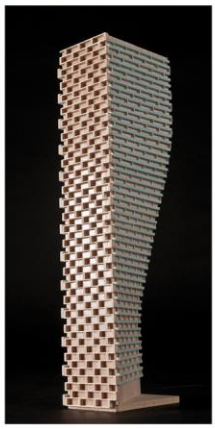
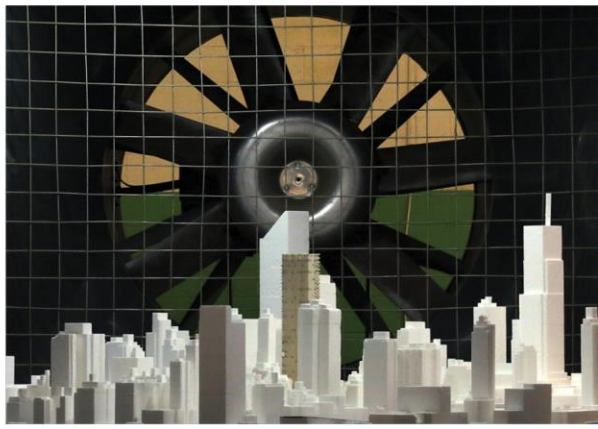
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE & VIBRATION ASSESSMENT

42 Northside Road
Ottawa, Ontario

Report: 21-358-Transportation Noise & Vibration R1





May 2, 2022

PREPARED FOR

Rohit Communities Ontario Inc.
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a transportation noise and ground vibration assessment undertaken in support of a Site Plan Control application (SPA) for a proposed residential development located at 42 Northside Road in Ottawa, Ontario. The proposed development will comprise a 5-storey residential building with 2 levels of underground parking.

The site is impacted by roadway traffic noise from Robertson Road, Northside Road, and Larkspur Drive, and railway noise from the CN Railway located approximately 230 metres to the north of the subject site. The vibration assessment was not conducted for the subject site as the railway guidelines indicate that a vibration evaluation is not required if the railway is more than 75 metres away from the site [1]. The subject site is surrounded by low-rise residential and commercial buildings. Figure 1 illustrates a complete site plan with the surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) (ii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iii) future vehicular traffic volumes based on ENCG roadway classifications and theoretical capacities; (iv) existing and future daily rail traffic data is based on Gradient Wind's experience as well as noise reports prepared by others for projects in the area surrounding the rail line of interest; and (v) drawings prepared by Rossmann Architecture, dated April 2022.

For the roadway traffic noise, results of the current analysis indicate that noise levels will range between 56 and 69 dBA during the daytime period (07:00-23:00) and between 49 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 69 dBA) occurs along the north façade of the development, which is nearest and most exposed to Robertson and Northside Roads.

[1] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Associated of Canada, May 2013.

For the rail noise, the results of the current analysis indicate that noise levels will range between 25 and 40 dBA during the daytime period (07:00-23:00). There will be no impact from the CN Railway during the nighttime period (23:00-07:00) as there is no train using the rail line during that period. The highest noise level (i.e. 40 dBA) occurs along the north façade of the building, which is nearest and most exposed to the rail line.

The results of the calculations indicate that upgraded building components will be required at the north and west façades of the building. The results of the calculations also indicate that the development will require central air conditioning (or a similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition, a Type D Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 7.

In addition to NPC-300 Warning Clauses, CN Railway Warning Clause will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 7.

The surroundings of the development are characterized by low-rise commercial and residential buildings. Some of the surrounding commercial buildings located to the north of the site are served by small rooftop equipment; however, the closest building with rooftop equipment is located more than 50 metres away from the subject site. And the remaining neighbouring buildings do not possess any apparent exterior stationary noise sources. Therefore, existing stationary noise impacts from these properties are considered insignificant.

For off-site impacts from the proposed building onto the surroundings, any stationary noise impacts are expected to be minor, given the size of the development. Any mechanical systems associated with the development are expected to be small internal fan coils or heat pumps. Any equipment installed will comply with NPC-116 – Noise Guidelines for Residential Air Conditioning Devices.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Rohit Communities Ontario Inc. to undertake a transportation noise and vibration assessment in support of a Site Plan Control application (SPA) for a proposed residential development located at 42 Northside Road in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise levels generated by local transportation sources.

This assessment was performed based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[2] guidelines, City of Ottawa[3]. Noise calculations were based on architectural drawings prepared by Rossmann Architecture, dated April 2022, with future traffic volumes corresponding to the City of Ottawa's Official Plan (OP) roadway classifications and theoretical capacities and railway traffic volumes based on Gradient Wind's experience as well as noise reports prepared by others for projects in the area surrounding the rail line of interest.

2. TERMS OF REFERENCE

The focus of this transportation noise & vibration assessment is a proposed residential building located at 42 Northside Road in Ottawa, Ontario. The proposed development will comprise a 5 -storey residential building with 2 levels of underground parking. The analysis is based on the drawings prepared by Rossmann Architecture, dated April 2022.

The balconies or terraces less than 4 metres deep are not considered Outdoor Living Areas (OLA) as per ENCG; therefore, no OLA receptors were defined in the study area.

The site is impacted by roadway traffic noise from Robertson Road, Northside Road, and Larkspur Drive, and railway noise from CN Railway located approximately 230 metres to the north of the subject site. Since the site is located further than 75 m from the CN Railway, a vibration assessment is not required[4].

[2] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[3] City of Ottawa Environmental Noise Control Guidelines, January 2016
[4] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Associated of Canada, May 2013.

The subject site is surrounded by low-rise residential and commercial buildings. Figure 1 illustrates a complete site plan with the surrounding context.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on development produced by local transportation sources, (ii) and ensure that interior and exterior noise levels do not exceed the allowable limits specified by the ENCG as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

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 particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise 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 better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Criteria for Transportation Noise

For vehicle traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time-varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level that has the same energy as a time-varying noise level over a period of time. For roadways, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The City of Ottawa's Environmental Noise Control Guidelines (ENCG) specify that the recommended indoor noise limit range for roadway noise is 45 (during daytime) and 40 (during nighttime) for residences, as listed in Table 1. However, to account for deficiencies in building construction and control peak noise, these levels should be targeted toward 42, 37 for living areas during the daytime and sleeping quarters during the nighttime respectively.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (ROAD AND RAIL)[5]

Type of Space	Time Period	Leq (dBA)	
		Road	Rail
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50	45
Living/dining/den areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	45	40
Sleeping quarters of hotels/motels	23:00 – 07:00	45	40
Sleeping quarters	07:00 – 23:00	45	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40	35

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise while a standard closed window is capable of providing a minimum 20 dBA noise reduction[6]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider the need for having windows and doors closed, which normally triggers the need for central air conditioning (or similar mechanical system). Where noise levels exceed 65 dBA daytime and 60 dBA nighttime building components will require higher levels of sound attenuation[7].

Due to the characteristics of rail noise which occur over short periods (i.e. whistles, brake squealing), and a significant low frequency component produced by the movement of the locomotive along the track, road and rail traffic noise require separate analyses, particularly when assessing indoor sound levels. In order to account for the special character of railway sound, the indoor sound level criteria are more stringent by 5 dBA as compared to the road traffic criteria. This difference typically results in requirements

[5] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[6] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[7] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

for upgraded glazing elements to provide better noise attenuation from the building envelope. Interior noise level criteria include the influence of rail crossings and warning whistle bursts.

Noise levels at outdoor living areas should be limited to 55 dBA where technically and administratively feasible. The City of Ottawa preferences for noise control prescribe the following hierarchy:

(i) Increased distance setback with absorptive ground cover (vegetation)
(ii) Relocation of noise-sensitive areas away from roadways
(iii) Earth berms
(iv) Acoustic barriers

4.3 Transportation Noise Assessment

4.3.1 Theoretical Roadway Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for road and rail analysis. Noise receptors were strategically placed at four (4) locations around the study area as illustrated in Figure 2. Appendix A includes the STAMSON 5.04 input and output data.

The roadway lines were treated as single line sources of noise that use, where appropriate, existing building locations as noise barriers partially or fully obstructing exposure to the source. In addition to the roadway volumes summarized in Table 2 below, theoretical noise predictions were also based on the following parameters:

- Truck traffic on all roadways was taken to comprise 5% heavy trucks and 7% medium trucks, as per ENCG requirements for noise level predictions.
- The day/night split for all streets was taken to be 92%/8% respectively.
- Ground surfaces were taken to be reflective due to the presence of hard ground (pavement and concrete ground).
- Topography was assumed to be a flat/gentle slope.
- Plane of window (POW) receptor heights were taken to be 13.5 m at the centre of the 5th-floor window.
- Receptor distance and exposure angles are outlined in Figures 3 and 4.

4.3.2 Roadway Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on a roadway's classification at the mature state of development. Therefore, traffic volumes are based on the roadway classifications outlined in the City of Ottawa's Official Plan (OP) and Transportation Master Plan[8] which provide additional details on future roadway expansions. Average Annual Daily Traffic (AADT) volumes are then based on data in Table B1 of the ENCG for each roadway classification. Table 2 (below) summarizes the AADT values used for the roadway in this assessment.

TABLE 2: ROADWAY TRAFFIC DATA

Segment	Roadway Traffic Data	Speed Limit (km/h)	Traffic Volumes
Robertson Road	4-Lane Urban Arterial Divided (4-UAD)	60	**35,000**
Northside Road	2 Lane Major Collector (2-UMCU)	40	**12,000**
Lakspur Drive	2 Lane Major Collector (2-UMCU)	40	**12,000**

4.3.3 Theoretical Railway Noise Predictions

Calculations were performed for receptors in close proximity to the railway with the assistance of STAMSON 5.04, which incorporates the calculation model '*Sound from Trains Environment Analysis Method*' (STEAM). The impact of railway noise is then combined with roadway predictions using a logarithmic addition at each point of reception and compared to the relevant criteria.

[8] City of Ottawa Transportation Master Plan, November 2013

The railway lines were treated as single line sources of noise that use, where appropriate, existing building locations as noise barriers partially or fully obstructing exposure to the source. In addition to the railway volumes summarized in Table 3 below, theoretical noise predictions were also based on the following parameters:

- Ground surfaces were taken to be reflective due to the presence of hard ground (pavement and concrete ground).
- Topography was assumed to be a flat/gentle slope.
- Plane of window (POW) receptor heights were taken to be 13.5 m at the centre of the 5th-floor window.
- Outdoor living area (OLA) receptor height was taken to be at 1.5 m high.
- All trains operating in the area are diesel trains.
- One locomotive was modelled with an average of six cars per train.
- Whistle noise was not considered as there is no grade-level crossing around the study site.
- The freight trains using the CN Railway were modelled with an operating speed of 16 km/hr (10 mph).
- Rail lines were assumed not to be welded.
- Receptor distance and exposure angles are outlined in Figures 3 and 4.

4.3.1 Railway Traffic Volumes

The NPC-300 dictates that noise calculations should consider Average Annual Daily Traffic (AADT) volumes projected 10-years into the future. Existing daily rail traffic data is based on Gradient Wind's experience, as well as noise reports prepared by others for projects in the area surrounding the rail line of interest. The east-west rail line traffic, situated to the north of the development site, is limited to one train a week. This assessment considers one inbound and one outbound train with the worst-case scenario being the round trip is completed in a single day. Therefore, rail traffic is assumed to remain constant over the next 10 years. Table 3 (below) summarizes the rail traffic counts included in this assessment.

TABLE 3: RAILWAY TRAFFIC DATA

Railway	Train Class	Speed Limit (km/h)	Rail Traffic Counts (Day / Night)	Number of Locomotives	Number of Cars
CN Railway	Diesel (Freight)	16	2 / 0	1	6

4.4 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, concrete and masonry walls can achieve STC 50 or more. Curtainwall systems typically provide around STC 35, depending on the glazing elements. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40 depending on the window manufacturer, pane thickness and inter-pane spacing. As previously mentioned, the windows are the known weak point in a partition.

According to the NPC-300, when daytime noise levels (from roadway sources) at the plane of the window exceed 65 dBA, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[9] considers:

- Window type and total area as a percentage of total room floor area
- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space

[9] Building Practice Note: Controlling Sound Transmission into Buildings by J.D. Quirt, National Research Council of Canada, September 1985

Based on published research[10], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Due to the limited information available at the time of the study, which was prepared for a zoning by-law amendment application, final detailed floor layouts and building elevations were unavailable and therefore detailed STC calculations could not be performed at this time. As a guideline, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels).

5. RESULTS AND DISCUSSION

5.1 Roadway and Railway Noise Levels

The results of the railway and roadway noise calculations are summarized in Table 4 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

For the roadway traffic noise, results of the current analysis indicate that noise levels will range between 56 and 69 dBA during the daytime period (07:00-23:00) and between 49 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 69 dBA) occurs along the north façade of the development, which is nearest and most exposed to Robertson and Northside Roads.

For the rail noise, the results of the current analysis indicate that noise levels will range between 25 and 40 dBA during the daytime period (07:00-23:00). There will be no impact from the CN Railway during the nighttime period (23:00-07:00) as there is no train using the rail line during that period. The highest noise level (i.e. 40 dBA) occurs along the north façade of the building, which is nearest and most exposed to the rail line.

[10] CMHC, Road & Rail Noise: Effects on Housing

TABLE 4: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Receptor Locations	Receptor Height Above Grave (m)	Noise Level (dBA)					
			Road		Rail		Combined	
			Day	Night	Day	Night	Day	Night
1	5th Floor North Façade POW	13.5	69	62	40	-	69	62
2	5th Floor West Façade POW	13.5	66	59	37	-	66	59
3	5th Floor South Façade POW	13.5	56	49	25	-	56	49
4	5th Floor East Façade POW	13.5	64	57	39	-	64	57

5.2 Noise Control Measures

The noise levels predicted due to railway traffic do not exceed the ENCG criteria; however, the roadway traffic noise levels exceed the criteria listed in Section 4.2 for building components at the north and west façades of the building. As discussed in Section 4.4, the anticipated STC requirements for windows have been estimated based on the overall noise reduction required for each intended use of space (STC = outdoor noise level – targeted indoor noise levels). As per NPC-300 requirements, detailed STC calculations will be required to be completed prior to building permit application for each unit type. The STC requirements for the windows are summarized below for various units within the development (see Figure 5):

- **Bedroom Windows**

(i) Bedroom windows facing north will require a minimum STC of 32

(ii) Bedroom windows facing west will require a minimum STC of 29

(iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2020) requirements

- **Living Room/Office Windows**

(i) Living room windows facing north will require a minimum STC of 27

(ii) Living room windows facing west will require a minimum STC of 24

(iii) All other living room windows are to satisfy Ontario Building Code (OBC 2020) requirements

- **Exterior Walls**

(i) Exterior wall components on the north façade will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[11]

The STC requirements apply to windows, doors, spandrel panels and curtainwall elements. Exterior wall components on these façades are recommended to have a minimum STC of 45, where a window/wall system is used. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing. We have specified an example window configuration, however, several manufacturers and various combinations of window components, such as those proposed, will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code. The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that the development will require central air conditioning (or similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6.

[11] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

6. GROUND VIBRATIONS & GROUND-BORNE NOISE

The potential requirement of a detailed vibration study was assessed. The nearest source of potential ground vibration is CN Railway, located approximately 230 metres north of the proposed development. As the development is outside the 75 metres influence area of the rail line for vibrations as per *Guidelines for New Development in Proximity to Railway Operations*[12], prepared for the Canadian Railway Association and Canadian Association of Municipalities, there are no ground vibration sources within proximity of the study site. Therefore, it is our professional opinion that a detailed vibration study is not required beyond this conclusion.

7. CONCLUSIONS AND RECOMMENDATIONS

For the roadway traffic noise, results of the current analysis indicate that noise levels will range between 56 and 69 dBA during the daytime period (07:00-23:00) and between 49 and 62 dBA during the nighttime period (23:00-07:00). The highest noise level (i.e. 69 dBA) occurs along the north façade of the development, which is nearest and most exposed to Robertson and Northside Roads.

For the rail noise, results of the current analysis indicate that noise levels will range between 25 and 40 dBA during the daytime period (07:00-23:00) and during the nighttime period (23:00-07:00) there will be no impact from the CN Railway as there is no train using the rail line during that period. The highest noise level (i.e. 40 dBA) occurs along the north façade of the building, which is nearest and most exposed to the rail line.

The results of the calculations indicate that upgraded building components will be required at the north and west façades of the building. The results of the calculations also indicate that the development will require central air conditioning (or a similar mechanical system), which will allow occupants to keep windows closed and maintain a comfortable living environment. In addition, a Type D Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized below:

[12] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Associated of Canada, May 2013

"This dwelling unit has been supplied with a central air conditioning system (or similar mechanical system) which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."

In addition to NPC-300 Warning Clauses the following CN Railway Warning Clause will be required in all Lease, Purchase and Sale Agreements:

"Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

CN Railway is located approximately 230 metres to the north of the subject site. Therefore, the vibration assessment was not conducted for the subject site as the railway guidelines indicate that a vibration evaluation is not required if the railway is more than 75 metres away from the site.

The surroundings of the development are characterized by low-rise commercial and residential buildings. Some of the surrounding commercial buildings located to the north of the site are served by small rooftop equipment; however, the closest building with rooftop equipment is located more than 50 metres away from the subject site. And the remaining neighbouring buildings do not possess any apparent exterior stationary noise sources. Therefore, existing stationary noise impacts from these properties are considered insignificant.

For off-site impacts from the proposed building onto the surroundings, any stationary noise impacts are expected to be minor, given the size of the development. Any mechanical systems associated with the development are expected to be small internal fan coils or heat pumps. Any equipment installed will comply with NPC-116 – Noise Guidelines for Residential Air Conditioning Devices.

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.

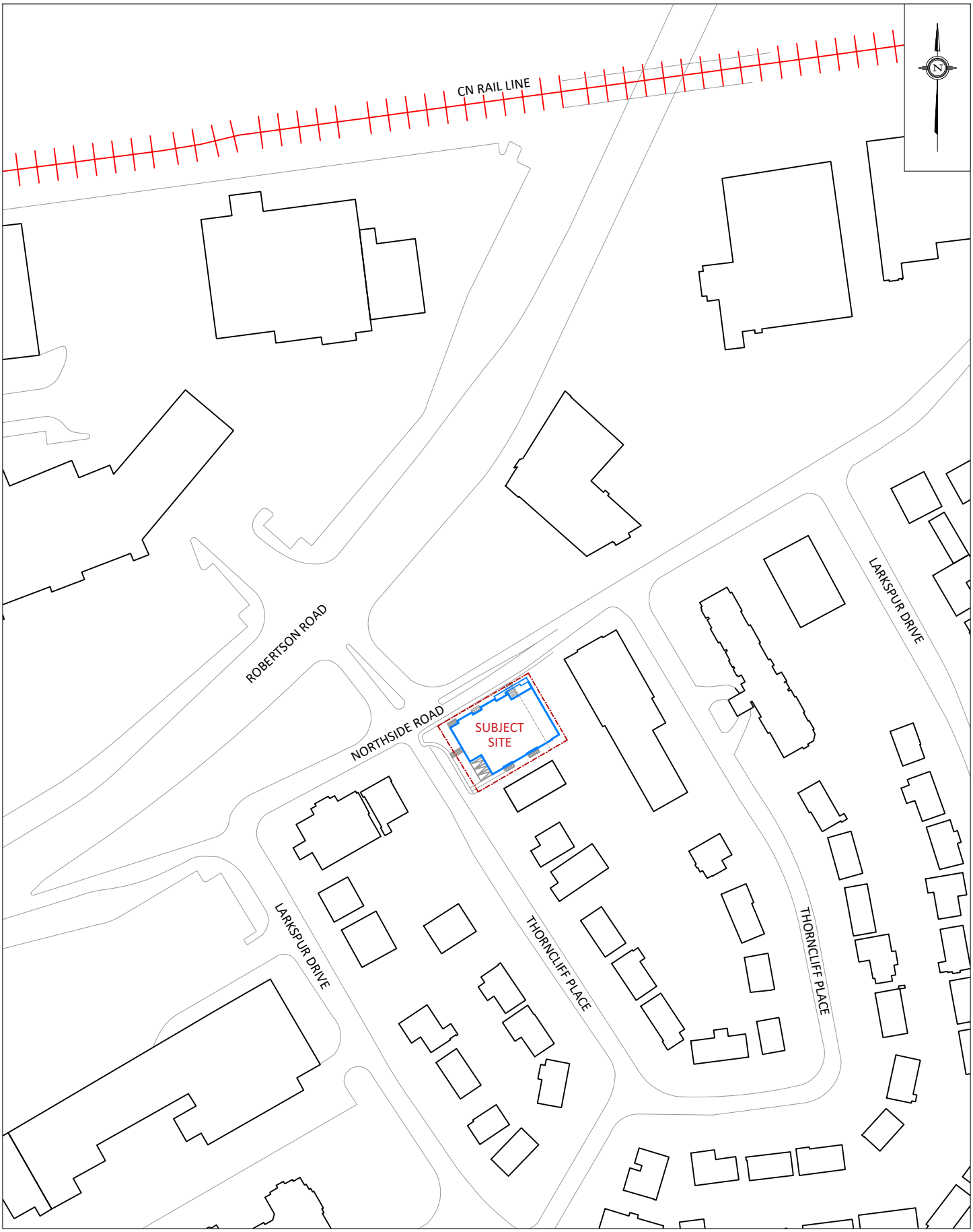
Sincerely,

Gradient Wind Engineering Inc.

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File#21-358 –Transportation Noise & Vibration R1



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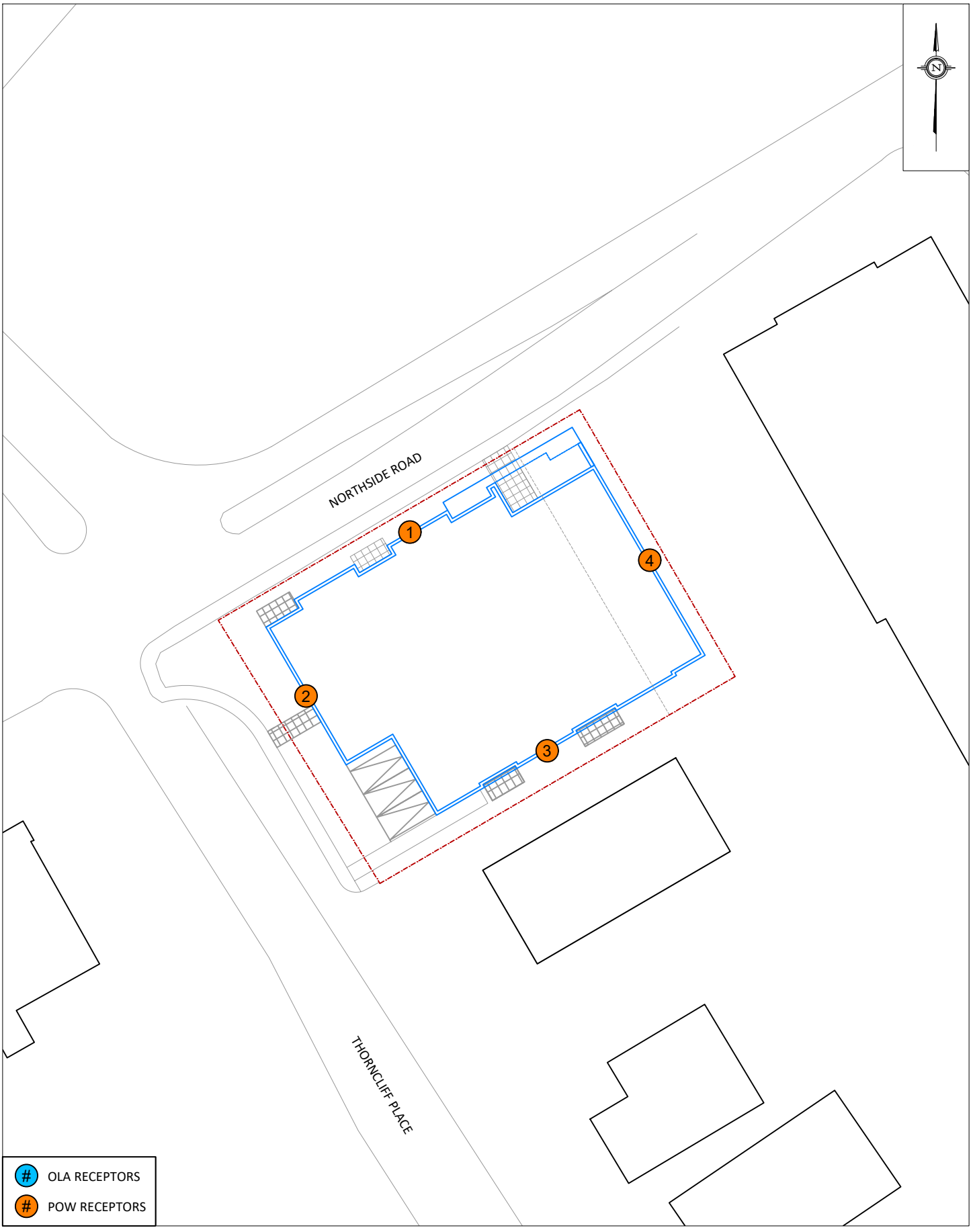
PROJECT	42 NORTHSIDE ROAD, OTTAWA TRANSPORTATION NOISE & VIBRATION ASSESSMENT
SCALE	1:2000
DRAWING NO.	21-358-ANV-1
DATE	APRIL, 2022
DRAWN BY	E.K.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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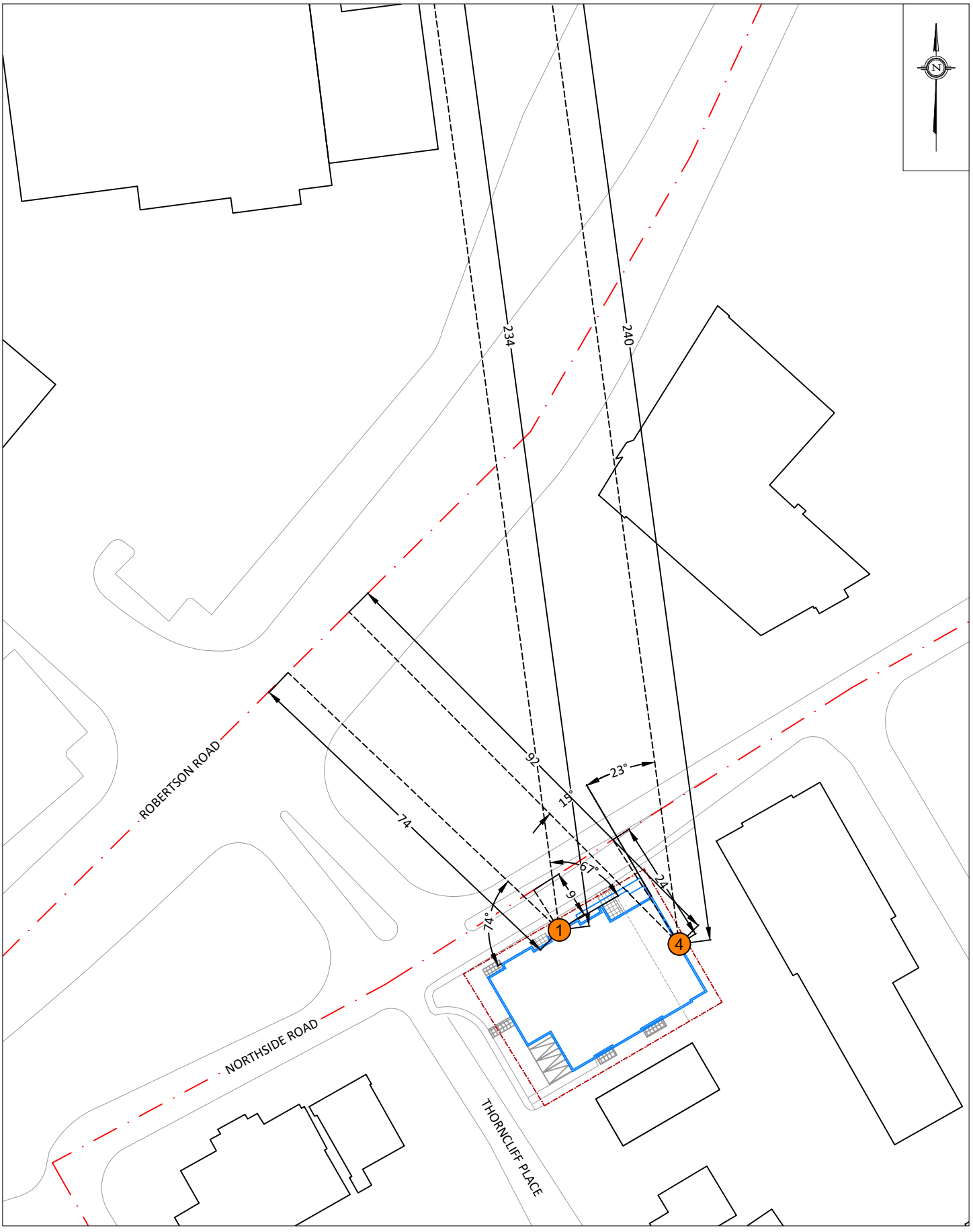
SCALE	1:2000
DRAWING NO.	21-358-ANV-2
DATE	APRIL, 2022
DRAWN BY	E.K.

DESCRIPTION

FIGURE 2:
RECEPTOR LOCATIONS



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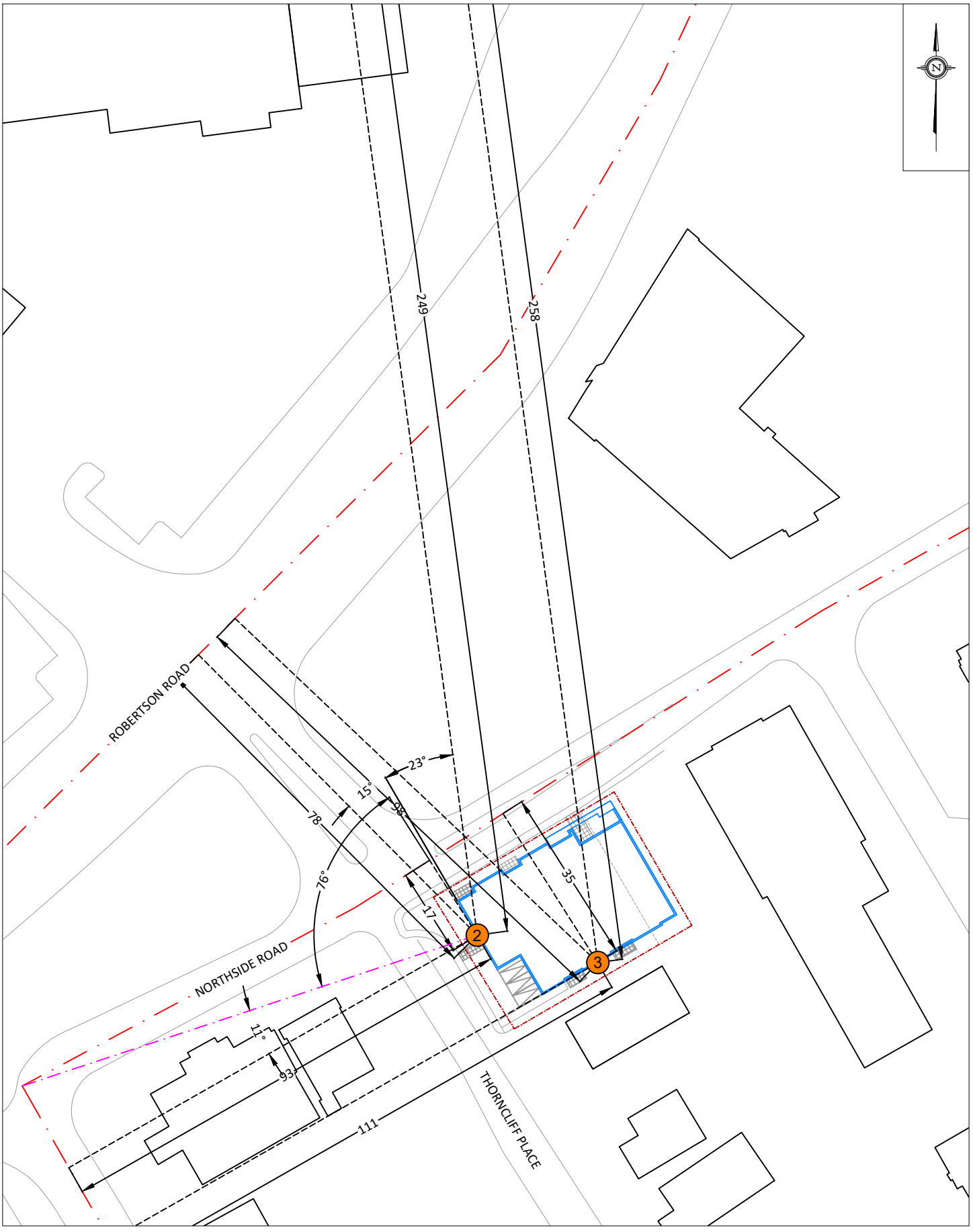
SCALE	1:2000
DRAWING NO.	21-358-ANV-3
DATE	APRIL, 2022
DRAWN BY	E.K.

DESCRIPTION

FIGURE 3:
STAMSON INPUT DATA
FOR RECEPTORS 1 & 4



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SCALE	1:2000
DRAWING NO.	21-358-ANV-4
DATE	APRIL, 2022
DRAWN BY	E.K.

DESCRIPTION

FIGURE 4:
STAMSON INPUT DATA
FOR RECEPTORS 2 & 3

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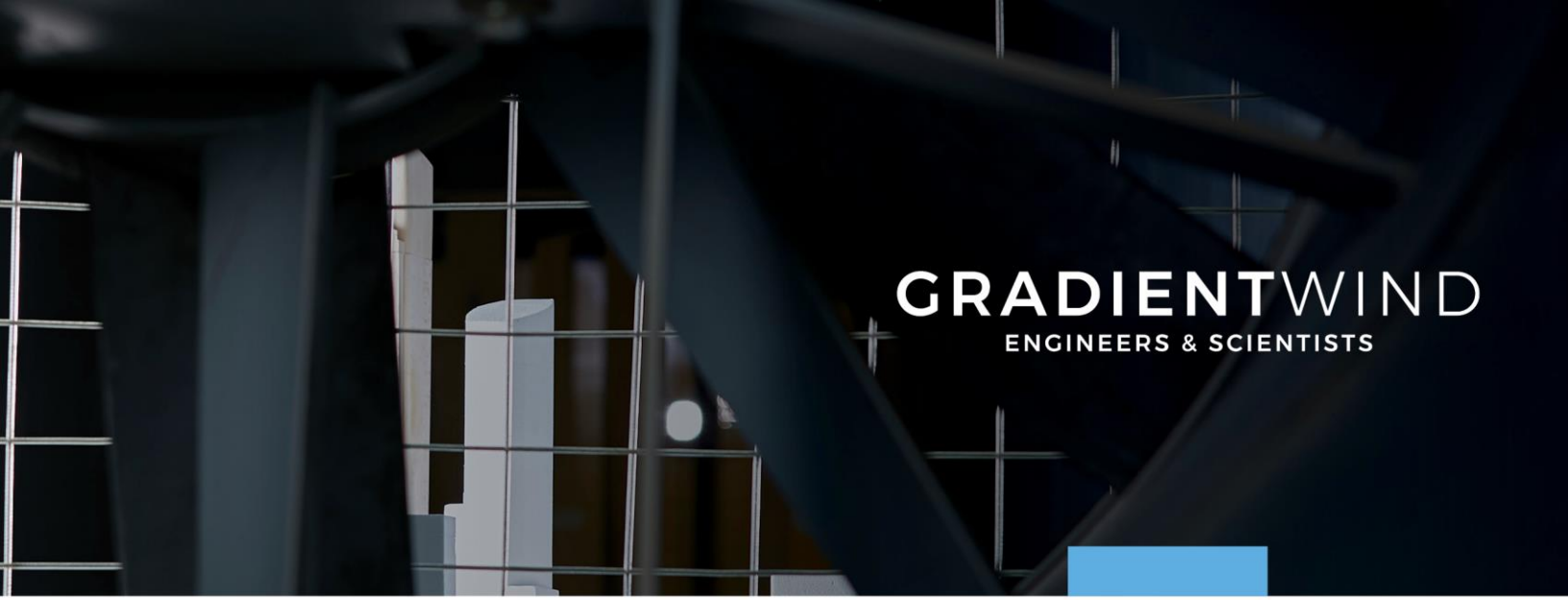
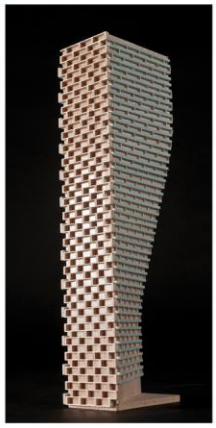
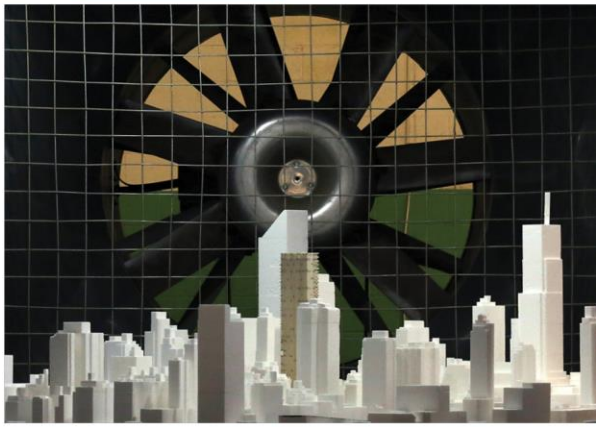
SCALE	1:2000
DRAWING NO.	21-358-ANV-5
DATE	APRIL, 2022
DRAWN BY	E.K.

DESCRIPTION

FIGURE 5:
STC REQUIREMENTS







APPENDIX A

STAMSON 5.04 – INPUT AND OUTPUT DATA

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

STAMSON 5.0 NORMAL REPORT Date: 14-12-2021 11:34:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: CN Rail Line (day/night)

Train Type	Trains (km/h)	Speed	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	2.0/0.0	16.0	1.0	6.0	Diesel	No

Data for Segment # 1: CN Rail Line (day/night)

Angle1 Angle2 : -90.00 deg 67.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 234.00 / 234.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
No Whistle
Reference angle : 0.00

Results segment # 1: CN Rail Line (day)

LOCOMOTIVE (0.00 + 40.01 + 0.00) = 40.01 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	67	0.00	52.53	-11.93	-0.59	0.00	0.00	0.00	40.01

WHEEL (0.00 + 25.70 + 0.00) = 25.70 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	67	0.00	38.23	-11.93	-0.59	0.00	0.00	0.00	25.70

Segment Leq : 40.17 dBA

Total Leq All Segments: 40.17 dBA

Results segment # 1: CN Rail Line (night)

LOCOMOTIVE (0.00 + -12.52 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	67	0.00	0.00	-11.93	-0.59	0.00	0.00	0.00	-12.52

WHEEL (0.00 + -12.52 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	67	0.00	0.00	-11.93	-0.59	0.00	0.00	0.00	-12.52

Segment Leq : 0.00 dBA

Total Leq All Segments: 0.00 dBA

Road data, segment # 1: Robertson Rd (day/night)

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Robertson Rd (day/night)

Angle1 Angle2 : -74.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 74.00 / 74.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Northside Rd (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Northside Rd (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Robertson Rd (day)

Source height = 1.50 m

ROAD (0.00 + 66.34 + 0.00) = 66.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-74	90	0.00	73.68	0.00	-6.93	-0.40	0.00	0.00	0.00	66.34

Segment Leq : 66.34 dBA

Results segment # 2: Northside Rd (day)

Source height = 1.50 m

ROAD (0.00 + 65.72 + 0.00) = 65.72 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	65.72	0.00	0.00	0.00	0.00	0.00	0.00	65.72

Segment Leq : 65.72 dBA

Total Leq All Segments: 69.05 dBA

Results segment # 1: Robertson Rd (night)

Source height = 1.50 m

ROAD (0.00 + 58.74 + 0.00) = 58.74 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-74	90	0.00	66.08	0.00	-6.93	-0.40	0.00	0.00	0.00	58.74

Segment Leq : 58.74 dBA

Results segment # 2: Northside Rd (night)

Source height = 1.50 m

ROAD (0.00 + 58.12 + 0.00) = 58.12 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	58.12	0.00	0.00	0.00	0.00	0.00	0.00	58.12

Segment Leq : 58.12 dBA

Total Leq All Segments: 61.45 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 69.06
(NIGHT): 61.45

STAMSON 5.0 NORMAL REPORT Date: 14-12-2021 11:35:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: CN Rail Line (day/night)

Train Type	Trains (day/night)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	2.0/0.0	16.0	1.0	6.0	Diesel	No

Data for Segment # 1: CN Rail Line (day/night)

Angle1 Angle2 : -90.00 deg -23.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 234.00 / 234.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
No Whistle
Reference angle : 0.00

Results segment # 1: CN Rail Line (day)

LOCOMOTIVE (0.00 + 36.31 + 0.00) = 36.31 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-23	0.00	52.53	-11.93	-4.29	0.00	0.00	0.00	36.31

WHEEL (0.00 + 22.00 + 0.00) = 22.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-23	0.00	38.23	-11.93	-4.29	0.00	0.00	0.00	22.00

Segment Leq : 36.47 dBA

Total Leq All Segments: 36.47 dBA

Results segment # 1: CN Rail Line (night)

LOCOMOTIVE (0.00 + -16.22 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-23	0.00	0.00	-11.93	-4.29	0.00	0.00	0.00	-16.22

WHEEL (0.00 + -16.22 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	-23	0.00	0.00	-11.93	-4.29	0.00	0.00	0.00	-16.22

Segment Leq : 0.00 dBA

Total Leq All Segments: 0.00 dBA

Road data, segment # 1: Robertson Rd (day/night)

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Robertson Rd (day/night)

Angle1 Angle2 : -90.00 deg 15.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 78.00 / 78.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Northside Rd (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Northside Rd (day/night)

Angle1 Angle2 : -76.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 17.00 / 17.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 3: Lakspur Dr (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: Lakspur Dr (day/night)

Angle1 Angle2 : -90.00 deg 11.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 93.00 / 93.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Robertson Rd (day)

Source height = 1.50 m

ROAD (0.00 + 64.18 + 0.00) = 64.18 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.00	73.68	0.00	-7.16	-2.34	0.00	0.00	0.00	64.18

Segment Leq : 64.18 dBA

Results segment # 2: Northside Rd (day)

Source height = 1.50 m

ROAD (0.00 + 61.43 + 0.00) = 61.43 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-76	0	0.00	65.72	0.00	-0.54	-3.74	0.00	0.00	0.00	61.43

Segment Leq : 61.43 dBA

Results segment # 3: Lakspur Dr (day)

Source height = 1.50 m

ROAD (0.00 + 55.28 + 0.00) = 55.28 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	11	0.00	65.72	0.00	-7.92	-2.51	0.00	0.00	0.00	55.28

Segment Leq : 55.28 dBA

Total Leq All Segments: 66.38 dBA

Results segment # 1: Robertson Rd (night)

Source height = 1.50 m

ROAD (0.00 + 56.58 + 0.00) = 56.58 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	15	0.00	66.08	0.00	-7.16	-2.34	0.00	0.00	0.00	56.58

Segment Leq : 56.58 dBA

Results segment # 2: Northside Rd (night)

Source height = 1.50 m

ROAD (0.00 + 53.83 + 0.00) = 53.83 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-76	0	0.00	58.12	0.00	-0.54	-3.74	0.00	0.00	0.00	53.83

Segment Leq : 53.83 dBA

Results segment # 3: Lakspur Dr (night)

Source height = 1.50 m

ROAD (0.00 + 47.68 + 0.00) = 47.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	11	0.00	58.12	0.00	-7.92	-2.51	0.00	0.00	0.00	47.68

Segment Leq : 47.68 dBA

Total Leq All Segments: 58.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.38
(NIGHT): 58.78

STAMSON 5.0 NORMAL REPORT Date: 14-12-2021 11:36:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: CN Rail Line (day/night)

Train Type	Trains (km/h)	Speed /Train	# loc /Train	# Cars type	Eng	Cont weld
1. Freight	2.0/0.0	16.0	1.0	6.0	Diesel	No

Data for Segment # 1: CN Rail Line (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 258.00 / 258.00 m
Receiver height : 13.50 / 13.50 m
Topography : 2 (Flat/gentle slope; with barrier)
No Whistle
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 15.00 m
Barrier receiver distance : 0.10 / 0.10 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: CN Rail Line (day)

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
4.00 ! 13.50 ! 13.50 ! 13.50
0.50 ! 13.50 ! 13.49 ! 13.49

LOCOMOTIVE (0.00 + 25.27 + 0.00) = 25.27 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 52.53 -12.36 0.00 0.00 0.00 -14.90 25.27

WHEEL (0.00 + 10.92 + 0.00) = 10.92 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 38.23 -12.36 0.00 0.00 0.00 -14.95 10.92

Segment Leq : 25.43 dBA

Total Leq All Segments: 25.43 dBA

Results segment # 1: CN Rail Line (night)

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
4.00 ! 13.50 ! 13.50 ! 13.50
0.50 ! 13.50 ! 13.49 ! 13.49

LOCOMOTIVE (0.00 + -27.26 + 0.00) = 0.00 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 0.00 -12.36 0.00 0.00 0.00 -14.90 -27.26

WHEEL (0.00 + -27.31 + 0.00) = 0.00 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 0.00 -12.36 0.00 0.00 0.00 -14.95 -27.31

Segment Leq : 0.00 dBA

Total Leq All Segments: 0.00 dBA

Road data, segment # 1: Robertson Rd (day/night)

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Robertson Rd (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 98.00 / 98.00 m
Receiver height : 13.50 / 13.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 15.00 m
Barrier receiver distance : 0.10 / 0.10 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 2: Northside Rd (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Northside Rd (day/night)

Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 35.00 / 35.00 m
Receiver height : 13.50 / 13.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 15.00 m
Barrier receiver distance : 0.10 / 0.10 m
Source elevation : 0.00 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Road data, segment # 3: Lakspur Dr (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 3: Lakspur Dr (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 111.00 / 111.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Robertson Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.50 ! 13.50 ! 13.49 ! 13.49

ROAD (0.00 + 50.31 + 0.00) = 50.31 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 73.68 0.00 -8.15 0.00 0.00 0.00 -15.22 50.31

Segment Leq : 50.31 dBA

Results segment # 2: Northside Rd (day)

Source height = 1.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.50 ! 13.50 ! 13.47 ! 13.47

ROAD (0.00 + 46.33 + 0.00) = 46.33 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 65.72 0.00 -3.68 0.00 0.00 0.00 -15.71 46.33

Segment Leq : 46.33 dBA

Results segment # 3: Lakspur Dr (day)

Source height = 1.50 m

ROAD (0.00 + 54.01 + 0.00) = 54.01 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	65.72	0.00	-8.69	-3.01	0.00	0.00	0.00	54.01

Segment Leq : 54.01 dBA

Total Leq All Segments: 56.04 dBA

Results segment # 1: Robertson Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.50 ! 13.50 ! 13.49 ! 13.49

ROAD (0.00 + 42.71 + 0.00) = 42.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 66.08 0.00 -8.15 0.00 0.00 0.00 -15.22 42.71

Segment Leq : 42.71 dBA

Results segment # 2: Northside Rd (night)

Source height = 1.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.50 ! 13.50 ! 13.47 ! 13.47

ROAD (0.00 + 38.73 + 0.00) = 38.73 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.00 58.12 0.00 -3.68 0.00 0.00 0.00 -15.71 38.73

Segment Leq : 38.73 dBA

Results segment # 3: Lakspur Dr (night)

Source height = 1.50 m

ROAD (0.00 + 46.42 + 0.00) = 46.42 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	58.12	0.00	-8.69	-3.01	0.00	0.00	0.00	46.42

Segment Leq : 46.42 dBA

Total Leq All Segments: 48.45 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.05
(NIGHT): 48.45

STAMSON 5.0 NORMAL REPORT Date: 14-12-2021 11:36:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: CN Rail Line (day/night)

Train Type	Trains (day/night)	Speed (km/h)	# loc/Train	# Cars/Train	Eng type	Cont weld
1. Freight	2.0/0.0	16.0	1.0	6.0	Diesel	No

Data for Segment # 1: CN Rail Line (day/night)

Angle1 Angle2 : -23.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 240.00 / 240.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
No Whistle
Reference angle : 0.00

Results segment # 1: CN Rail Line (day)

LOCOMOTIVE (0.00 + 38.47 + 0.00) = 38.47 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.00	52.53	-12.04	-2.02	0.00	0.00	0.00	38.47

WHEEL (0.00 + 24.16 + 0.00) = 24.16 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.00	38.23	-12.04	-2.02	0.00	0.00	0.00	24.16

Segment Leq : 38.63 dBA

Total Leq All Segments: 38.63 dBA

Results segment # 1: CN Rail Line (night)

LOCOMOTIVE (0.00 + -14.06 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.00	0.00	-12.04	-2.02	0.00	0.00	0.00	-14.06

WHEEL (0.00 + -14.06 + 0.00) = 0.00 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-23	90	0.00	0.00	-12.04	-2.02	0.00	0.00	0.00	-14.06

Segment Leq : 0.00 dBA

Total Leq All Segments: 0.00 dBA

Road data, segment # 1: Robertson Rd (day/night)

Car traffic volume : 28336/2464 veh/TimePeriod *
Medium truck volume : 2254/196 veh/TimePeriod *
Heavy truck volume : 1610/140 veh/TimePeriod *
Posted speed limit : 60 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 35000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Robertson Rd (day/night)

Angle1 Angle2 : 15.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 92.00 / 92.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: Northside Rd (day/night)

Car traffic volume : 9715/845 veh/TimePeriod *
Medium truck volume : 773/67 veh/TimePeriod *
Heavy truck volume : 552/48 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 12000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Northside Rd (day/night)

Angle1 Angle2 : 0.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 24.00 / 24.00 m
Receiver height : 13.50 / 13.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Robertson Rd (day)

Source height = 1.50 m

ROAD (0.00 + 62.00 + 0.00) = 62.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
15 90 0.00 73.68 0.00 -7.88 -3.80 0.00 0.00 0.00 62.00

Segment Leq : 62.00 dBA

Results segment # 2: Northside Rd (day)

Source height = 1.50 m

ROAD (0.00 + 60.67 + 0.00) = 60.67 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
0 90 0.00 65.72 0.00 -2.04 -3.01 0.00 0.00 0.00 60.67

Segment Leq : 60.67 dBA

Total Leq All Segments: 64.40 dBA

Results segment # 1: Robertson Rd (night)

Source height = 1.50 m

ROAD (0.00 + 54.40 + 0.00) = 54.40 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
15	90	0.00	66.08	0.00	-7.88	-3.80	0.00	0.00	0.00	54.40

Segment Leq : 54.40 dBA

Results segment # 2: Northside Rd (night)

Source height = 1.50 m

ROAD (0.00 + 53.07 + 0.00) = 53.07 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	58.12	0.00	-2.04	-3.01	0.00	0.00	0.00	53.07

Segment Leq : 53.07 dBA

Total Leq All Segments: 56.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.41
(NIGHT): 56.80