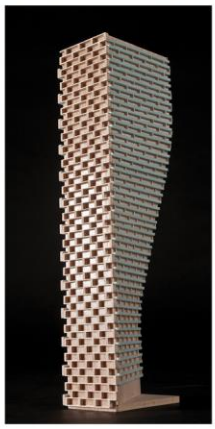
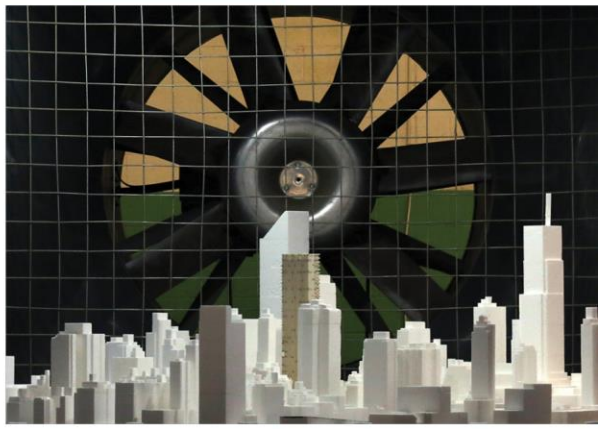
GRADIENTWIND
ENGINEERS & SCIENTISTS

TRANSPORTATION NOISE & GROUND VIBRATIONS IMPACT STUDY

335 Roosevelt Avenue
Ottawa, Ontario

REPORT #20-091-Transportation Noise & Vibration R1





May 23, 2025

PREPARED FOR

Uniform Urban Developments
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PREPARED BY

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EXECUTIVE SUMMARY

This report describes a transportation noise and ground vibration assessment undertaken for a proposed residential development located at 335 Roosevelt Avenue in Ottawa, Ontario to examine the impact of light rail transit corridor (proposed future LRT) traffic on the development to ensure that future occupants are afforded comfortable use of indoor and outdoor living spaces, as directed by the City of Ottawa's Environmental Noise Control Guidelines (ENCG). This report was prepared in consideration of an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) applications.

The proposed residential development is located at 335 Roosevelt Avenue in Ottawa at the intersection of Roosevelt and Winston Avenues. The development features two residential buildings; one lies between Roosevelt and Winston Avenues on the west side and the other on the east side of Winston Avenue. The current study is based on architectural drawings prepared by Hobin Architecture received in May 2025. Previously Gradient Wind completed a transportation noise study dated July 21, 2020. At the time, the west building was rising up to 21 storeys, and the east building was rising up to 18 storeys. The buildings' footprints have not changed drastically in the new design; however, the buildings heights have decreased. The Residential Building West comprises 14 storeys, while the Residential Building East comprises 13 storeys in the latest design. The Residential Building West and East feature a 160 and 105-car underground parking, respectively. The buildings set back on levels 4, 8, 9, 11, and 12 from different sides creating terraces. The four low-rise blocks (Block A, B, C, and D) have been removed from the design. These changes in massing are relatively minor from a noise and vibration perspective, and new noise calculations have only been completed where necessary, as such plane of window receptor results for the east and west buildings still apply. The plane of window receptors on the low-rise buildings have been removed from the study. The outdoor living area locations are updated as the new design now incorporates different terraces at the east and west buildings.

The study site is not within a hundred metres of any existing or planned collector or arterial roadway. However, a light rail transit corridor, which is planned to be built on the north side of the study site, is the major source of noise and ground vibrations. Figure 1 illustrates a complete site plan with the surrounding context.

The Western LRT is the westerly extension of the City's Confederation Line. This report describes the assessment, methodology and results for existing and future environmental noise and vibration impacts influenced by the project undertaking and provides recommendations for mitigation where required.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP) (ii) ground-borne vibration prediction and assessment methodology as specified by the Federal Transit Authority (FTA) Protocol; (iii) noise level criteria as specified by the City of Ottawa's Environmental Noise Control Guidelines (ENCG); (iv) future rail traffic volumes based on the ultimate buildout LRT volumes were used which were established in the Confederation Line West Extension Environmental Assessment Study; and (v) drawings prepared by Hobin Architecture, dated June 2020.

The results of the current analysis indicate that noise levels will range between 48 and 60 dBA during the daytime period (07:00-23:00) and between 42 and 53 dBA during the nighttime period (23:00-07:00) at plane of window receptors. The highest noise level (i.e. 60 dBA) occurs at the north façades of the East and West Buildings, which are nearest and most exposed to the LRT line. Outdoor Living Area (OLA) noise levels at building terraces and outdoor amenity areas are well below the 55 dBA ENCG criteria. Therefore, no barriers will be required.

The results of the calculations also indicate that the dwellings should be designed with forced air heating and provisions for the installation of central air conditioning.

Warning clauses will be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

The results of the vibration calculations indicated that the ground vibration levels will be approximately 0.11 mm/s, marginally above the threshold level of human perception to vibrations and the criterion of 0.10 mm/s. The ground-borne noise is estimated to be at 38 dBA. The exceedance is deemed to be trivial, therefore, mitigation for ground-borne vibrations and noise is not required. Details of the vibration calculations are presented in Appendix B.

With regards to stationary noise impacts, a stationary noise study will be performed once mechanical plans for the proposed building become available. This study would assess the impacts of stationary

sources, such as rooftop mechanical units serving the proposed building on surrounding noise-sensitive areas. This study will include recommendations for any noise control measures that may be necessary to ensure noise levels fall below ENCG and NPC-300 limits. Noise impacts can generally be minimized by judicious selection and placement of the equipment. Generally, loader pieces of equipment such as cooling towers, generators and large make-up air units, should be placed in the mechanical penthouse or the high roof. Where necessary, noise screens and silencers can be placed into the design.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Uniform Urban Developments to undertake a transportation noise and vibration assessment for a proposed residential development located at 335 Roosevelt Avenue in Ottawa, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior and interior noise & vibration levels generated by local transportation sources.

Our work is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[1] guidelines, City of Ottawa[2], and vibration assessment conforming to the Federal Transit Authority (FTA) Protocol. Calculations were based on architectural drawings prepared by Hobin Architecture, dated June 2020, with the ultimate buildout LRT volumes were used which were established in the Confederation Line West Extension Environmental Assessment Study.

2. TERMS OF REFERENCE

The focus of this study is the proposed residential development is located at 335 Roosevelt Avenue in Ottawa just at the intersection of Roosevelt and Winston Avenues.

Gradient Wind completed a transportation noise study dated July 21, 2020. At the time, the west building was rising up to 21 storeys, and the east building was rising up to 18 storeys. The buildings' footprints have not changed drastically in the new design; however, the buildings heights have decreased. The Residential Building West comprises 14 storeys, while the Residential Building East comprises 13 storeys in the latest design. The Residential Building West and East feature a 160 and 105-car underground parking, respectively. The buildings set back on levels 4, 8, 9, 11, and 12 from different sides creating terraces. The four low-rise blocks (Block A, B, C, and D) have been removed from the design.

The major source of noise and ground vibrations impacting the site is a planned light rail transit corridor north of the site. At the time of writing of the report, construction has started on the line which is converting

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Printer for Ontario, Toronto, 2013
[2] City of Ottawa Environmental Noise Control Guidelines, January 2016

an existing bus rapid transit network to LRT. There are no other major roadways within a 100 metres of the site. Figure 1 illustrates a complete site plan with the surrounding context.

As the buildings have not changed drastically in the new design, the previous plane of window receptor results for the east and west buildings still apply. The plane of window receptors on the low-rise buildings have been removed from the study. The outdoor living area locations are updated as the new design now incorporates different terraces at the east and west buildings.

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on development produced by local transportation sources, (ii) measure the vibration levels on the study building produced from passing trains, (iii) ensure that interior and exterior noise levels do not exceed the allowable limits specified by the ENCG as outlined in Section 4.2.1 of this report, and (v) ensure vibration levels to not exceed the allowable limits specified by industry guidelines, such as the United States Federal Transit Authority (FTA).

4. METHODOLOGY

4.1 Noise 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 Transportation Noise

4.2.1 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 road and railways including LRT, 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) specifies that the recommended indoor noise limit range for roadway and LRT 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 (LRT)[3]

Type of Space	Time Period	Leq (dBA)
		LRT
General offices, reception areas, retail stores, etc.	07:00 – 23:00	50
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
Sleeping quarters of hotels/motels	23:00 – 07:00	45
Sleeping quarters	07:00 – 23:00	45
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	40

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[4]. Therefore, where noise levels exceed 55 dBA daytime and 50 dBA nighttime, the ventilation for the building should consider

[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125

the need for having windows and doors closed, which normally triggers the need for central air conditioning (or similar systems). Where noise levels exceed 65 dBA daytime and 60 dBA nighttime building components will require higher levels of sound attenuation[5].

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 and light rail transit corridors
(iii) Earth berms
(iv) Acoustic barriers

4.2.2 Theoretical LRT Noise Predictions

Noise predictions were performed with the aid of the MECP computerized noise assessment program, STAMSON 5.04, for transportation noise analysis. Appendix A includes the STAMSON 5.04 input and output data.

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

(i) Noise receptors were strategically placed at seventeen (17) locations around the study area (see Figure 2).
(ii) Ground surfaces were taken as reflective where hard ground (pavement and concrete areas) present and absorptive where soft ground (grass, foliage, trees) present.
(iii) Topography was assumed to be a flat/gentle slope with a barrier for receptors influenced by the LRT which is located 5.5 metres below the grade level of the study site.
(iv) A total of nine (9) Plane of window (POW) receptor and six (6) outdoor living area (OLA) receptors were used at the study site.

[5] MOECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.1.3

(v) Receptor distance and exposure angles outlined in Figures 3-6.

4.2.1 Light Rail Traffic Volumes

The ENCG dictates that noise calculations should consider future sound levels based on the mature state of development of the roadway or transit system. Therefore, the ultimate buildout LRT volumes were used which were established in the Confederation Line West Extension Environmental Assessment Study. Table 2 below summarizes the light rail traffic volumes considered in the assessment.

TABLE 2: LIGHT RAIL TRAFFIC DATA

Railway	Railway Traffic Data		Speed Limit (km/h)	Traffic Volumes
	Existing (2020)	Projected (2035)		
Confederation Line LRT (Phase 2)	N/A	540/60*	70	N/A

* Daytime/nighttime volumes

4.3 Ground Vibration and Ground-borne Noise

Rail systems and heavy vehicles on roadways can produce perceptible levels of ground vibrations, especially when they are in close proximity to residential neighbourhoods or vibration-sensitive buildings. Similar to sound waves in air, vibrations in solids are generated at a source, propagated through a medium, and intercepted by a receiver. In the case of ground vibrations, the medium can be uniform, or more often, a complex layering of soils and rock strata. Also, similar to sound waves in air, ground vibrations produce perceptible motions and regenerated noise known as 'ground-borne noise' when the vibrations encounter a hollow structure such as a building. Ground-borne noise and vibrations are generated when there is an excitation of the ground, such as from a train. The repetitive motion of the wheels on the track or rubber tires passing over an uneven surface causes vibrations to propagate through the soil. When they encounter a building, vibrations pass along the structure of the building beginning at the foundation and propagating to all floors. Air inside the building excited by the vibrating walls and floors represents regenerated airborne noise. Characteristics of the soil and the building are imparted to the noise, thereby creating a unique noise signature.

Human response to ground vibrations is dependent on the magnitude of the vibrations, which is measured by the root mean square (RMS) of the movement of a particle on a surface. Typical units of ground

vibration measures are millimetres per second (mm/s), or inch per second (in/s). Since vibrations can vary over a wide range, it is also convenient to represent them in decibel units, or dBV. In North America, it is common practice to use the reference value of one micro-inch per second (µin/s) to represent vibration levels for this purpose. The threshold level of human perception to vibrations is about 0.10 mm/s RMS or about 72 dBV. Although somewhat variable, the threshold of annoyance for continuous vibrations is 0.5 mm/s RMS (or 85 dBV), five times higher than the perception threshold, whereas the threshold for significant structural damage is 10 mm/s RMS (or 112 dBV), at least one hundred times higher than the perception threshold level.

4.3.1 Criteria for Ground Vibration and Ground-borne Noise

In the United States, the Federal Transportation Authority (FTA) has set vibration criteria for sensitive land uses next to transit corridors. Similar standards have been developed by the MECP. These standards indicate that the appropriate criterion for residences is 0.10 mm/s RMS for vibrations. For mainline railways, a document titled *Guidelines for New Development in Proximity to Railway Operations*[6] indicates that vibration conditions should not exceed 0.14 mm/s RMS averaged over a one-second time-period at the first floor and above of the proposed building. The Federal Transportation Authority (FTA) criterion was adopted as the appropriate standard for this study. As the main vibration source is due to the light rail line which has frequent events, the 0.10 mm/s RMS (72 dBV) vibration criteria and 35 dBA ground-borne noise criteria were adopted for this study.

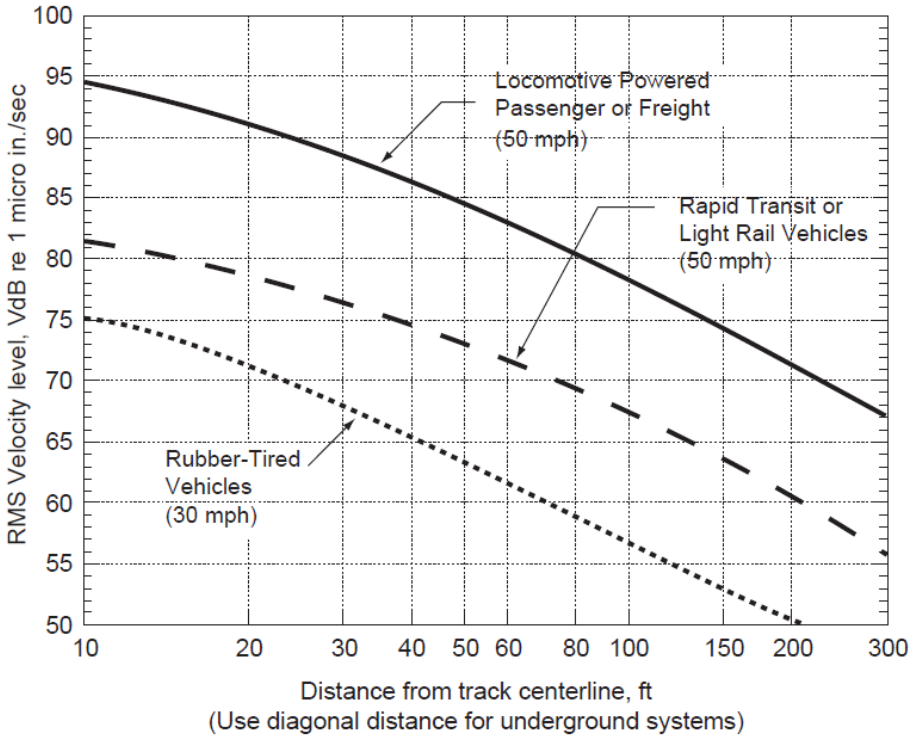
4.3.2 Theoretical Ground Vibration Prediction Procedure

Potential vibration impacts of trains were predicted using the FTA's *Transit Noise and Vibration Impact Assessment*[7] protocol. The FTA general vibration assessment is based on an upper bound generic set of curves that show vibration level attenuation with distance. These curves, illustrated in the figure below, are based on ground vibration measurements at various transit systems throughout North America. Vibration levels at points of reception are adjusted by various factors to incorporate known characteristics of the system being analyzed, such as operating speed of the vehicle, conditions of the track, construction

[6] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013
[7] C. E. Hanson; D. A. Towers; and L. D. Meister, Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

of the track and/or tunnel; depth and geology; as well as the structural type of the impacted building structures. The vibration impact on the building was determined using a set of curves for LRT at a speed of 70 km/h. Adjustment factors were considered based on the following information:

- The maximum operating speed of the LRT near the study area is 70 km/h (43 mph)
- The distance between the development property line and the closest track is 20 m
- The vehicles are assumed to have soft primary suspensions
- Tracks are not welded though in otherwise good condition
- Soil conditions do not efficiently propagate vibrations
- The building's foundation is large masonry on piles



FTA GENERALIZED CURVES OF VIBRATION LEVELS VERSUS DISTANCE (ADOPTED FROM FIGURE 10-1, FTA TRANSIT NOISE AND VIBRATION IMPACT ASSESSMENT)

5. RESULTS AND DISCUSSION

5.1 LRT Noise Levels

The results of the railway noise calculations are summarized in Table 3 below. A complete set of input and output data from all STAMSON 5.04 calculations are available in Appendix A.

TABLE 3: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Receptor Type / Building	Receptor Locations	Receptor Height (m)	LRT Noise Levels (dBA)	
				Day	Night
1	POW / West Building	West Façade POW	62.70 m	58	52
2	POW / West Building	North Façade POW	62.70 m	59	53
3	POW / West Building	North Façade POW	62.70 m	60	53
4	POW / West Building	East Façade POW	62.70 m	48	42
5	POW / West Building	South Façade POW	62.70 m	49	42
6	POW / East Building	West Façade POW	53.70 m	58	51
7	POW / East Building	North Façade POW	53.70 m	59	53
8	POW / East Building	North Façade POW	53.70 m	60	53
9	POW / East Building	East Façade POW	53.70 m	54	47
10	OLA / West Building	Rooftop Amenity Terrace – West	47.5 m	42	N/A*
11	OLA / West Building	11th Floor Terrace – West	34 m	42	N/A*
12	OLA / East Building	Rooftop Amenity Terrace – West	44 m	39	N/A*
13	OLA / East Building	11th Floor Terrace – West	34 m	39	N/A*
14	OLA / West Building	8th Floor Terrace – West	27.5 m	43	N/A*
15	OLA / East Building	Rooftop Amenity Terrace – Northeast	44 m	46	N/A*

* OLA noise levels during the nighttime are not considered as per the ENCG

The results of the current analysis indicate that noise levels will range between 48 and 60 dBA during the daytime period (07:00-23:00) and between 42 and 53 dBA during the nighttime period (23:00-07:00) at plane of window receptors. The highest noise level (i.e. 60 dBA) occurs at the north façades of the East and West Buildings, which are nearest and most exposed to the LRT line. Outdoor Living Area (OLA) noise levels at building terraces and outdoor amenity areas are well below the 55 dBA ENCG criteria.

5.2 Noise Control Measures for LRT Traffic

As the results indicate, the noise levels at Plane of Window receptors do not exceed 65 dBA during daytime and 60 dBA during nighttime, therefore, upgraded building components will not be required. Building components compliant with the Ontario Building Code will be sufficient.

The results of the calculations also indicate that the buildings should be designed with forced air heating and provisions for the installation of central air conditioning. In addition to ventilation requirements, warning clauses will also be required to be placed on all Lease, Purchase and Sale Agreements, as summarized in Section 6.

5.3 Vibration Impacts

The results of the vibration calculations indicated that the ground vibration levels will be approximately 0.11 mm/s, marginally above the threshold level of human perception to vibrations and the criterion of 0.10 mm/s. The ground-borne noise is estimated to be at 38 dBA. The exceedance is deemed to be trivial, therefore, mitigation for ground-borne vibrations and noise is not required. Details of the vibration calculations are presented in Appendix B.

6. CONCLUSIONS AND RECOMMENDATIONS

The results of the current analysis indicate that noise levels will range between 48 and 60 dBA during the daytime period (07:00-23:00) and between 42 and 53 dBA during the nighttime period (23:00-07:00) at plane of window receptors. The highest noise level (i.e. 60 dBA) occurs at the north façades of the East and West Buildings, which are nearest and most exposed to the LRT line. Outdoor Living Area (OLA) noise levels at building terraces and outdoor amenity areas are well below the 55 dBA ENCG criteria. Therefore, no barriers will be required.

The results of the calculations also indicate that the dwellings should be designed with forced air heating and provisions for the installation of central air conditioning. If installed at the occupants' discretion, air conditioning will allow windows and doors to remain close providing a quiet and comfortable indoor environment. Warning clauses will be required to be placed on all Lease, Purchase and Sale Agreements, as summarized below:

TYPE C

"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments 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, the Rail Construction Program Office recommends that the warning clause identified below to be included in all agreements of purchase and sale and lease agreements for the proposed development including those prepared prior to the registration of the Site Plan Agreement:

"The Owner hereby acknowledges and agrees:

i) The proximity of the proposed development of the lands described in Schedule "A" hereto (the "Lands") to the City's existing and future transit operations, may result in noise, vibration, electromagnetic interferences, stray current transmissions, smoke and particulate matter (collectively referred to as "Interferences") to the development;

ii) It has been advised by the City to apply reasonable attenuation measures with respect to the level of the Interferences on and within the Lands and the proposed development; and

iii) The Owner acknowledges and agrees all agreements of purchase and sale and lease agreements, and all information on all plans and documents used for marketing purposes, for the whole or any part of the subject lands, shall contain the following clauses which shall also be incorporated in all transfer/deeds and leases from the Owner so that the clauses shall be covenants running with the lands for the benefit of the owner of the adjacent road:

'The Transferee/Lessee for himself, his heirs, executors, administrators, successors and assigns acknowledges being advised that a public transit light-rail rapid transit system (LRT) is proposed to be located in proximity to the subject lands, and the construction, operation and maintenance of the LRT may result in environmental impacts including, but not limited to noise, vibration, electromagnetic interferences, stray current transmissions, smoke and particulate matter (collectively referred to as the Interferences) to the subject lands. The Transferee/Lessee acknowledges and agrees that despite the inclusion of noise control features within the subject lands,

Interferences may continue to be of concern, occasionally interfering with some activities of the occupants on the subject lands.

The Transferee covenants with the Transferor and the Lessee covenants with the Lessor that the above clauses verbatim shall be included in all subsequent lease agreements, agreements of purchase and sale and deeds conveying the lands described herein, which covenants shall run with the lands and are for the benefit of the owner of the adjacent road.'"

The results of the vibration calculations indicated that the ground vibration levels will be approximately 0.11 mm/s, marginally above the threshold level of human perception to vibrations and the criterion of 0.10 mm/s. The ground-borne noise is estimated to be at 38 dBA. The exceedance is deemed to be trivial, therefore, mitigation for ground-borne vibrations and noise is not required. Details of the vibration calculations are presented in Appendix B.

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.

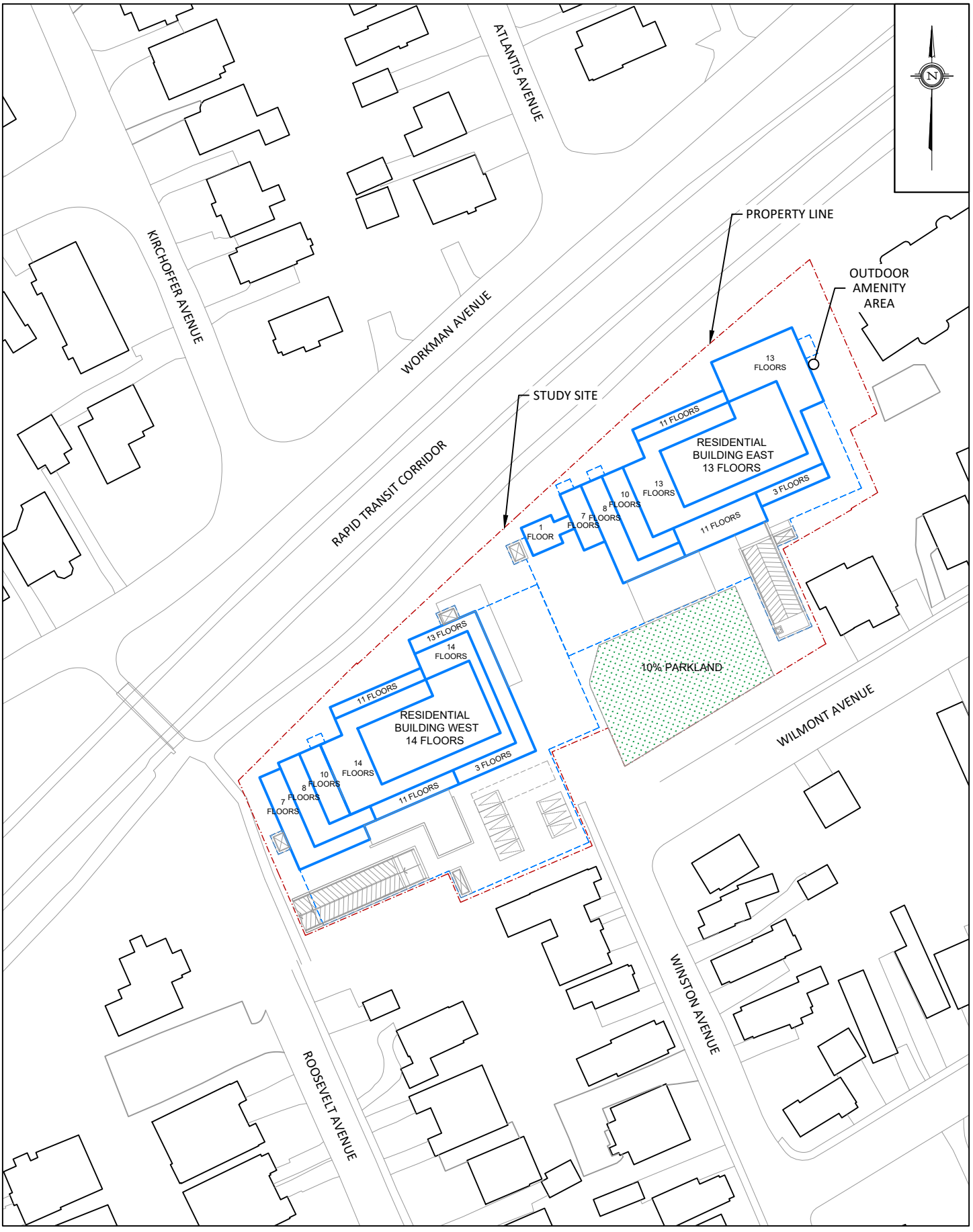
Sincerely,

Gradient Wind Engineering Inc.

Efser Kara, MSc, LEED GA
Acoustic Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind File#20-091 – Transportation Noise & Vibration R1



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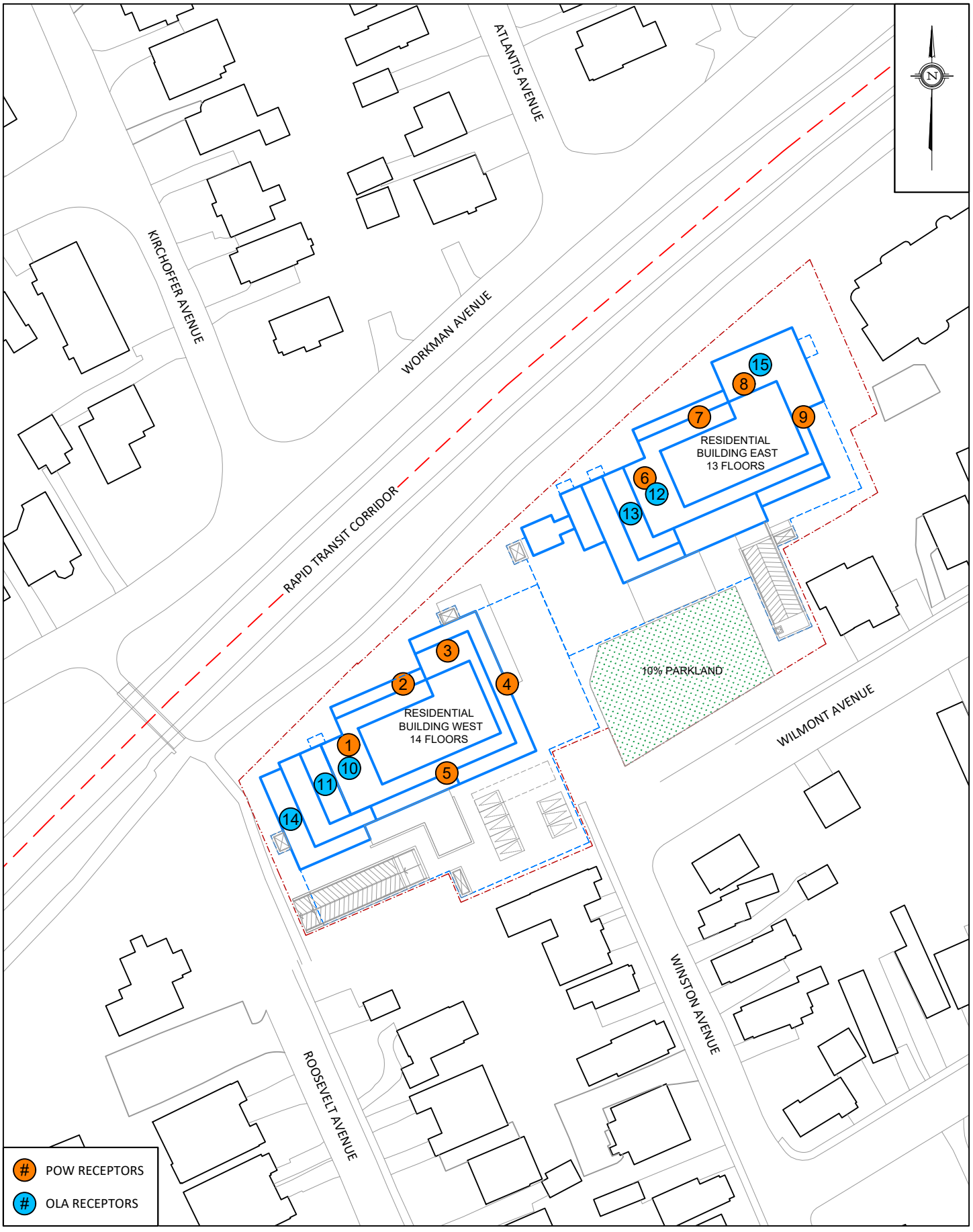
PROJECT	335 ROOSEVELT AVENUE RAILWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-091-1
DATE	MAY 20, 2025	DRAWN BY	E.K.

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT



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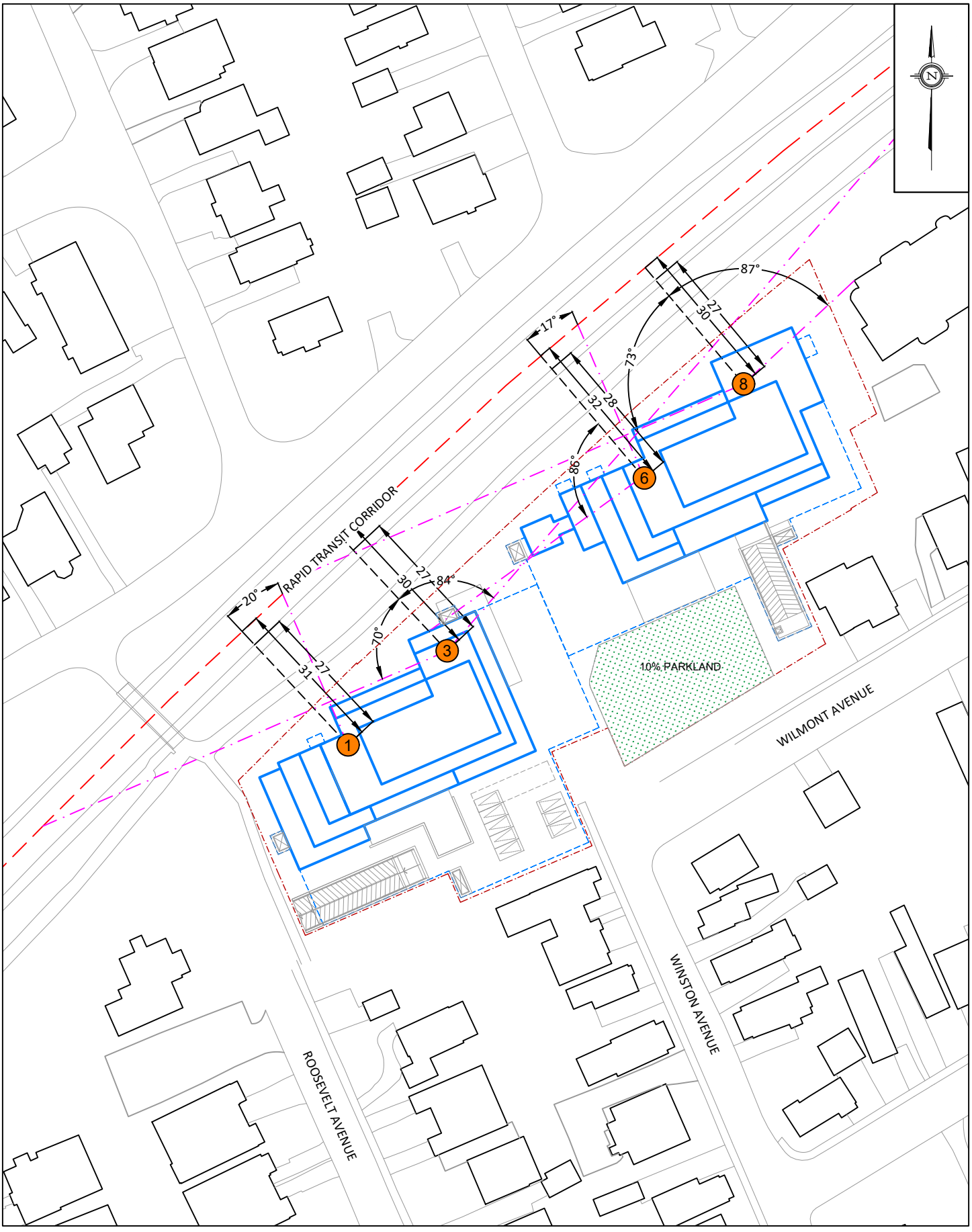
PROJECT	335 ROOSEVELT AVENUE RAILWAY TRAFFIC NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1000 (APPROX.)	DRAWING NO.	GW20-091-2
DATE	MAY 20, 2025	DRAWN BY	E.K.

FIGURE 2:
RECEPTOR LOCATIONS



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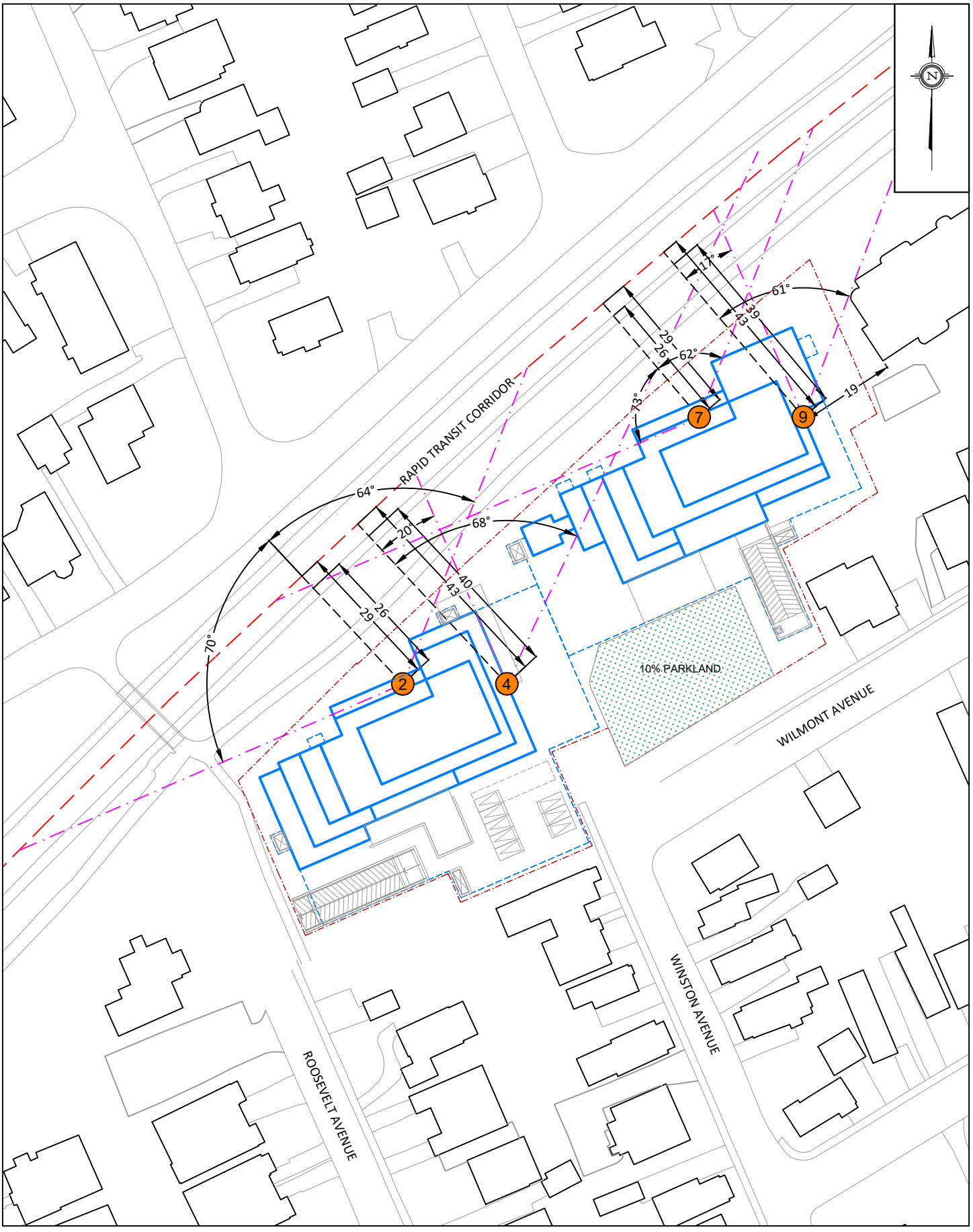
PROJECT	335 ROOSEVELT AVENUE RAILWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-091-3
DATE	MAY 20, 2025
DRAWN BY	E.K.

DESCRIPTION

FIGURE 3:
STAMSON INPUT DATA
FOR RECEPTORS 1, 3, 6 AND 8



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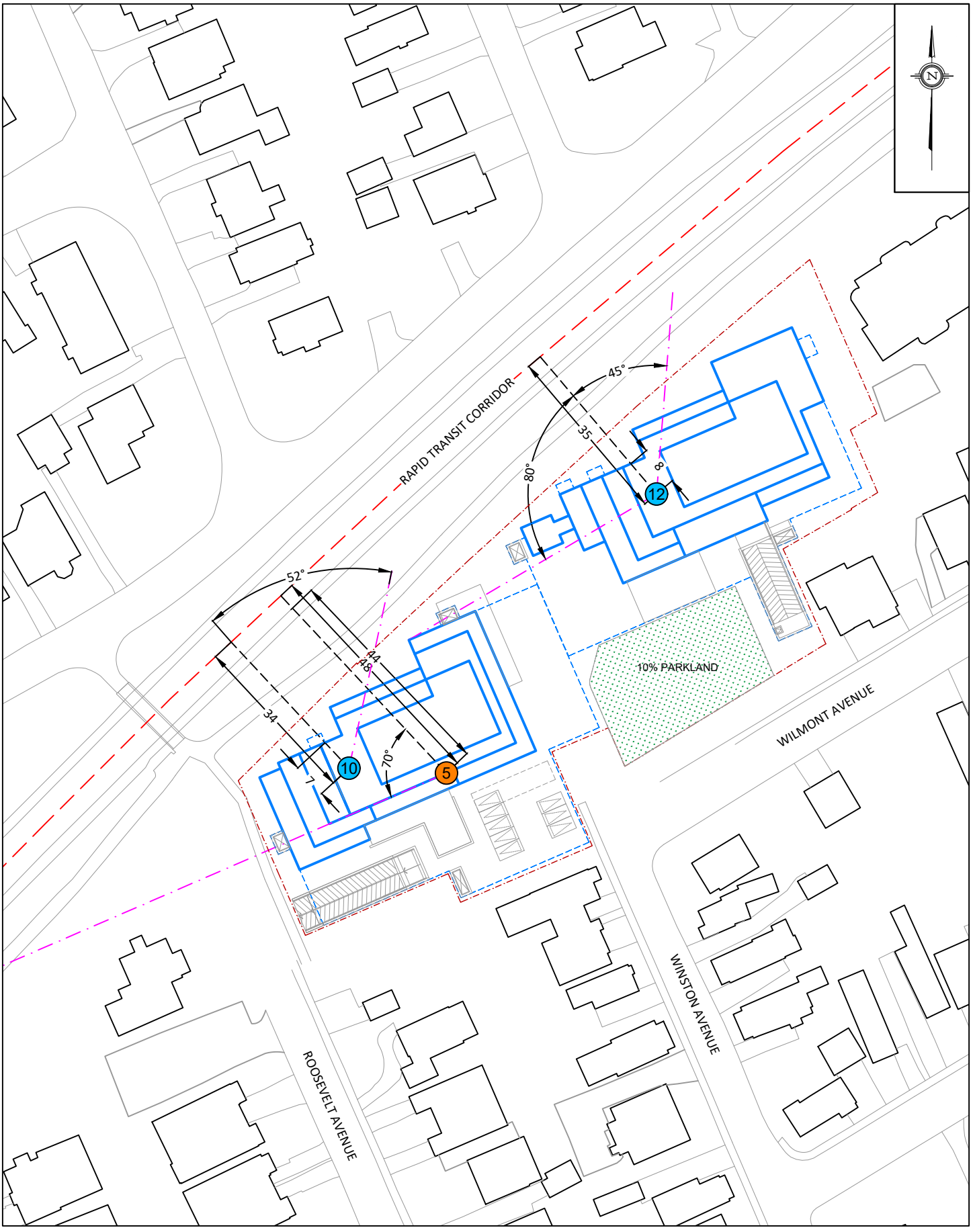
PROJECT	335 ROOSEVELT AVENUE RAILWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-091-4
DATE	MAY 20, 2025
DRAWN BY	E.K.

DESCRIPTION

FIGURE 4:
STAMSON INPUT DATA
FOR RECEPTORS 2, 4, 7 AND 9



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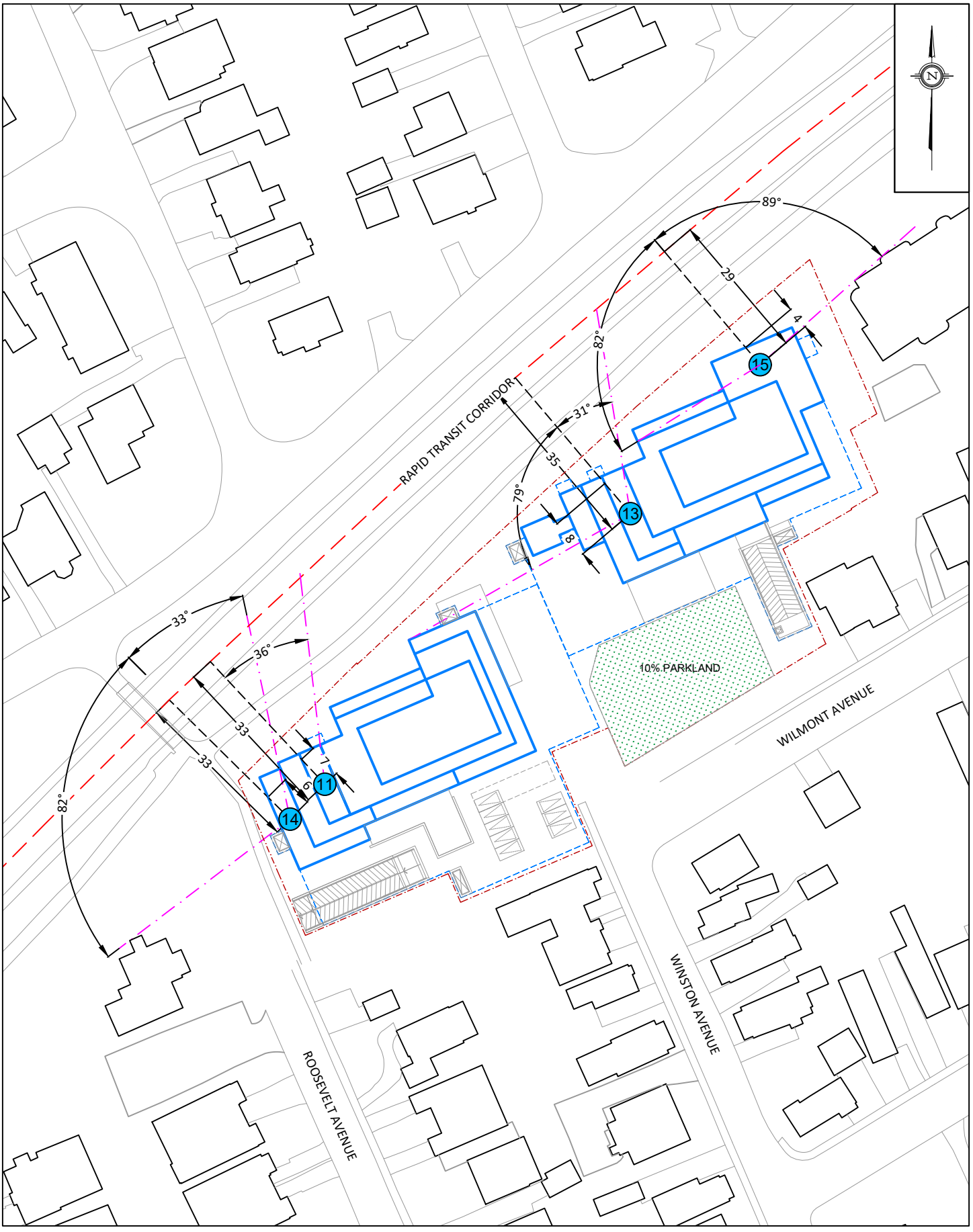
DATE	MAY 20, 2025
DRAWN BY	E.K.

DESCRIPTION

FIGURE 5:
STAMSON INPUT DATA
FOR RECEPTORS 5, 10, AND 12



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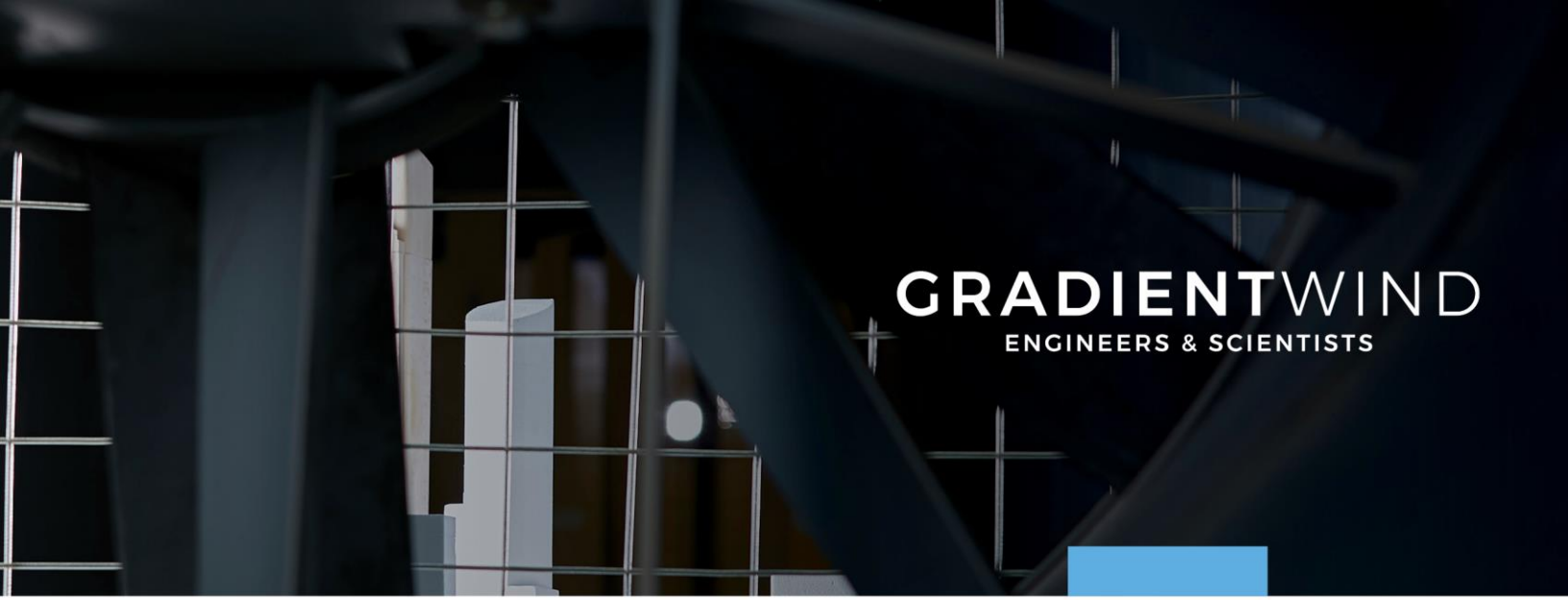
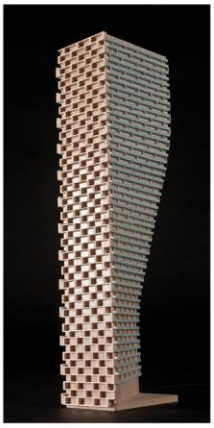
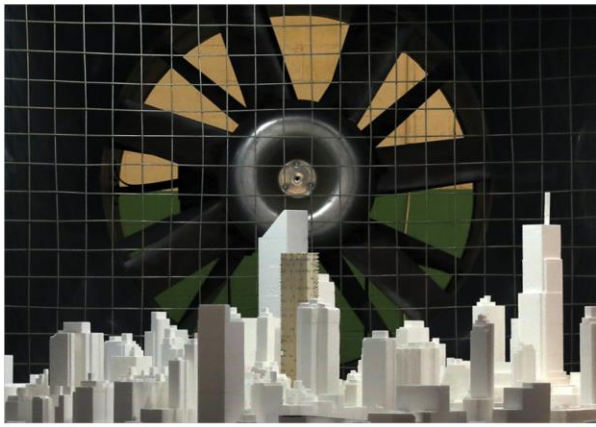
PROJECT	335 ROOSEVELT AVENUE RAILWAY TRAFFIC NOISE ASSESSMENT
SCALE	1:1000 (APPROX.)
DRAWING NO.	GW20-091-6
DATE	MAY 20, 2025
DRAWN BY	E.K.

DESCRIPTION

FIGURE 6:
STAMSON INPUT DATA
FOR RECEPTORS 11, 13, 14, AND 15







APPENDIX A

STAMSON INPUT-OUTPUT DATA

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STAMSON 5.0 NORMAL REPORT Date: 19-06-2020 12:21:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -90.00 deg 20.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 31.00 / 31.00 m
Receiver height : 62.70 / 62.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 20.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 27.00 / 27.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 3.74 ! 3.74

RT/Custom (0.00 + 58.15 + 0.00) = 58.15 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 20 0.00 63.44 -3.15 -2.14 0.00 0.00 -0.33 57.81*
-90 20 0.00 63.44 -3.15 -2.14 0.00 0.00 0.00 58.15
---

* Bright Zone !

Segment Leq : 58.15 dBA

Total Leq All Segments: 58.15 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 3.74 ! 3.74

RT/Custom (0.00 + 51.61 + 0.00) = 51.61 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 20 0.00 56.91 -3.15 -2.14 0.00 0.00 -0.33 51.28*
-90 20 0.00 56.91 -3.15 -2.14 0.00 0.00 0.00 51.61
---

* Bright Zone !

Segment Leq : 51.61 dBA

Total Leq All Segments: 51.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.15
(NIGHT): 51.61

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 15:39:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -70.00 deg 64.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.00 / 29.00 m
Receiver height : 62.70 / 62.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -70.00 deg Angle2 : 64.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 26.00 / 26.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 2.00 ! 2.00

RT/Custom (0.00 + 59.29 + 0.00) = 59.29 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-70 64 0.00 63.44 -2.86 -1.28 0.00 0.00 -1.80 57.49*
-70 64 0.00 63.44 -2.86 -1.28 0.00 0.00 0.00 59.29
---

* Bright Zone !

Segment Leq : 59.29 dBA

Total Leq All Segments: 59.29 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 2.00 ! 2.00

RT/Custom (0.00 + 52.76 + 0.00) = 52.76 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-70 64 0.00 56.91 -2.86 -1.28 0.00 0.00 -1.80 50.96*
-70 64 0.00 56.91 -2.86 -1.28 0.00 0.00 0.00 52.76
---

* Bright Zone !

Segment Leq : 52.76 dBA

Total Leq All Segments: 52.76 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.29
(NIGHT): 52.76

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 15:40:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -70.00 deg 84.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.00 / 30.00 m
Receiver height : 62.70 / 62.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -70.00 deg Angle2 : 84.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 27.00 / 27.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 1.77 ! 1.77

RT/Custom (0.00 + 59.75 + 0.00) = 59.75 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-70 84 0.00 63.44 -3.01 -0.68 0.00 0.00 -2.70 57.05*
-70 84 0.00 63.44 -3.01 -0.68 0.00 0.00 0.00 59.75
---

* Bright Zone !

Segment Leq : 59.75 dBA

Total Leq All Segments: 59.75 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 1.77 ! 1.77

RT/Custom (0.00 + 53.22 + 0.00) = 53.22 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-70 84 0.00 56.91 -3.01 -0.68 0.00 0.00 -2.70 50.52*
-70 84 0.00 56.91 -3.01 -0.68 0.00 0.00 0.00 53.22
---

* Bright Zone !

Segment Leq : 53.22 dBA

Total Leq All Segments: 53.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.75
(NIGHT): 53.22

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 15:44:27
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

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

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : 20.00 deg 68.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.00 / 43.00 m
Receiver height : 62.70 / 62.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 20.00 deg Angle2 : 68.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 40.00 / 40.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! -0.28 ! -0.28

RT/Custom (0.00 + 48.05 + 0.00) = 48.05 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
20 68 0.00 63.44 -4.57 -5.74 0.00 0.00 -5.07 48.05

Segment Leq : 48.05 dBA

Total Leq All Segments: 48.05 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! -0.28 ! -0.28

RT/Custom (0.00 + 41.52 + 0.00) = 41.52 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
20 68 0.00 56.91 -4.57 -5.74 0.00 0.00 -5.07 41.52

Segment Leq : 41.52 dBA

Total Leq All Segments: 41.52 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.05
(NIGHT): 41.52

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 15:45:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -90.00 deg -70.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.00 / 48.00 m
Receiver height : 62.70 / 62.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : -70.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 44.00 / 44.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 0.64 ! 0.64

RT/Custom (0.00 + 48.84 + 0.00) = 48.84 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 -70 0.00 63.44 -5.05 -9.54 0.00 0.00 -4.89 43.95*
-90 -70 0.00 63.44 -5.05 -9.54 0.00 0.00 0.00 48.84
---

* Bright Zone !

Segment Leq : 48.84 dBA

Total Leq All Segments: 48.84 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 62.70 ! 0.64 ! 0.64

RT/Custom (0.00 + 42.31 + 0.00) = 42.31 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 -70 0.00 56.91 -5.05 -9.54 0.00 0.00 -4.89 37.42*
-90 -70 0.00 56.91 -5.05 -9.54 0.00 0.00 0.00 42.31
---

* Bright Zone !

Segment Leq : 42.31 dBA

Total Leq All Segments: 42.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 48.84
(NIGHT): 42.31

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 15:46:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -86.00 deg 17.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.00 / 32.00 m
Receiver height : 53.70 / 53.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -86.00 deg Angle2 : 17.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 28.00 / 28.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 2.34 ! 2.34

RT/Custom (0.00 + 57.72 + 0.00) = 57.72 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-86 17 0.00 63.44 -3.29 -2.42 0.00 0.00 -0.61 57.11*
-86 17 0.00 63.44 -3.29 -2.42 0.00 0.00 0.00 57.72
---

* Bright Zone !

Segment Leq : 57.72 dBA

Total Leq All Segments: 57.72 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 2.34 ! 2.34

RT/Custom (0.00 + 51.19 + 0.00) = 51.19 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-86 17 0.00 56.91 -3.29 -2.42 0.00 0.00 -0.61 50.58*
-86 17 0.00 56.91 -3.29 -2.42 0.00 0.00 0.00 51.19
---

* Bright Zone !

Segment Leq : 51.19 dBA

Total Leq All Segments: 51.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.72
(NIGHT): 51.19

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 16:15:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -73.00 deg 62.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.00 / 29.00 m
Receiver height : 53.70 / 53.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -73.00 deg Angle2 : 62.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 26.00 / 26.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 1.07 ! 1.07

RT/Custom (0.00 + 59.32 + 0.00) = 59.32 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-73 62 0.00 63.44 -2.86 -1.25 0.00 0.00 -4.04 55.29*
-73 62 0.00 63.44 -2.86 -1.25 0.00 0.00 0.00 59.32
---

* Bright Zone !

Segment Leq : 59.32 dBA

Total Leq All Segments: 59.32 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 1.07 ! 1.07

RT/Custom (0.00 + 52.79 + 0.00) = 52.79 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-73 62 0.00 56.91 -2.86 -1.25 0.00 0.00 -4.04 48.75*
-73 62 0.00 56.91 -2.86 -1.25 0.00 0.00 0.00 52.79
---

* Bright Zone !

Segment Leq : 52.79 dBA

Total Leq All Segments: 52.79 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.32
(NIGHT): 52.79

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 16:15:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -73.00 deg 87.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.00 / 30.00 m
Receiver height : 53.70 / 53.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -73.00 deg Angle2 : 87.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 27.00 / 27.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 0.87 ! 0.87

RT/Custom (0.00 + 59.92 + 0.00) = 59.92 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-73 87 0.00 63.44 -3.01 -0.51 0.00 0.00 -4.42 55.50*
-73 87 0.00 63.44 -3.01 -0.51 0.00 0.00 0.00 59.92
---

* Bright Zone !

Segment Leq : 59.92 dBA

Total Leq All Segments: 59.92 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 0.87 ! 0.87

RT/Custom (0.00 + 53.38 + 0.00) = 53.38 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-73 87 0.00 56.91 -3.01 -0.51 0.00 0.00 -4.42 48.97*
-73 87 0.00 56.91 -3.01 -0.51 0.00 0.00 0.00 53.38
---

* Bright Zone !

Segment Leq : 53.38 dBA

Total Leq All Segments: 53.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.92
(NIGHT): 53.38

STAMSON 5.0 NORMAL REPORT Date: 18-06-2020 16:19:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r9.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : 17.00 deg 61.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.00 / 43.00 m
Receiver height : 53.70 / 53.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 17.00 deg Angle2 : 61.00 deg
Barrier height : 0.00 m
Barrier receiver distance : 39.00 / 39.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

RT/Custom data, segment # 2: Conf.LinePh2 (day/night)
---
1 - Bus:
Traffic volume : 540/60 veh/TimePeriod
Speed : 50 km/h

Data for Segment # 2: Conf.LinePh2 (day/night)

Angle1 Angle2 : 61.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.00 / 43.00 m
Receiver height : 53.70 / 53.70 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : 61.00 deg Angle2 : 90.00 deg
Barrier height : 19.00 m
Barrier receiver distance : 19.00 / 19.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 0.46 ! 0.46

RT/Custom (0.00 + 52.75 + 0.00) = 52.75 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
17 61 0.00 63.44 -4.57 -6.12 0.00 0.00 -4.74 48.01*
17 61 0.00 63.44 -4.57 -6.12 0.00 0.00 0.00 52.75
---

* Bright Zone !

Segment Leq : 52.75 dBA

Results segment # 2: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 27.76 ! 27.76

RT/Custom (0.00 + 46.55 + 0.00) = 46.55 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
61 90 0.00 59.05 -4.57 -7.93 0.00 0.00 -0.36 46.19*
61 90 0.00 59.05 -4.57 -7.93 0.00 0.00 0.00 46.55
---

* Bright Zone !

Segment Leq : 46.55 dBA

Total Leq All Segments: 53.68 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 0.46 ! 0.46

RT/Custom (0.00 + 46.21 + 0.00) = 46.21 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
17 61 0.00 56.91 -4.57 -6.12 0.00 0.00 -4.74 41.47*
17 61 0.00 56.91 -4.57 -6.12 0.00 0.00 0.00 46.21
---

* Bright Zone !

Segment Leq : 46.21 dBA

Results segment # 2: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 53.70 ! 27.76 ! 27.76

RT/Custom (0.00 + 40.01 + 0.00) = 40.01 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
61 90 0.00 52.52 -4.57 -7.93 0.00 0.00 -0.36 39.66*
61 90 0.00 52.52 -4.57 -7.93 0.00 0.00 0.00 40.01
---

* Bright Zone !

Segment Leq : 40.01 dBA

Total Leq All Segments: 47.14 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.68
(NIGHT): 47.14

STAMSON 5.0 NORMAL REPORT Date: 20-05-2025 17:24:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r10.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -90.00 deg 52.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 34.00 / 34.00 m
Receiver height : 47.50 / 47.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 52.00 deg
Barrier height : 46.00 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 47.50 ! 36.69 ! 36.69

RT/Custom (0.00 + 41.61 + 0.00) = 41.61 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 52 0.00 63.44 -3.55 -1.03 0.00 0.00 -17.25 41.61

Segment Leq : 41.61 dBA

Total Leq All Segments: 41.61 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 47.50 ! 36.69 ! 36.69

RT/Custom (0.00 + 35.07 + 0.00) = 35.07 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 52 0.00 56.91 -3.55 -1.03 0.00 0.00 -17.25 35.07

Segment Leq : 35.07 dBA

Total Leq All Segments: 35.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 41.61
(NIGHT): 35.07

STAMSON 5.0 NORMAL REPORT Date: 20-05-2025 17:23:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r11.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -90.00 deg 36.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 33.00 / 33.00 m
Receiver height : 34.00 / 34.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 36.00 deg
Barrier height : 32.50 m
Barrier receiver distance : 7.00 / 7.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 34.00 ! 25.73 ! 25.73

RT/Custom (0.00 + 42.24 + 0.00) = 42.24 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 36 0.00 63.44 -3.42 -1.55 0.00 0.00 -16.23 42.24

Segment Leq : 42.24 dBA

Total Leq All Segments: 42.24 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 34.00 ! 25.73 ! 25.73

RT/Custom (0.00 + 35.70 + 0.00) = 35.70 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 36 0.00 56.91 -3.42 -1.55 0.00 0.00 -16.23 35.70

Segment Leq : 35.70 dBA

Total Leq All Segments: 35.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 42.24
(NIGHT): 35.70

STAMSON 5.0 NORMAL REPORT Date: 20-05-2025 17:52:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r12.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -80.00 deg 45.00 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 : 44.00 / 44.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -80.00 deg Angle2 : 45.00 deg
Barrier height : 42.50 m
Barrier receiver distance : 8.00 / 8.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 44.00 ! 32.80 ! 32.80

RT/Custom (0.00 + 38.97 + 0.00) = 38.97 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-80 45 0.00 63.44 -3.68 -1.58 0.00 0.00 -19.21 38.97

Segment Leq : 38.97 dBA

Total Leq All Segments: 38.97 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 44.00 ! 32.80 ! 32.80

RT/Custom (0.00 + 32.43 + 0.00) = 32.43 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-80 45 0.00 56.91 -3.68 -1.58 0.00 0.00 -19.21 32.43

Segment Leq : 32.43 dBA

Total Leq All Segments: 32.43 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 38.97
(NIGHT): 32.43

STAMSON 5.0 NORMAL REPORT Date: 20-05-2025 18:10:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r13.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh2 (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh2 (day/night)

Angle1 Angle2 : -79.00 deg 31.00 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 : 34.00 / 34.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -79.00 deg Angle2 : 31.00 deg
Barrier height : 32.50 m
Barrier receiver distance : 8.00 / 8.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh2 (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 34.00 ! 25.09 ! 25.09

RT/Custom (0.00 + 39.02 + 0.00) = 39.02 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-79 31 0.00 63.44 -3.68 -2.14 0.00 0.00 -18.60 39.02

Segment Leq : 39.02 dBA

Total Leq All Segments: 39.02 dBA

Results segment # 1: Conf.LinePh2 (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 34.00 ! 25.09 ! 25.09

RT/Custom (0.00 + 32.48 + 0.00) = 32.48 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-79 31 0.00 56.91 -3.68 -2.14 0.00 0.00 -18.60 32.48

Segment Leq : 32.48 dBA

Total Leq All Segments: 32.48 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 39.02
(NIGHT): 32.48

STAMSON 5.0 NORMAL REPORT Date: 22-05-2025 10:03:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r14.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh (day/night)

Angle1 Angle2 : -82.00 deg 33.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 33.00 / 33.00 m
Receiver height : 27.50 / 27.50 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -82.00 deg Angle2 : 33.00 deg
Barrier height : 26.00 m
Barrier receiver distance : 6.00 / 6.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 27.50 ! 21.59 ! 21.59

RT/Custom (0.00 + 42.54 + 0.00) = 42.54 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-82 33 0.00 63.44 -3.42 -1.95 0.00 0.00 -15.52 42.54

Segment Leq : 42.54 dBA

Total Leq All Segments: 42.54 dBA

Results segment # 1: Conf.LinePh (night)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 27.50 ! 21.59 ! 21.59

RT/Custom (0.00 + 36.01 + 0.00) = 36.01 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-82 33 0.00 56.91 -3.42 -1.95 0.00 0.00 -15.52 36.01

Segment Leq : 36.01 dBA

Total Leq All Segments: 36.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 42.54
(NIGHT): 36.01

STAMSON 5.0 NORMAL REPORT Date: 22-05-2025 10:04:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r15.te Time Period: Day/Night 16/8 hours
Description:

RT/Custom data, segment # 1: Conf.LinePh (day/night)
---
1 - 4-car SRT:
Traffic volume : 540/60 veh/TimePeriod
Speed : 70 km/h

Data for Segment # 1: Conf.LinePh (day/night)

Angle1 Angle2 : -82.00 deg 89.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 29.00 / 29.00 m
Receiver height : 44.00 / 44.00 m
Topography : 2 (Flat/gentle slope; with barrier)
Barrier angle1 : -82.00 deg Angle2 : 89.00 deg
Barrier height : 42.50 m
Barrier receiver distance : 4.00 / 4.00 m
Source elevation : -5.50 m
Receiver elevation : 0.00 m
Barrier elevation : 0.00 m
Reference angle : 0.00

Results segment # 1: Conf.LinePh (day)

Source height = 0.50 m

Barrier height for grazing incidence

Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 44.00 ! 37.24 ! 37.24

RT/Custom (0.00 + 45.92 + 0.00) = 45.92 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-82 89 0.00 63.44 -2.86 -0.22 0.00 0.00 -14.43 45.92

Segment Leq : 45.92 dBA

Total Leq All Segments: 45.92 dBA

Results segment # 1: Conf.LinePh (night)

Source height = 0.50 m

Barrier height for grazing incidence

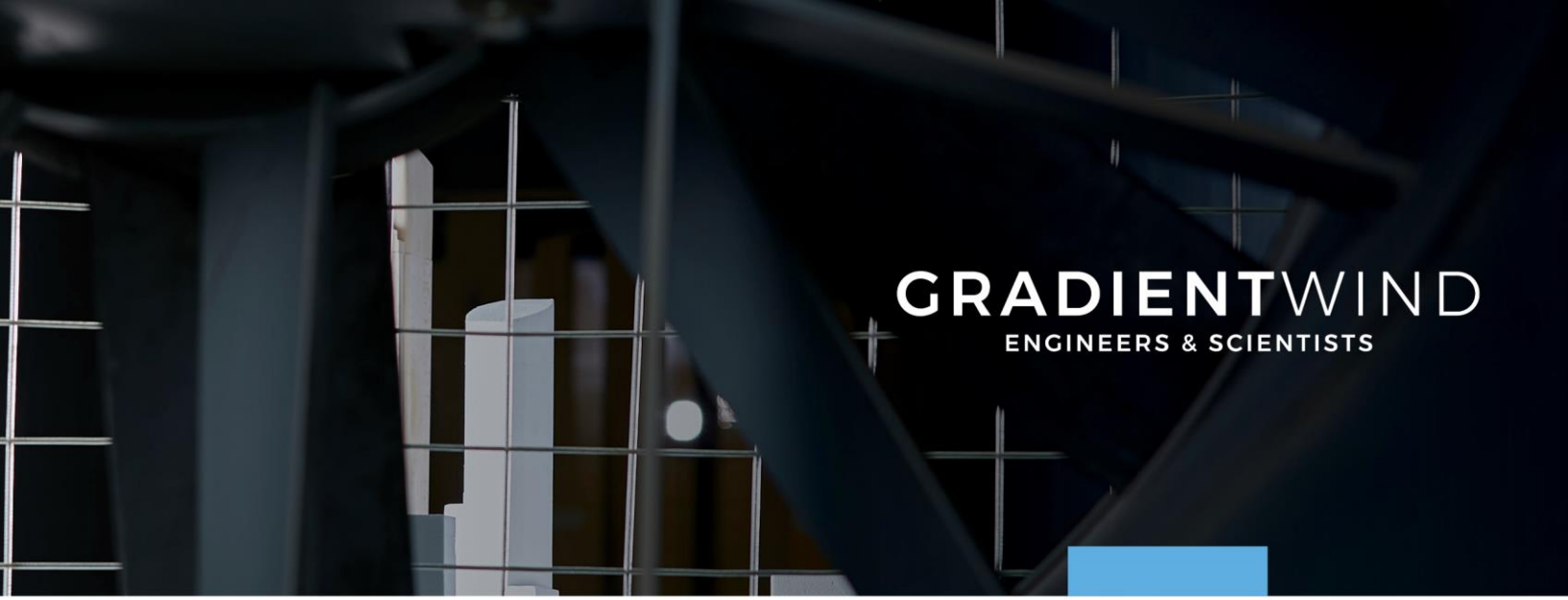
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
0.50 ! 44.00 ! 37.24 ! 37.24

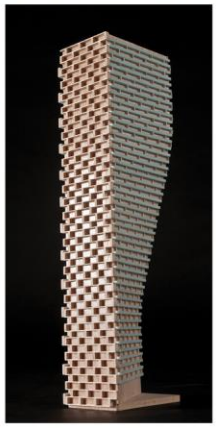
RT/Custom (0.00 + 39.39 + 0.00) = 39.39 dBA
Angle1 Angle2 Alpha RefLeq D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-82 89 0.00 56.91 -2.86 -0.22 0.00 0.00 -14.43 39.39

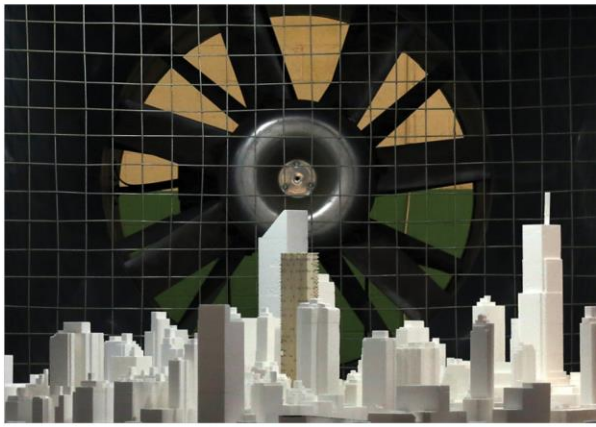
Segment Leq : 39.39 dBA

Total Leq All Segments: 39.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 45.92
(NIGHT): 39.39







APPENDIX B

FTA VIBRATION CALCULATIONS

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

GW20-091

Possible Vibration Impacts on
335 Roosevelt Avenue
Perdicted using FTA General Assesment

Train Speed 70 km/h 43 mph

	Distance from C/L	
	(m)	(ft)
LRT	17.0	55.8

Vibration

From FTA Manual Fig 10-1

Vibration Levels at distance from track	72	dBV re 1 micro in/sec	
Adjustment Factors FTA Table 10-1			
Speed reference 50 mph	-1	Operating Speed 43 mph	
Vehicle Parameters	0	Assume Soft primary suspension, Wheels run true	
Track Condition	0	Good condition	
Track Treatments	0	none	
Type of Transit Structure	0	Open cut	
Efficient vibration Propagation	2	Propagation through rock	
Vibration Levels at Fdn	73		0.111
Coupling to Building Foundation	0	Fondation on Bedrock	
Floor to Floor Attenuation	-4.0	Second Floor Ocupied	
Amplification of Floor and Walls	4		
Total Vibration Level	72.79	dBV or	0.111 mm/s
Noise Level in dBA	37.79	dBA	