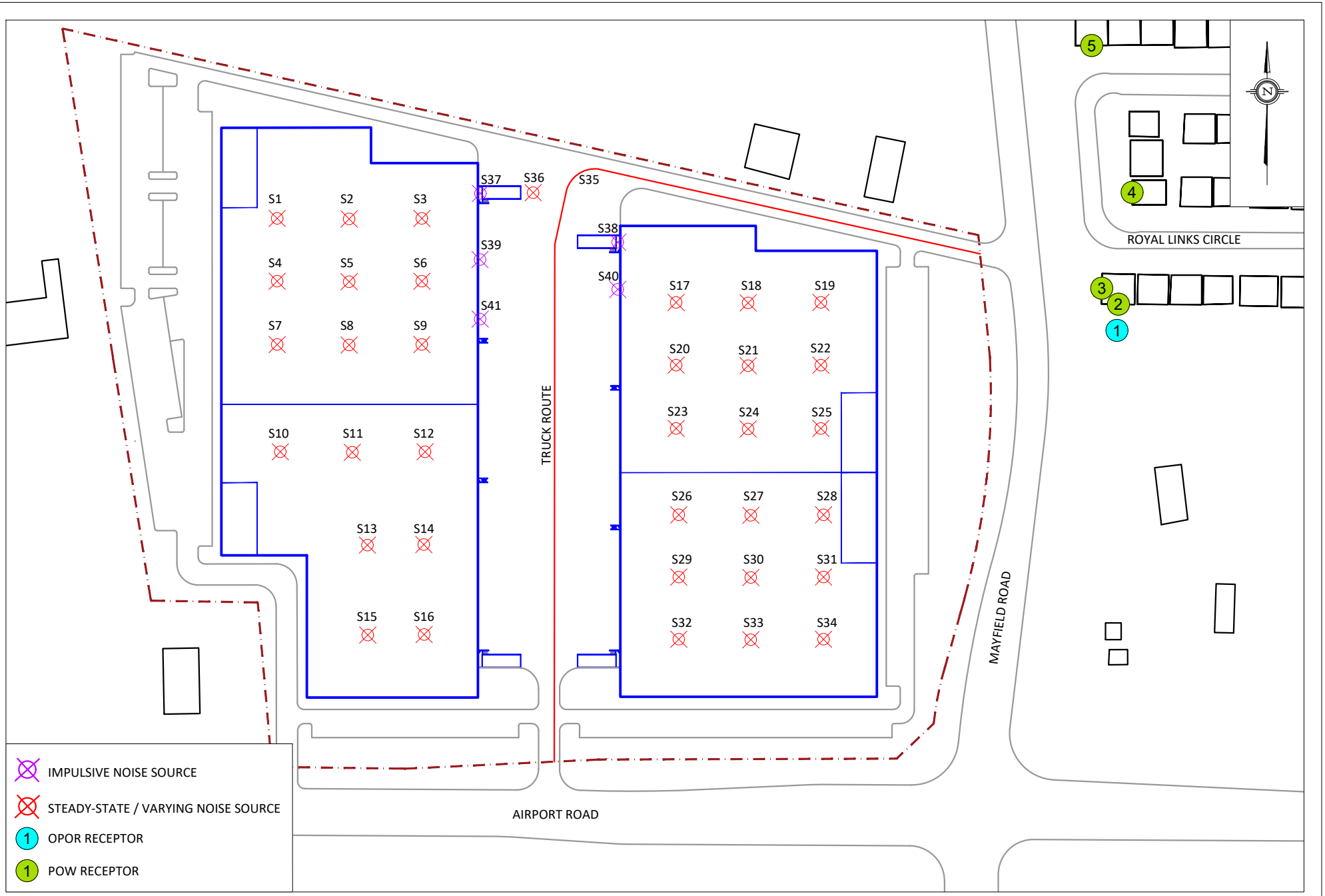
PROJECT	AIRPORT RD. & MAYFIELD RD., CALEDON, ONTARIO STATIONARY NOISE FEASIBILITY ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-234-1
DATE	JULY 12, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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PROJECT	AIRPORT RD. & MAYFIELD RD., CALEDON, ONTARIO STATIONARY NOISE FEASIBILITY ASSESSMENT
SCALE	1:2000 (APPROX.)
DRAWING NO.	GW21-234-2
DATE	JULY 13, 2021
DRAWN BY	T.M.F.

DESCRIPTION

FIGURE 2:
STATIONARY NOISE SOURCES AND RECEPTOR LOCATIONS

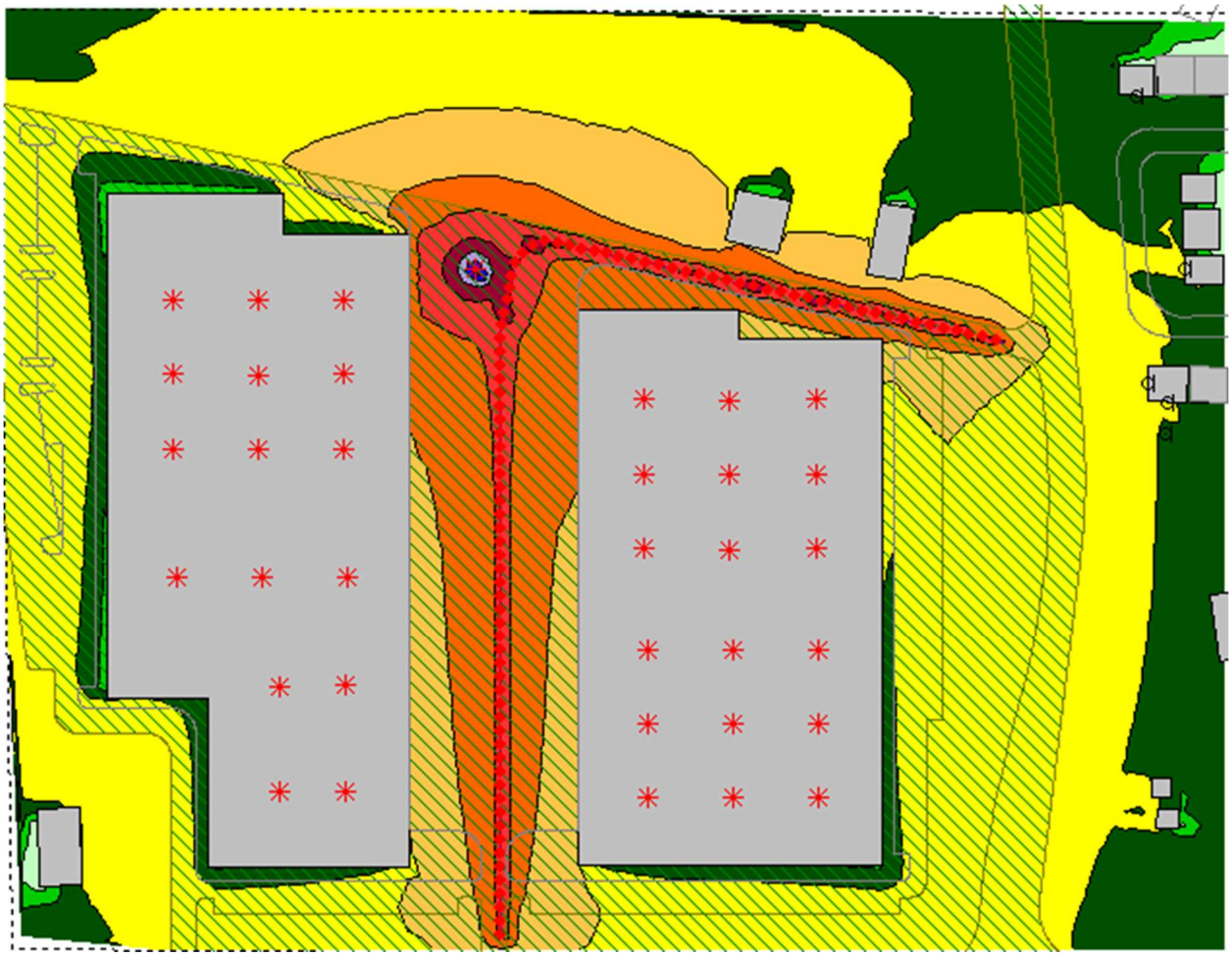
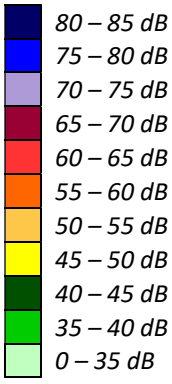


FIGURE 3: DAYTIME STEADY-STATE / VARYING STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)



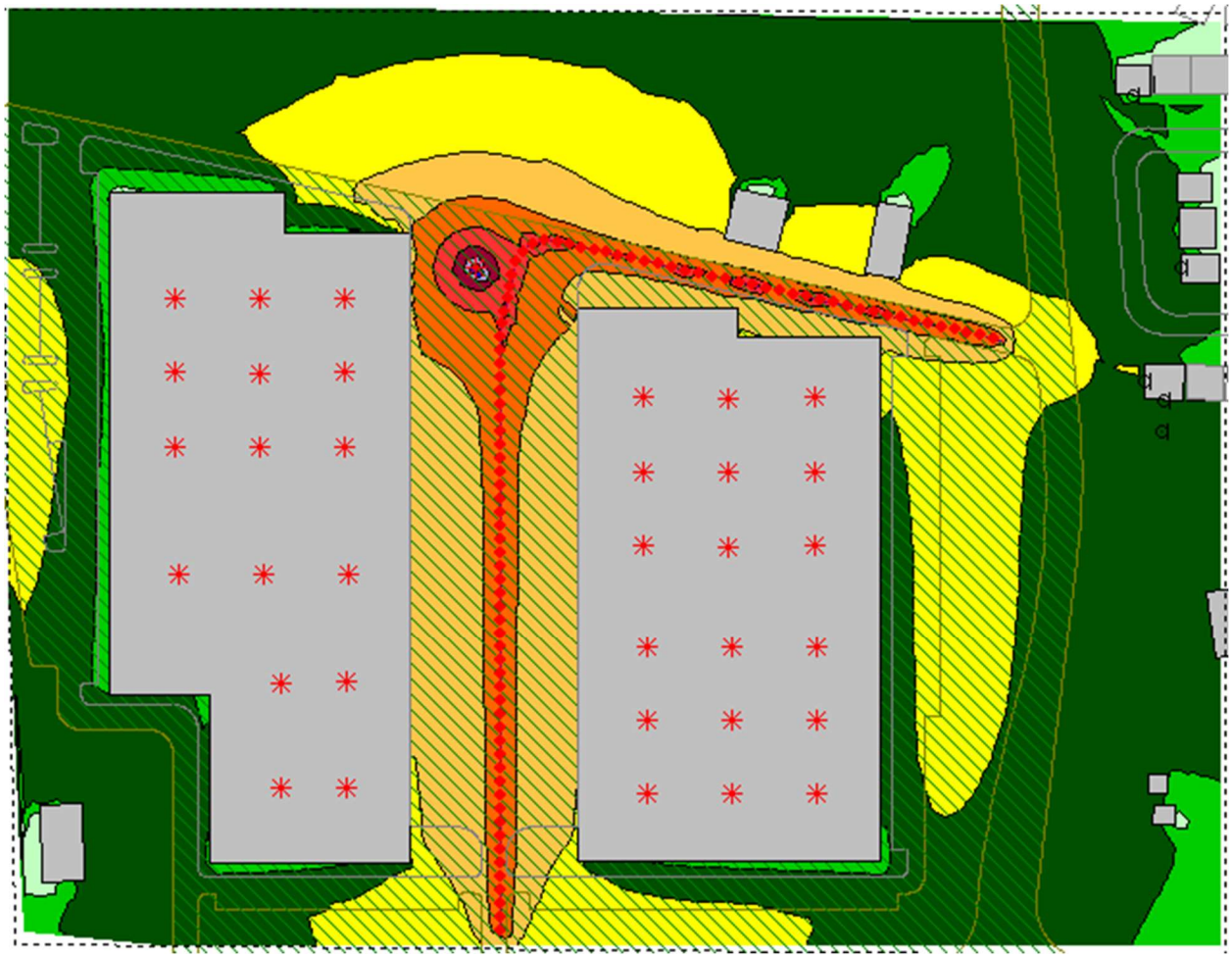


FIGURE 4: NIGHTTIME STEADY-STATE / VARYING STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)

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

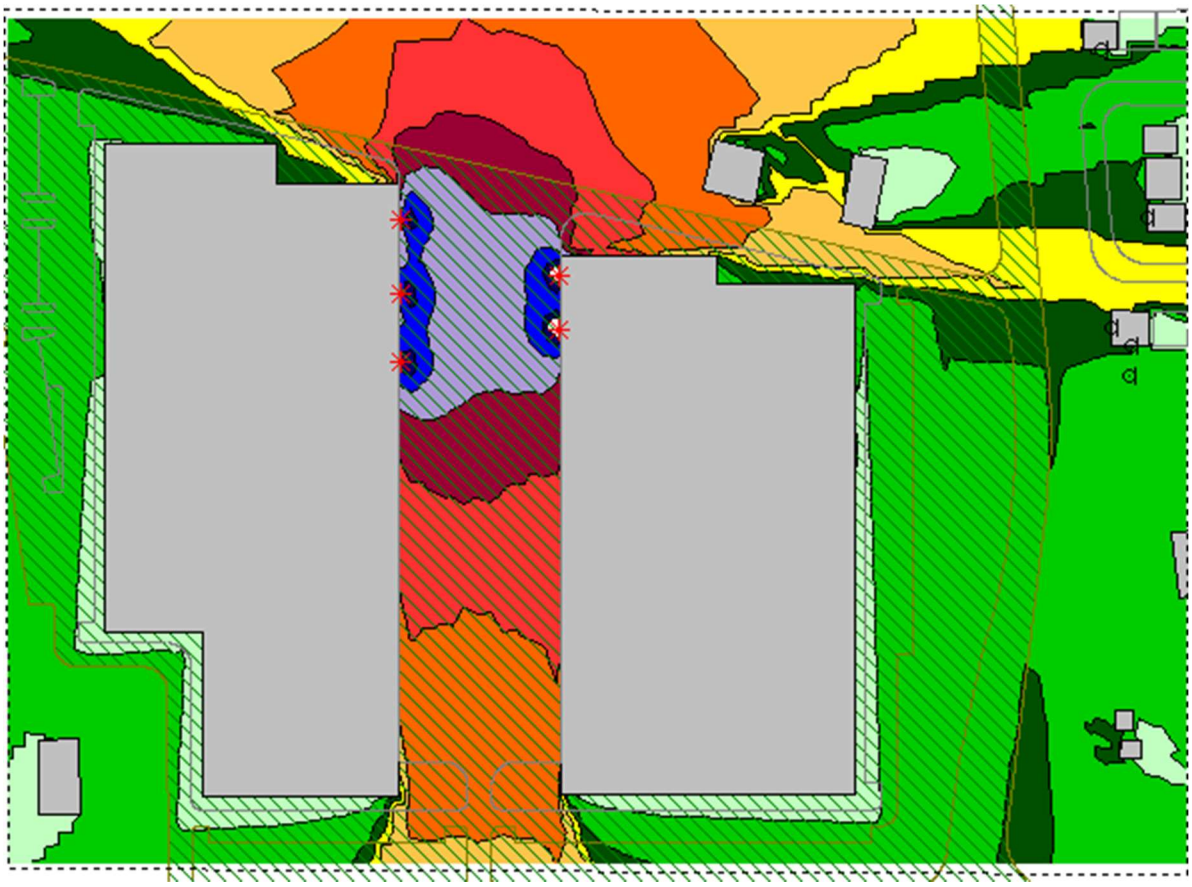
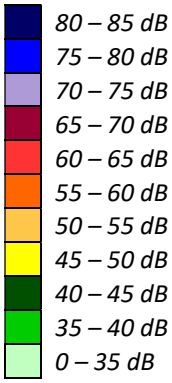


FIGURE 5: DAYTIME IMPULSIVE STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)



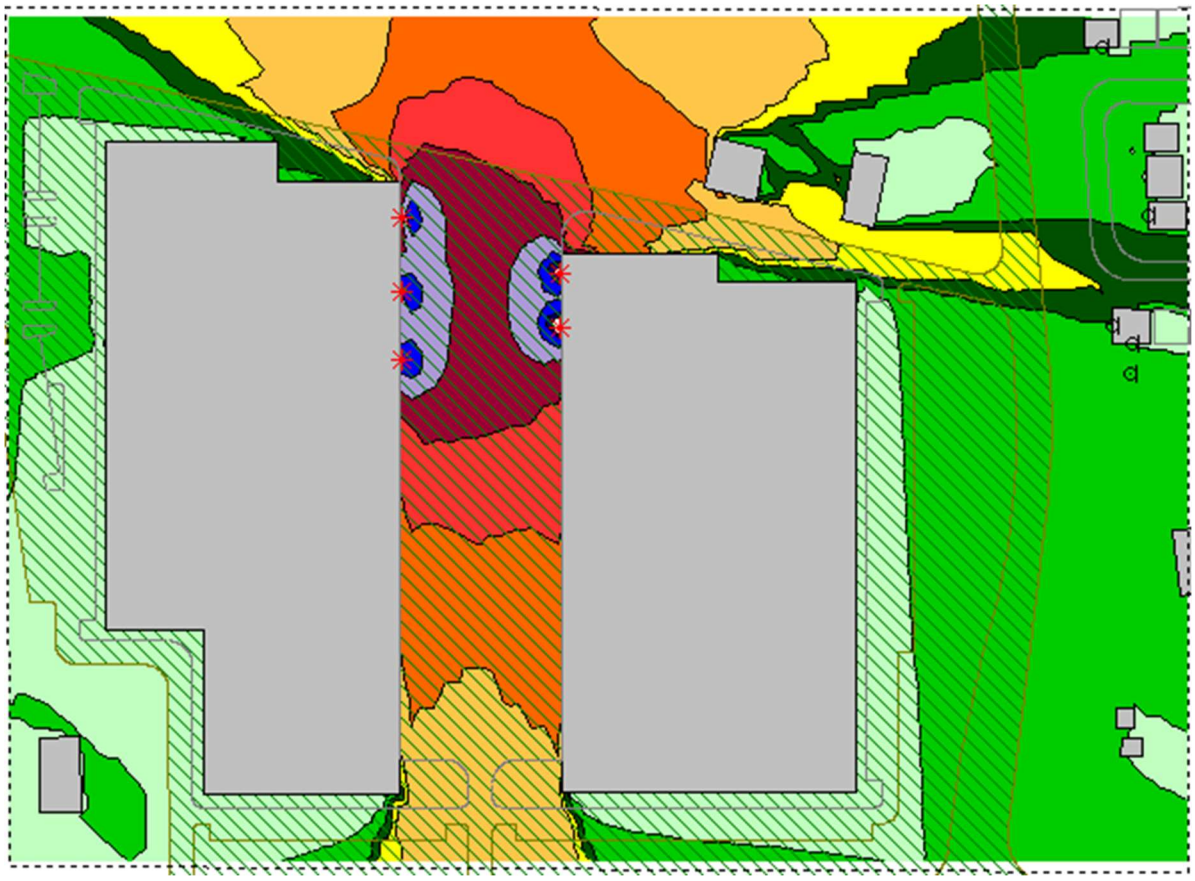


FIGURE 6: NIGHTTIME IMPULSIVE STATIONARY NOISE CONTOURS (1.5 METERS ABOVE GRADE)

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