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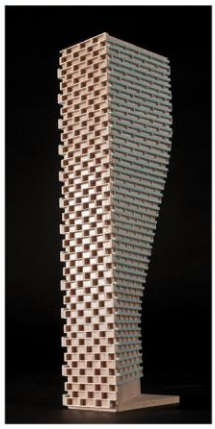
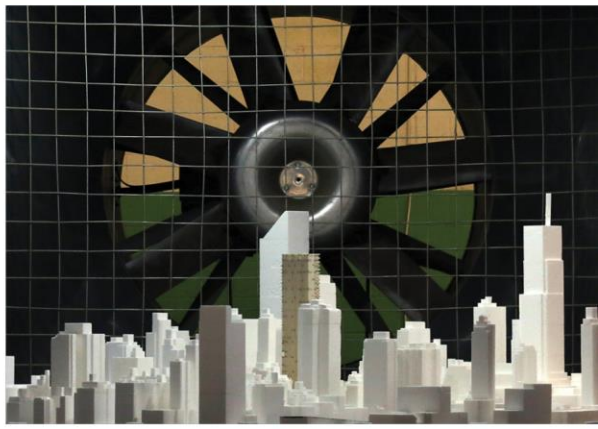
STATIONARY NOISE ASSESSMENT

1140 Terry Fox Drive
Kanata, Ontario

GRADIENT WIND REPORT: 19-233 - Stationary Noise





January 28, 2020

PREPARED FOR

SmartCentres
Attn: Heather Jenkins
Senior Director Portfolio Management
3200 Highway 7
Vaughan, Ontario
L4K 5Z5

PREPARED BY

Giuseppe Garro, MASc., Junior Environmental Scientist
Joshua Foster, P.Eng., Principal

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 Buildings W, X and Y as part of the SmartCentre commercial development located at 1140 Terry Fox Drive in Kanata, Ontario. Sources of stationary noise include rooftop air handling equipment vents, refrigeration unit vents, as well as a truck route. 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), and; (iii) architectural drawings prepared by Petroff Partnership Architects dated January 2020, and mechanical information provided by BK Consulting Inc. and SmartCentres.

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria. The results are based on 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 and future proposed noise sensitive land uses. The sound data and specification of the equipment stated in this report have been incorporated into the contract documents. A review of the final equipment selections and locations should be verified prior to installation of the equipment.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by SmartCentres to undertake a stationary noise assessment for the proposed Buildings W, X and Y located at 1140 Terry Fox Drive in Kanata, Ontario. The buildings are part of a SmartCentres commercial development. 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 rooftop mechanical equipment vents, refrigeration unit vents, as well as a truck route for delivery services. 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 Petroff Partnership Architects dated January 2020, mechanical information provided by BK Consulting Inc. and SmartCentres, and assumed by Gradient Wind based on experience with similar projects, surrounding street layouts obtained from the City of Ottawa, and recent site imagery.

2. TERMS OF REFERENCE

The focus of this stationary noise assessment is the proposed Buildings W, X and Y as part of the SmartCentre commercial development located at 1140 Terry Fox Drive in Kanata, Ontario. The development site is located at the intersection of Terry Fox Drive and Cope Drive. Buildings W and X are located at the southwest side of the site, while Building Y is located at the northeast corner of the site. Building W has a nearly rectangular planform and is reserved for the LCBO. Building X and Y have rectangular planforms and are commercial retail units. Additionally, a recessed loading dock is situated at the northwest corner of Building W accessed by a truck route along the southwest perimeter from Cope Drive. Building X includes a loading/unloading area to the north as opposed to a traditional loading dock. A 3.1 m wall is located immediately west of loading dock and runs parallel with the west façade of Building W. The study site is surrounded by residential land to the west, a storm water management pond to the

[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

north, Terry Fox Drive to the east, and Cope Drive to the south. Figure 1 illustrates the site plan and surrounding context.

The facility is considered to operate during the daytime and evening periods, from 07:00-23:00. Sources of stationary noise include rooftop mechanical equipment, as well as truck route for delivery services to the LCBO. This route is considered the worst-case (ie. loudest) truck route in and out of the development. Figure 3 illustrates the location of all noise sources included in this study.

2.1 Assumptions

Mechanical information for the rooftop equipment has been provided by BK Consulting Inc. and SmartCentres. Gradient Wind assumed sound power levels for the truck route based on experience with similar developments. 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) Sound data for rooftop equipment are based on manufacturer's data provided by BK Consulting Inc. and SmartCentres.

(ii) Locations and quantity of rooftop units is based on mechanical drawings provided by BK Consulting Inc., SmartCentres, and LCBO.

(iii) The rooftop mechanical units (RTU) are assumed to operate for 80% and 30% over a 1-hour period during the daytime and nighttime periods, respectively, which represent more realistic conditions. Nighttime conditions account for the decreased occupancy loads in the buildings during this time.

(iv) Refrigeration units for the LCBO are assumed to operate continuously over a 1-hour period during the daytime and at 50% operation during the nighttime period.

(v) Screening/barrier effects of the proposed 0.6m parapet along the perimeter of roof deck for Building X was included in the modelling.

(vi) The ground region was modelled as reflective due to the presence of hard ground (pavement). For rear yards within the residential area, the ground region was modelled as absorptive ground due to the presence of soft ground (lawn). The storm water management (SWM) pond and adjacent landscaping was omitted from the model as they are not located along the path between

the sources and the receivers. The small and slender landscaped area along the southwestern boundary line was conservatively excluded from the modelling due to the area's negligible impact on the results.

(vii) Screening/barrier effects of nearby buildings were included in the modelling.

(viii) 6 receptors were strategically placed at select noise sensitive dwellings associated with the residential development to the west (see Figure 2).

The equipment that was used in the model consisted of:

(i) Rooftop Unit (Lennox Model LGH-036, LGH-060, LGH-074, LGH-092)

(ii) Delivery truck movement

(iii) Refrigeration Unit (KoolJet Model KJL-500-RM-FC)

Figure 3 illustrates the location of the stationary sources within the development.

Furthermore, there is a loading dock along the western portion of the LCBO, as well as a loading/unloading area to the north of Building X. According to NPC-300 Section A5.5[3], sources that are not considered as stationary sources include "*occasional movement of vehicles on the property such as delivery of goods to and the removal of goods/refuse from convenience stores, fast food restaurants and similar commercial facilities, etc.*". Based on information provided by SmartCentres and LCBO, the anticipated delivery schedule for refrigerated trucks to the LCBO is approximately 2 times per week which is considered insignificant. Regular deliveries on non-refrigerated trucks are expected to arrive daily and were considered by the addition of a truck route in the modelling. It is assumed that idling would not occur as per the City of Ottawa's no idling by-law[4].

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.

[3] NPC – 300, page 20
[4] City of Ottawa By-law No. 2007-266: Idling Control

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. Six 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"[5].

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,

[5] NPC – 300, page 16

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"[6]. 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 a suburban environment at a POR are outlined in Table 1 below. The study site is considered to be Class 1 as it is located within the "Urban Area" boundary as defined in Schedule A and B of the City of Ottawa Official Plan[7], and in general proximity to employment and commercial lands. Furthermore, Terry Fox Drive is classified as an arterial roadway and is the main contributor 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	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

Mechanical information for the rooftop equipment has been provided by BK Consulting Inc. and SmartCentres. Gradient Wind assumed sound power levels for the truck route based on experience with similar developments. Truck movements were outlined in drawings prepared by Petroff Partnership Architects. A review of the final equipment selections and locations by a qualified acoustical engineer will be required prior to installation of the equipment. Table 2 summarizes the sound power of each source used in the analysis.

[6] NPC – 300, page 14
[7] City of Ottawa Official Plan Vol 1: Section 6

TABLE 2: EQUIPMENT SOUND POWER LEVELS (dBA)

Source ID	Description	Height Above Grade/ Roof (m)	Frequency (Hz)								
			63	125	250	500	1000	2000	4000	8000	Total
S1	"6 Ton" RTU	1.2	-	67	72	76	76	70	64	58	**80**
S2, S7, S12	"7.5 Ton" RTU	1.2	-	76	79	84	83	79	73	66	**88**
S3	"3 Ton" RTU	1.2	-	60	65	69	68	63	58	51	**73**
S4-S6, S8-S10	"5 Ton" RTU	1.2	-	66	69	74	74	68	62	55	**78**
S11	Truck Movement	1.5	65	72	76	85	90	89	83	74	**94**
S13, S14	Refrigeration Units	1.95	-	-	-	-	74	-	-	-	**74**

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 six 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 2. All units were represented as point sources in the Predictor model, with the exception of the truck movement 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. Predictor-Lima modelling data is available upon request.

TABLE 3: RECEPTOR LOCATIONS

Receptor Number	Receptor Location	Height Above Grade (m)
R1	POW – 805 Paseana Place	4.5
R2	OPOR – 805 Paseana Place	1.5
R3	POW – 813 Paseana Place	4.5
R4	OPOR – 813 Paseana Place	1.5
R5	POW – 809 Paseana Place	4.5
R6	OPOR – 809 Paseana Place	1.5

TABLE 4: CALCULATION SETTINGS

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

5. RESULTS AND DISCUSSION

Noise levels produced by the mechanical equipment are presented Table 5.

TABLE 5: NOISE LEVELS FROM ROOFTOP MECHANICAL SOURCES

Receptor Number	Receptor Location	Noise Level (dBA)		Sound Level Limits		Meets ENCG Class 1 Criteria	
		Day	Night	Day	Night	Day	Night
R1	POW – 805 Paseana Place	47	42	50	45	Yes	Yes
R2	OPOR – 805 Paseana Place	45	N/A	50	N/A	Yes	N/A
R3	POW – 813 Paseana Place	49	45	50	45	Yes	Yes
R4	OPOR – 813 Paseana Place	46	N/A	50	N/A	Yes	N/A
R5	POW – 809 Paseana Place	48	44	50	45	Yes	Yes
R6	OPOR – 809 Paseana Place	46	N/A	50	N/A	Yes	N/A

N/A: Noise levels during the nighttime period are not considered as per ENCG

As Table 5 summarizes, noise levels at nearby sensitive receptors are expected to fall below the ENCG criteria for stationary noise. Sound levels listed are based on assumptions outlined in Section 2.1. Noise contours at 1.5m and 4.5m above grade during the daytime and nighttime periods are presented in Figures 4-7. From these contours, noise levels at proposed future blocks toward the west of the site are expected to fall below ENCG criteria. With consideration of Gradient Wind's recommendations and assumptions, the proposed development is expected to be compatible with the existing and future proposed land uses.

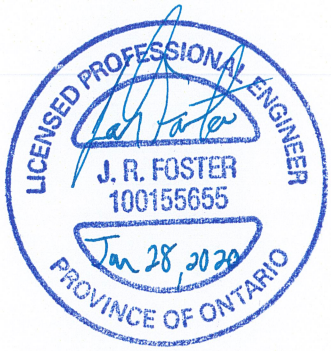
6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current study indicate that noise levels at nearby points of reception are expected to fall below the ENCG noise criteria. The results are based on 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 and future proposed noise sensitive land uses. The sound data and specification of the equipment stated in this report have been incorporated into the contract documents. A review of the final equipment selections and locations should be verified 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,

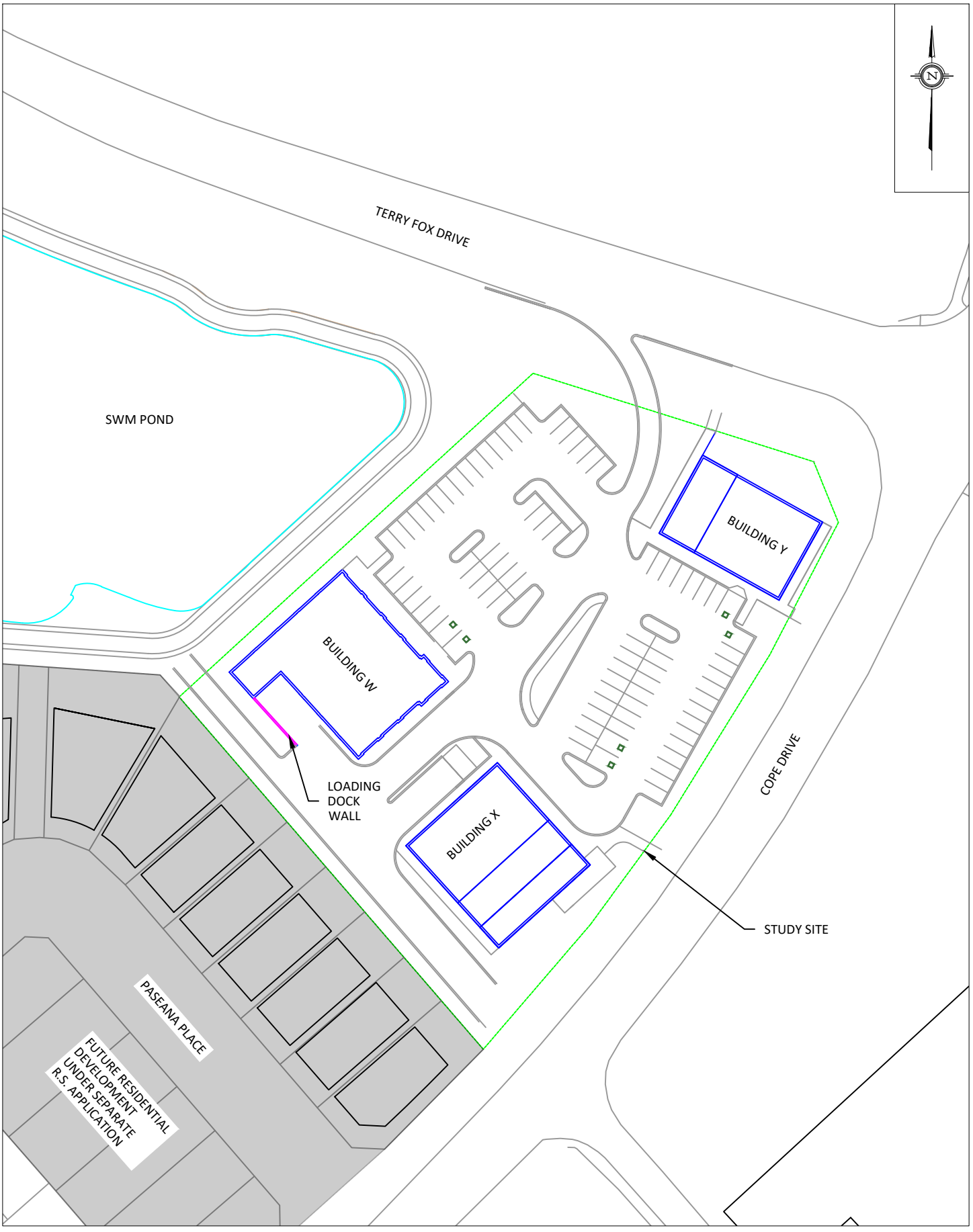
Gradient Wind Engineering Inc.



Giuseppe Garro, MASc.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Principal

Gradient Wind File #19-233 – Stationary Noise



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PROJECT	1140 TERRY FOX DRIVE, KANATA STATIONARY NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GWE19-233-1
DATE	JANUARY 28, 2020
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DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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DESCRIPTION	FIGURE 2: RECEPTOR LOCATIONS

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DATE	JANUARY 28, 2020	DRAWN BY	G.G.

DESCRIPTION

FIGURE 3:
STATIONARY SOURCE LOCATIONS

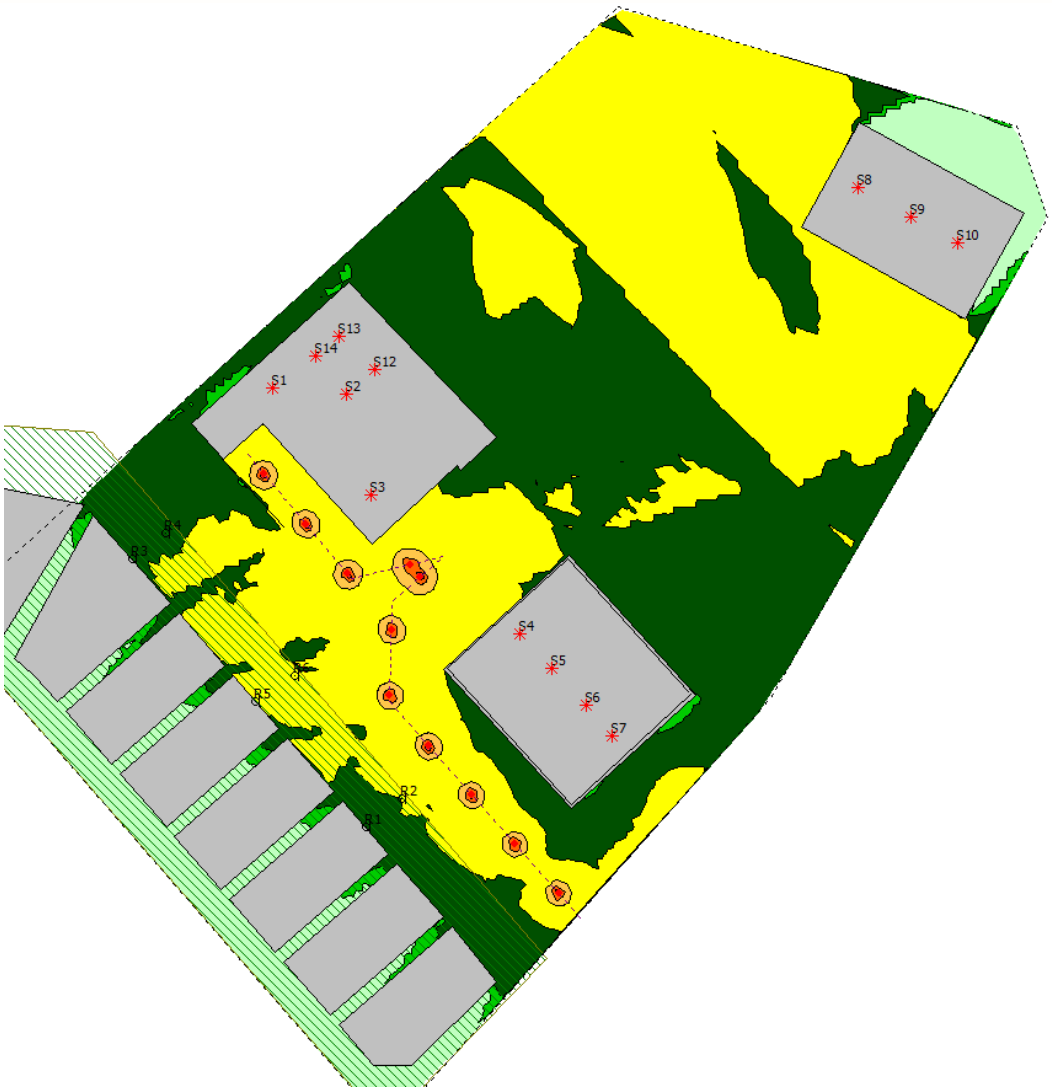


FIGURE 4: SOUND LEVEL NOISE CONTOURS 1.5M ABOVE GRADE (DAYTIME PERIOD)

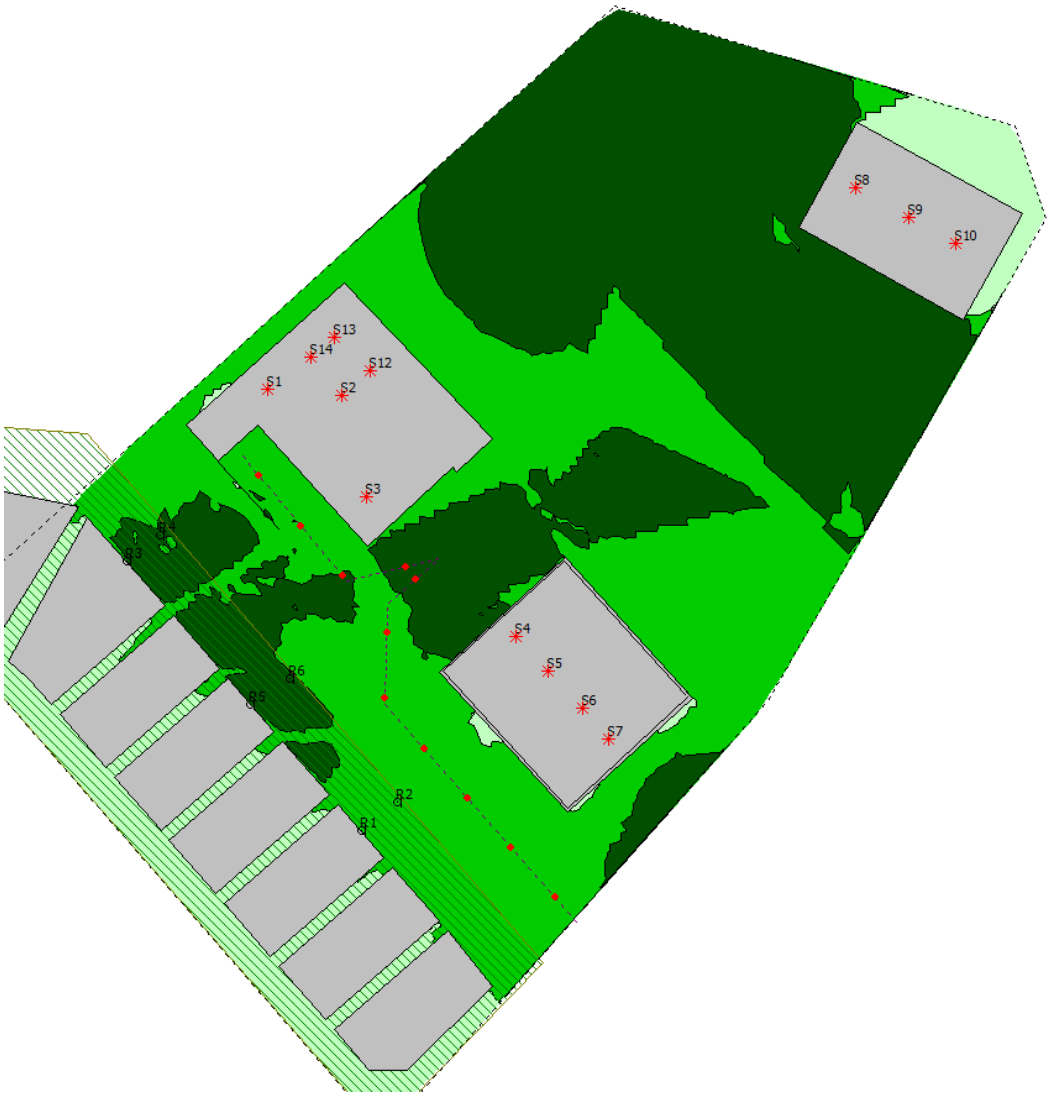


FIGURE 5: SOUND LEVEL NOISE CONTOURS 1.5M ABOVE GRADE (NIGHTTIME PERIOD)

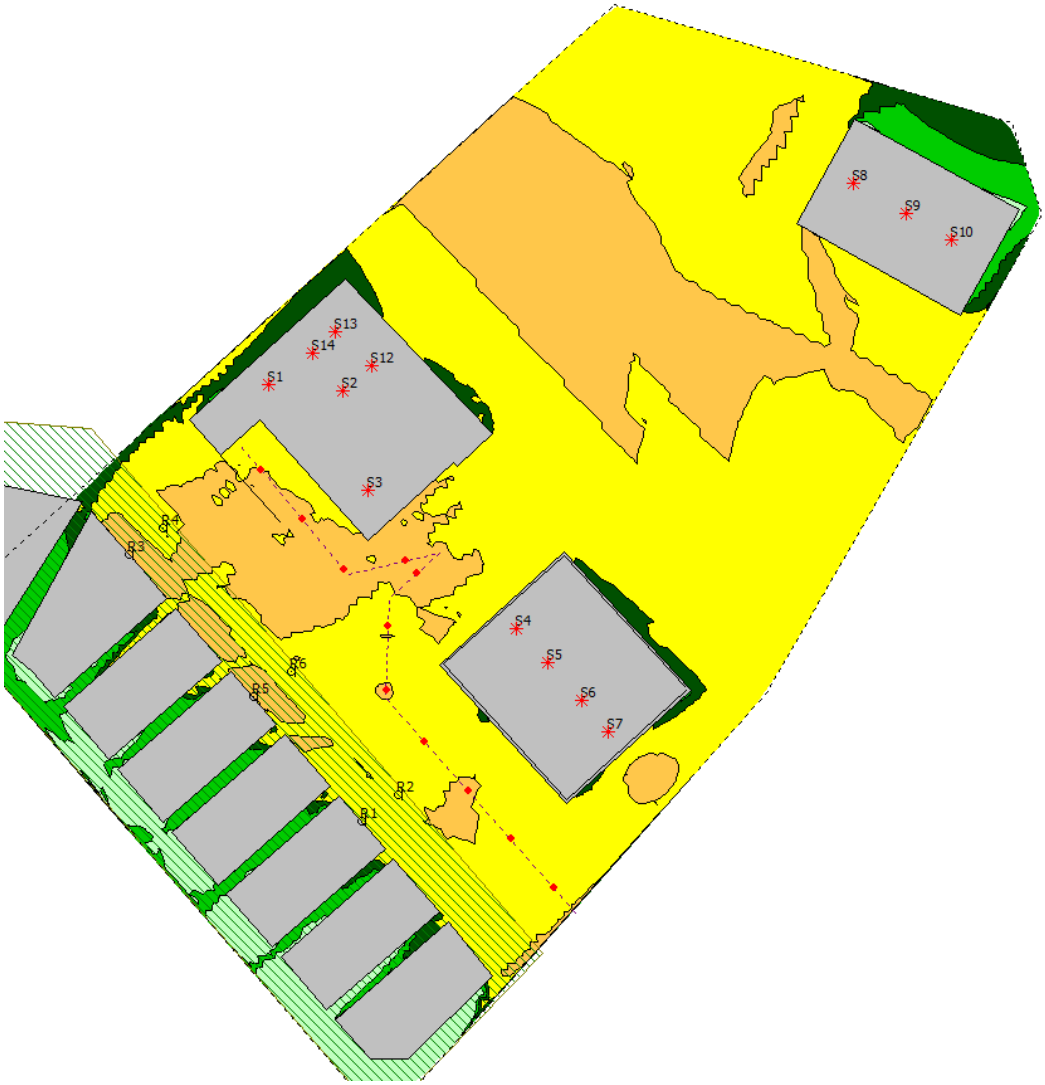
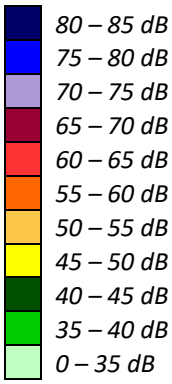


FIGURE 6: SOUND LEVEL NOISE CONTOURS 4.5M ABOVE GRADE (DAYTIME PERIOD)



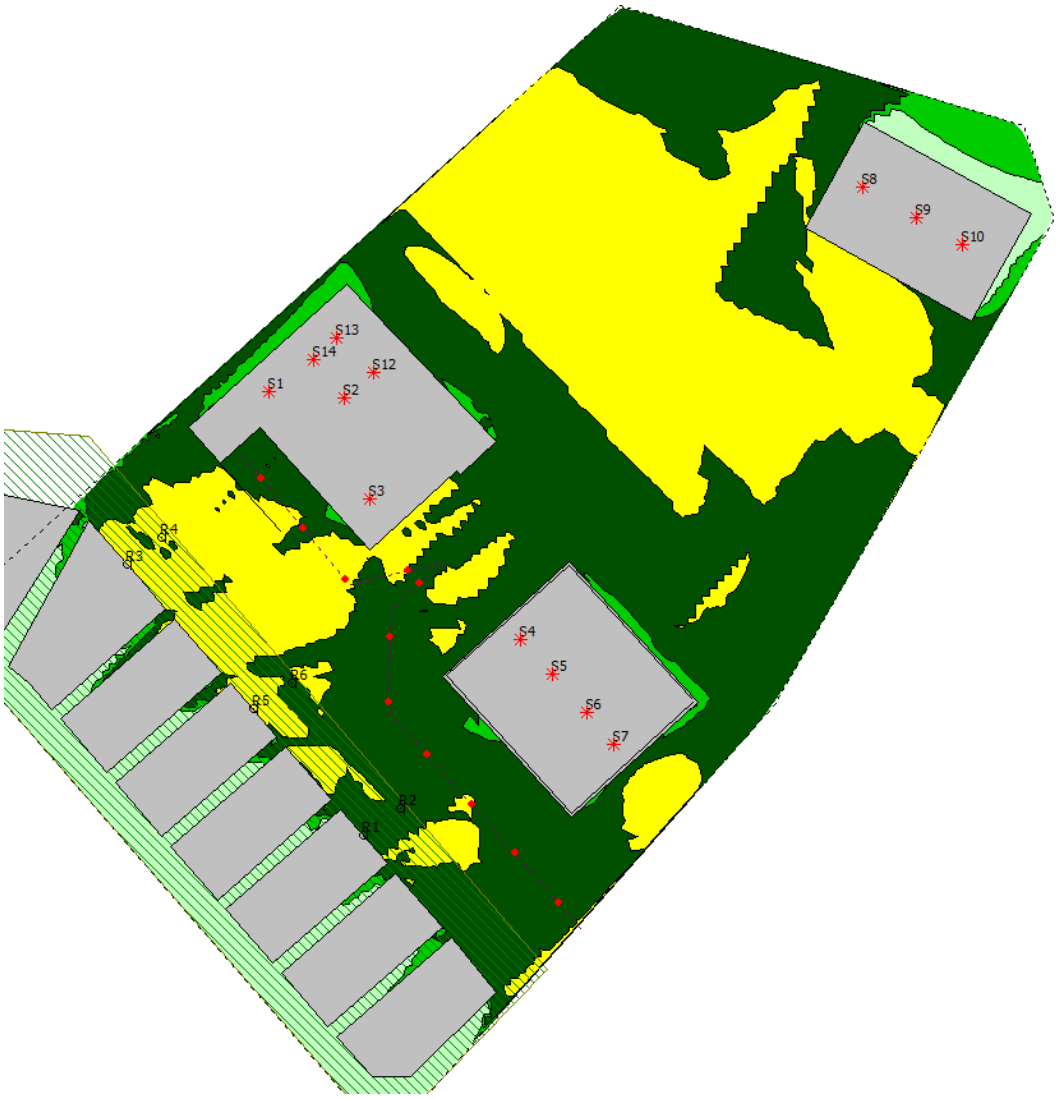


FIGURE 7: SOUND LEVEL NOISE CONTOURS 4.5M ABOVE GRADE (NIGHTTIME PERIOD)